Children Ages 3-5 Years Use Language to Identify Talkers

Reina Mizrahi and Sarah C. Creel

1. Introduction

A central question in development is how children begin to comprehend spoken language. The ease with which we engage in everyday conversation disguises the complexity of the mechanisms involved in comprehending speech. By adulthood, listeners can identify and integrate information at a variety of linguistic levels (i.e., speech sounds, syntax, discourse) and extralinguistic levels (i.e., talker information, visual scene, mood) to reach full comprehension. Until recently, it was unknown when and how in language development children could identify and use these different sources of information in real-time speech processing.

Generally, being able to identify who is talking facilitates language comprehension – as it matters not just what is being said, but also who is saying it. For example, the sentence “I need a drink”, may well refer to a different liquid depending on whether a child or an adult says it. While decades of research have been dedicated to understanding how children learn words and grammatical properties of their native language, little is known about the type of speaker information that children of different language backgrounds (i.e., monolingual or bilingual) are able to extract from spoken language, and whether such information is utilized in language comprehension. The current study aims to shed light on this matter by investigating whether the language someone speaks can itself serve as an extralinguistic cue for talker identification.

1.1. Representing talker information across development

A number of studies have focused on children’s sensitivity to talker information throughout language development. From as early as birth, children are able distinguish their mother’s voice from a stranger’s voice (DeCasper & Fifer, 1980), and at 7.5 months infants demonstrate difficulty generalizing recognition of a familiarized word form to various speakers (though they may overcome this by 10.5 months; Houston & Jusczyk, 2000). Preschool-aged children (Creel, 2014) and even adults (Creel et al., 2008; Creel & Tumlin, 2011) recognize newly-learned words more readily if they are spoken in the voice that they were learned in. Such findings suggest that from an early age, children are sensitive to specific acoustic details of words in their native

* Reina Mizrahi, University of California San Diego, rmizrahi@ucsd.edu. Research was supported by NSF CAREER Award BCS-1057080.

language. While these studies provide important information regarding perceptual sensitivity at early stages of language acquisition, they do not address whether and how children use speaker-specific acoustic cues to identify talkers.

For children to be able to use voice characteristics to identify talkers, they must form an association between the acoustic cues and particular individuals. Creel and Jimenez (2012) investigated this question in a number of experiments testing preschoolers’ and adults’ ability to form voice-character associations on voice characteristics such as formant frequency, pitch, gender, and age. The authors found that preschool age children were able to form voice-character associations as long as voice characteristics were acoustically and socially distinct. For example, children were easily able to differentiate between a male and a female speaker but not between two speakers matched on age, gender, and dialect.

Given such findings, more recent studies have focused on whether children utilize salient speaker-specific information (e.g., favorite color - pink) to inform their comprehension of spoken language (Creel, 2012; Creel 2014; Borovsky & Creel, 2014). In these studies, children showed predictive looks towards objects related to information about the speaker (e.g., a pink object), even before the speaker named the object (Creel, 2012; Creel 2014; Borovsky & Creel, 2014). Findings from these studies suggest that children not only associate voice characteristics with particular speakers, but can also deploy talker-specific knowledge in spoken language comprehension.

However, in spoken language there is a range of sources of information beyond the ones that have been studied, which can also influence the meaning of a spoken phrase. As shown by some of the studies in the language comprehension literature, identifying who is talking facilitates language comprehension as it can provide the listener information about what the speaker is likely to say and how they might say it (Creel 2014; Borovsky and Creel; 2014). The studies discussed have primarily focused on monolingual children and adults, leaving it unknown whether the same or different cues are used by children that speak more than one language. Given the increasing number of children being raised as bilingual speakers (U.S. Census Bureau, 2015), it is important to investigate how language input differences may influence spoken language comprehension.

1.2. Current Studies

Prior work provides us with strong evidence regarding children’s ability to extract and utilize speaker information in language comprehension. However, there are a number of questions that remain unanswered regarding the kinds of cues that children can and cannot extract. Until now, the cues that have been studied specifically focus on the influence of extralinguistic information on meaning and comprehension in monolingual children, leaving the following questions unanswered: (1) Can linguistic cues serve as talker-identifying information? (2) Does language background (bilingual or monolingual)
influence how much a listener relies on the different sources of information in the speech signal? The current study aims to explore these questions by investigating how children of different language backgrounds can utilize the language someone speaks as a cue for talker identification.

Whether or not children are able to utilize language as a cue for talker identification has important theoretical and practical implications for our understanding of bilingual and monolingual language development. In the bilingual language development literature it is unclear how bilingual speakers, especially young children, keep separate representations of the two languages they speak (Byers-Heinlein, 2014; Genesee et al., 1989, Grosjean, 2001). In other words, how do bilinguals know which language to use in a particular conversation? Research investigating when bilingual children begin to address others in the appropriate language is mixed. While some studies suggest that children do in fact address others in the appropriate language (Genesee et al., 1996), other studies find that children mix the two languages they speak regardless of whether the other interlocutor comprehends both languages (Nicoladis, 1998). Such findings are hard to interpret as children may have many reasons for not using the correct language, over and above not knowing the appropriate language to use (Genesee et al., 1989). For example, they may not know a particular word in the correct language, even though they know what language they should use.

Using a talker identification task, in which children are not required to produce language but simply to comprehend language, could inform our understanding of monolingual and bilingual children’s representation of the language(s) they speak throughout development. Additionally, the use of language as an identifying cue would be theoretically interesting as it would violate the divide researchers classically make between linguistic speech cues and extralinguistic speech cues, as language itself serves as both.

One possibility we consider that facilitates bilinguals’ ability to keep their two languages separate, is that children associate specific people with particular languages. If this is the case, then we might expect bilinguals, regardless of which two languages they speak, to more readily use language as a talker identification cue than monolinguals. However, it may also be the case that language serves as a cue insofar as the listener comprehends the language(s) of the speaker regardless of bilingual status.

To test our hypotheses, we use the visual-world eye tracking paradigm (VWP; Tanenhaus et al., 1995; Swingley et al., 1998). The VWP measures moment-to-moment changes in participants’ eye gaze to objects in a visual scene in response to spoken language. Participants’ eye movements have been interpreted to reflect real time language processing (Allopenna et al., 1998). In Experiment 1, we asked whether children could utilize language as a cue for talker identification by measuring pointing accuracy and fixation patterns to the target character. As a follow-up to Experiment 1, Experiment 2 considered whether participants recognized the target character based on properties of the talker’s voice, rather than based on their language.
2. Experiment 1
2.1. Methods
2.1.1. Participants

Thirty-two English monolingual children (15 female), ages 3-5 ($M = 4.67, SD = 0.63$), 26 bilinguals that speak English and another language other than Spanish (15 female), ages 3-5 ($M = 4.60, SD = 0.68$), and 15 English-Spanish bilingual children (8 female), ages 3–5 years ($M = 4.78, SD = 0.84$). Children were recruited from and tested at day cares and preschools in the San Diego area.

2.1.2. Stimuli

Auditory stimuli were recorded by four native speaking English-Spanish bilinguals (2 female) using child directed speech in both English and Spanish. This allowed for the same speaker to serve as either the Spanish or English speaker across all participants. The English sentences for the learning phase and test phase were matched on length and were similar to those utilized in the study conducted by Creel and Jimenez (2012). The Spanish sentences are direct translations of the English sentences. The four distinct cartoon characters used in this experiment are identical to those used in the study by Creel and Jimenez (2012) (see Figure 1).

![Figure 1. Cartoon characters used in both experiments.](image)

2.1.3. Apparatus/Equipment

In all experiments, eye movements were tracked by an Eyelink 1000 Remote eye tracker (SR Research, Mississauga, ON, Canada; http://www.sr-research.com). This device has 2-millisecond temporal resolution. The desktop mount Eyelink 1000 does not require participants to wear equipment or utilize a chin rest, allowing for more comfortable use with young children.

Stimuli were presented by a Macintosh Mini using Matlab software, from scripts using Psych-Toolbox 3 (Brainard, 1997; Pelli, 1997) and the Eyelink Toolbox (Cornelissen et al., 2002).

2.1.4. Procedure

After an eye tracker calibration sequence, the experiment began. The experiment had two phases: (1) familiarization phase and (2) test phase. In the familiarization phase participants were introduced to two cartoon characters (8 trials, 4 per speaker), each of whom spoke a different language (Spanish or
English; either two female or two male talkers). On each trial, one character appeared on-screen and spoke a passage in their respective language. Each character spoke all of the sentences equally often and appeared from each side of the screen an equal number of times. The order in which characters appeared on the screen was randomized across all participants.

Following the familiarization phase, the test phase consisted of 16 two-alternative forced choice trials, in which one of the characters spoke a novel sentence and the child was asked to point to the character they believed said the sentence. The experimenter clicked the computer mouse on the character the child was pointing to, to record their response. Eye movements were recorded throughout the test phase by the Eyelink 1000.

This familiarization-test procedure occurred two times in a single session, resulting in two blocks—one with two female speakers and the other with two male speakers. The order of the blocks was counterbalanced so that half of the participants received the female voiced characters first.

Following the two familiarization-test sequences, we assessed participant receptive vocabulary in English with the Peabody Picture Vocabulary Test (PPVT-IV, Dunn & Dunn, 2007, Version A). For the English-Spanish bilinguals Spanish vocabulary was measured using a Spanish equivalent of the PPVT, scores (TVIP, Dunn et al., 1986). Vocabulary scores were used to ensure participants were truly bilingual, which we defined as above the 20th percentile range in both English and Spanish. Participants with scores below the 20th percentile were not included in the data analysis.

2.2. Preliminary Results
2.2.1. Behavioral data

A mixed-effects logistic regression was conducted on test accuracy as a function of Language Background (English-Spanish bilingual, English-other bilingual, monolingual) and Age (continuous variable), with random effects for participants. Mean accuracy was overall high (84%) and significantly above chance ($p<0.001$), but no main effects or interactions were significant (Figure 2).
2.2.2. Eye-tracking data

Looks to target character and competitor character underwent an empirical logit transformation to correct for non-normality (Barr, 2008). Next, competitor looks were subtracted from looks to the target character, to form a target preference looking score. Prior studies in our lab using eye tracking have used 1000-millisecond time windows beginning at the first point where information is available. However, based on pilot data (and experimenter intuition) suggesting that children may need several words to identify which language is being spoken, both an early (200-1200 ms) and late (1200-2200 ms) time window were used for this analysis.

**Early time window (200-1200 ms).** An analysis of variance (ANOVA) was conducted on the mean difference in empirical-logit-transformed looking times to target character minus competitor with Language Background (English-Spanish bilingual, English-other bilingual, monolingual) and Age (continuous variable) as between subject factors. There was a significant main effect of age, $F(1, 113) = 7.64, p = 0.007$, but no main effect of language group, $F(2, 113) = 1.78, p = 0.173$ (Figure 3). Additionally, there was no significant interaction between the two factors, $F(2, 113) = 0.63, p = 0.535$. As shown in the behavioral data, looks to the target character were significantly above chance across all participant groups, $t(65) = 7.53, p < 0.0001$.

**Late time window (1200-2200 ms).** An ANOVA with the same predictors on looks in the later time period showed similar patterns of results. There was no significant main effect of language background, $F(2, 78) = 0.08, p = 0.923$ (Figure 3). A main effect of age was found, $F(1, 78) = 11.1, p = 0.001$ (Figure 3), with greater looks among older children, and no interaction. As in the early time window, looks to the target character were significantly above chance across all participant groups, $t(53) = 8.03, p < 0.0001$. 

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**Figure 2.** Average percent accuracy by language group, ***$p < 0.0001$.**

**Figure 3.** Looks to target minus competitor by language group showing both early (200-1200ms) and late (1200-2200ms) time windows.
2.3. Discussion

Preliminary findings from Experiment 1 suggest two things. First, given that performance was significantly above chance for all three participant groups, it suggests that language is a highly salient vocal feature that can be used for talker identification across children of different language backgrounds. Second, because there are no significant differences in looking patterns across children of different language backgrounds, it suggests that the ease with which language as a cue for talker identification is used is not dependent on comprehending the speaker. It is important to note, however, that data collection is not complete and data patterns may change once data collection is complete.

While data patterns suggest similar performance across children that do and do not comprehend the two languages, it is unclear how children that comprehend only one of the two languages are distinguishing the two characters in comparison to bilingual children that do comprehend both. Possible ways of distinguishing the two voices include intelligibility differences, as well as speech sound and phonotactic differences between the two languages.

Further, children may be using voice quality differences to distinguish the speakers. Recall that the current study utilized different speakers to voice each language (i.e., Speaker A voiced character 1 and Speaker B voiced character 2). Although it seems unlikely, given Creel and Jiménez’s (2012) finding that same-gender, same-age voices are difficult to tell apart, it is possible that children may have utilized voice characteristics rather than language to distinguish between the two characters. We addressed this in Experiment 2.

3. Experiment 2

Experiment 2 investigated whether children utilized voice characteristics for talker identification. English monolingual children were tested, as they only comprehend one of the two languages in the task and could perhaps rely to a greater degree on voice characteristics than bilingual children that do comprehend both English and Spanish.

Spanish-English bilingual and English monolingual adults were also tested to serve as a comparison for child participants. Both bilingual and monolingual participants were tested based on findings from Perrachione et al. (2010) suggesting that voice identification is facilitated by familiarity with a particular language. Of key interest was to identify whether monolingual children would pattern more similarly to that of bilingual adults or monolingual adults.

3.1. Methods
3.1.1. Participants

Thirty-two English monolingual children (15 female), ages 3-5 ($M = 4.35$, $SD = 0.66$). Children were recruited from and tested at day cares and preschools
in the San Diego area. Thirty-two undergraduate participants (16 English monolinguals, 16 Spanish-English bilingual) from the University of California, San Diego were tested. Children received a thank-you toy for participating; adults received course credit for their participation.

3.1.2. Stimuli, Apparatus/Equipment

The same stimuli and apparatus as in Experiment 1 were used.

3.1.3. Procedure

The experimental procedure matched that of Experiment 1, with one modification in the test phase. After the first half of the test trials (16 total test trials), the speaker voicing each language was switched. For example, if speaker A originally spoke English, after the first 8 trials speaker A now spoke Spanish.

For adult participants, vocabulary was measured using the Multilingual Naming Test (MiNT) for the language(s) they spoke (Gollan et al., 2012).

3.2. Results

To assess whether participants were identifying the character based on voice properties or language, we compared participants’ character selection based on language between the first half of the test trials (before the speaker language switch) and second half (after the switch). If participants were selecting characters based on language rather than voice, there should be a significant difference in participants’ selection of character based on speaker, and no significant difference in participants’ selection of character based on language between the first and second half of the test block.

3.2.1. Behavioral data

Child participants. A mixed-effects logistic regression was conducted on the proportion of character selection based on the speaker (voice) as a function of Test Half (pre-switch and post-switch) and Age (continuous variable) with random effects for participants. For purposes of analysis here, selection of the same speaker (even if they changed language) was counted as correct. Mean accuracy was overall high in the pre-switch test phase half (89%), whereas the post-switch condition accuracy was overall low (14%). Test Half was a significant predictor of performance, \( p < 0.001 \) (Figure 4). Note that if these data are re-scored such that correctness is defined as selecting the character based on the language they spoke at training, accuracy is high for both the pre-switch and post-switch half, 89% and 86% respectively (\( p < 0.001 \)), and Test Half is not a significant predictor of performance, \( p = 0.169 \) (Figure 5). This suggests that children are relying completely on language, not voice, to identify talkers.
Adult participants. Similar to the analysis of child participant data, a mixed-effects logistic regression was conducted investigating the proportion of character selection based on the speaker (voice) as a function of Test Half and Language Background (bilingual and monolingual) with random effects for participants. Similar to the first analysis of child data, selection of the same speaker (even if language spoken changed) was counted as correct. Selection of characters based on language rather than voice was overall high and significantly above chance for the pre-switch half, 99%, and close to chance for the post-switch half, 47%. The interaction between Test Half and Language Background was a significant predictor of performance, \( p < 0.001 \). To better understand the interaction, post-hoc pairwise comparisons were conducted and showed a greater drop in performance across Test Half for bilingual (pre-switch: \( M = 1, SE = 0.06 \); post-switch: \( M = 0.36, SE = 0.06 \), \( t = 26.8, p < 0.001 \), relative to monolingual participants (pre-switch: \( M = 0.99, SE = 0.06 \); post-switch: \( M = 0.58, SE = 0.06 \), \( t = 17.6, p < 0.001 \).

To examine whether participants had different strategies in selecting characters based on language and/or voice. A chi-square test of independence was performed to examine the relation between language background and language/voice selection, \( \chi^2(1) = 2, p = 0.157 \). The test shows that the strategy participants use is not dependent on language background. Importantly, the test revealed that out of the number of participants in each language group (16 bilinguals, 16 monolinguals), individual participants tended to use either language or voice as the key cue for talker identification (Bilinguals: 10 language; Monolinguals: 6 language).

3.2.2. Eye-tracking data

Child participants. Similar to Experiment 1, looks to the competitor character (the character voiced by the opposite speaker as in the familiarization phase) were subtracted from looks to the target character (the character voiced by the same speaker as in the familiarization phase), to form a speaker

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**Figure 4.** Avg. percent of characters selected based on speaker for the first half of the test trials (pre-switch) and second half (post-switch), *** \( p < 0.001 \).

**Figure 5.** Avg. percent of characters selected based on language for the first half of the test trials (pre-switch) and second half (post-switch).
preference looking score. As in Experiment 1, an early (200-1200 ms) and late (1200-2200 ms) time window were used for this analysis.

Early time window (200-1200 ms). An analysis of variance (ANOVA) was conducted on the mean difference in empirical-logit-transformed looking times to target character minus competitor with Test Phase Half (pre-switch and post-switch) and Age (continuous variable) as within and between subject factors respectively. There was no significant main effect of age, $F(1, 30) = 0.03, p = 0.854$. There was however a main effect of test phase half, $F(1, 30) = 7.22, p = 0.012$ (Figure 6). Additionally, there was no significant interaction between the two factors, $F(1, 30) = 2.51, p = 0.123$.

Late time window (1200-2200 ms). The same ANOVA from the early time window over a later time period showed a different pattern of results. There was a significant main effect of test phase half, $F(1, 30) = 78.44, p < 0.0001$ (Figure 6) and no main effect of age, $F(1, 30) = 3.28, p = 0.080$. There was no interaction between the two factors, $F(1, 30) = 2.86, p = 0.101$.

Similar to behavioral data, the eye-tracking data for the early and late time windows was analyzed with respect to looks to the character based on language rather than speaker. In both the early and late time windows there was no main effect of Test Half, $F(1, 30) = 1.209, p = 0.281, F(1, 30) = 0.182, p = 0.673$ (Figure 7).

![Figure 6.](image1.png) ![Figure 7.](image2.png)

**Figure 6.** Looks to speaker-character pairing minus language-character pairing by test half in both early and late time windows, *p < 0.05, ***p < 0.0001.

**Figure 7.** Looks to language-character pairing test half in both early and late time windows.

Adult participants. Early time window (200-1200 ms). An analysis of variance (ANOVA) was conducted on the mean difference in empirical-logit-transformed looking times to target character minus competitor with Test Phase Half (pre-switch and post-switch) and Language Background (bilingual and monolingual) as within and between subject factors respectively. There was no significant main effect of language background, $F(1, 28) = 1.80, p = 0.190$. There was however a main effect of test phase half, $F(1, 27) = 34.50, p < 0.001$. Additionally, there was no significant interaction between the two factors, $F(1, 28) = 3.33, p = 0.078$. 
Late time window (1200-2200 ms). The same ANOVA from the early time window over a later time period showed a different pattern of results. There was a significant main effect of test phase half, \( F(1, 29) = 45.31, p < 0.0001 \), and no main effect of language background, \( F(1, 29) = 1.67, p = 0.207 \). There was no interaction between the two factors, \( F(1, 29) = 2.84, p = 0.103 \).

![Figure 8](image1.png) **Figure 8.** Looks to speaker-character pairing minus language-character pairing by test half in both early and late time windows for language responders.

![Figure 9](image2.png) **Figure 9.** Looks to language-character pairing test half in both early and late time windows for voice responders.

* \( p < 0.05 \), ** \( p < 0.001 \), *** \( p < 0.0001 \).

Based on the findings from the chi-squared test of the behavioral data, the analysis was rerun with response type (voice/language) and test half as variables instead of language background to test differences in looking patterns for participants using different response strategies. In both the early and late time windows, there was a significant interaction between test half and response type, \( F(1, 27) = 68.17, p < 0.0001 \) and \( F(1, 29) = 101.2, p < 0.0001 \), respectively.

In both time windows, the interactions are driven by test half affecting the two types of responders differently. Specifically, for language responders, trials in the second test half resulted in significantly higher looks to the character originally associated with the language regardless of voice, time window 1 \( F(1,13) = 124.4, p < 0.0001 \); time window 2 \( F(1,14) = 241.4, p < 0.0001 \) (Figure 8). For voice responders, trials in the second test half resulted in a drop in looks towards the character associated with a particular voice, time window 1 \( F(1,15) = 4.81, p = 0.045 \); time window 2 \( F(1,15) = 9.05, p = 0.009 \) (Figure 9). Thus for voice responders, a language change may interfere mildly with recognition. Unlike child participants, these data show that regardless of language background adults adopt varied strategies for speaker identification.

### 3.3. Discussion

These findings suggest that language, rather than voice characteristics, drives children’s responses in talker identification. These results are consistent with the findings in Creel and Jimenez (2012) showing that children within this age range have great difficulties distinguishing between two speakers whose
voices are matched on age, gender, and dialect. Importantly, the patterns are consistent both in the behavioral and eye-tracking data suggesting that switching the speaker voicing each language was irrelevant for children’s performance.

When comparing adult and child performance, all child participants utilize language as the primary cue for talker identification different from the split observed in adult participants. However, child and adult participants that use language as a cue for talker identification have similar data patterns which are distinct from adults that utilize voice properties for talker identification. Specifically, adults utilizing voice properties have fewer looks towards the target character once the languages spoken by the two speakers have switched. This suggests that using voice characteristics is potentially more difficult and has higher processing demands than those required by using language as a talker identifying cue.

4. General Discussion

While existing evidence has identified talker-identifying vocal features that are distinguishable by children (Creel and Jimenez, 2012), it was not known whether linguistic cues could be used as talker-identifying information and whether language background would influence the extent with which this cue would be used. We found that across multiple language backgrounds children as early as 3- to 5-years-old can utilize language to identify talkers. These findings suggest that by preschool age, children have learned features about the language(s) they speak enabling them to differentiate between speakers of their language and speakers of another language. Bilingual children who understood both languages appear to be neither better nor worse at recognition.

Language as talker-identifying information. From birth, as infants gain experience with language they attend to features that are specifically relevant to their native language (Werker and Tees, 1984; Mehler et al., 1988; Nazzi et al., 1998). Given these findings and the importance of talker information for comprehension, developmental research has examined the relationship between speech sound knowledge and children’s ability to identify talkers (Goggin et al., 1991; Creel and Jimenez, 2012; Perrachione et al., 2010). This research has shown that speech sound knowledge influences talker identification, such that familiarity with a particular language facilitates talker identification in that language (Perrachione et al., 2010). Our findings are consistent with this idea in that talker identification was successful as long as the child knew at least one of the languages being spoken.

In the developmental literature, talker identifying cues that have been identified as salient vocal features to preschool aged children tend to be cues that are socially relevant such as age and gender. This makes it unclear whether socially relevant or acoustic vocal features are enabling children to make talker distinctions. The present study demonstrates children are able to utilize a linguistic source of information as a talker identifying cue. Given what we know about the relationship of speech sound knowledge and talker identification, for
children to be able to use language as a talker-identifying cue they must have a strong representation of the language they speak. It is unclear from the current studies what features within their native language(s) children are utilizing as the distinguishing cues. Exploring the features underlying identification, including intelligibility, phonotactics, and speech sounds, would speak to monolinguals’ and bilinguals’ developing native language representations, building on earlier findings in infants (Nazzi et al., 1998; Mehler et al., 1988) and, more recently, young children (Potter and Saffran, 2015).

One of the main questions we were interested is how language background may influence children’s ability to identify talkers via linguistic information. For bilingual children, being able to associate language with particular individuals may allow them to appropriately utilize each of their two languages in conversation. Until now, studies investigating how early bilingual children are able to selectively use each of their two languages have led to inconclusive findings in part because studies have focused on observing production. The current paradigm enables us to explore bilinguals’ representation of their two languages throughout development via comprehension, possibly a more sensitive way of assessing what children know about their two languages.

It is clear from our study that language is a salient vocal feature that can be used from as early as three years of age to identify talker. These findings enable us to ask further questions regarding use of talker identity in comprehension.

References


Byers-Heinlein, Krista. (2014). Languages as categories: Reframing the “one language or two” question in early bilingual development. *Language Learning, 64*(s2), 184-201.


