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ARTICLE

Linguistic Experience and Cognitive Development: Dispelling Mainstream Ideas Regarding Early Aymara-Spanish Bilingualism

***Jennifer Markovits*[1*], *Elías Ticona*[2]**

[1] *Playa Ancha University, Valparaíso, Valparaíso Region, 2340000 ,Chile*

[2] *Ministry of Education, Santiago, Metropolitan Region 9160000, Chile*

ABSTRACT

Previous studies have demonstrated that language acquisition is connected to cognitive development. In this line, several works have found that Theory of Mind (ToM) influenced the acquisition of evidentiality across languages. Thus, the previous works trigger the question about the connection between language experience and developing cognitive processes such as ToM. The current investigation is a follow-up study which investigates whether speakers who proficiently use a language with explicit evidential markers at the lexical level would likely exhibit a cognitive edge in developing Theory of Mind abilities compared to those mastering languages lacking such features. Twenty-one bilingual Aymara-Spanish children and nineteen monolingual Spanish children of the same age range and from the same region performed two ToM tasks, showing a similar mean across groups. In addition, inferential statistics were conducted, showing that language experience does not influence the development of ToM abilities. The contribution of the study is twofold. First, from a generativist view, the results support the modularity of language, and, from sociolinguists' impact, the current study's data demonstrated that early Aymara-Spanish bilingualism does not affect normal cognitive development.

Keywords: Bilingualism; Linguistic experience; Cognitive development; Evidentiality; Theory of Mind

1. Introduction

Recent findings regarding the association between bilingual language acquisition and cognitive processes have demonstrated that early bilingualism is not related to the development of cognitive

*CORRESPONDING AUTHOR:
Jennifer Markovits, Playa Ancha University, Valparaíso, Valparaíso Region, 2340000, Chile; Email: jennifer.markovits@upla.cl

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functions (Bice and Kroll, 2021; Torregrossa et al., 2021). However, contrary to this trend, sociolinguistic studies have demonstrated negative attitudes toward the early acquisition of the ancestral language in indigenous parent communities (Barahona and Zurita, 2018). The idea that early exposure to the indigenous language will delay the development of linguistic abilities in Spanish triggers false beliefs about children being bilingual. Currently, there exist several indigenous language programs in schools with 20% indigenous enrolment students. However, it is necessary to support the previous initiatives with works demonstrating a clear connection between the effects of early exposure to an ancestral language in a Spanish-speaking country.

Therefore, the current investigation attempts to spread the conception that early bilingualism is not connected to linguistic experience; in other words, early exposure to multiple languages during childhood does not impede language-related skills. Being bilingual is connected to numerous positive effects regarding language revitalization and cultural identity, among others, but not to the development of cognitive mechanisms. Hence, the contribution of the present work is to examine the precise impact of acquiring an ancestral language involves investigating how linguistic background (specifically, Aymara-Spanish bilingualism versus Spanish monolingualism in children) shapes cognitive development and potentially fosters a change in community attitudes towards bilingualism in Aymara and Spanish.

2. State of the art

2.1 Bilingual experience and cognitive skills

During the initial decades of the twentieth century, there prevailed a widely held belief that acquiring multiple languages could impact children's capacity to develop typical cognitive functions. Later, Peal and Lambert's (1962) study showed a significant advantage for bilingual children over monolinguals in several linguistic and non-linguistic abilities. Recent studies have been more balanced, demonstrating that language acquisition and general cognitive mechanisms are unrelated, thus withdrawing ideas about the adverse effects of early bilingualism on children's minds. The growing bilingual heritage speaker population due to migration has led different authors to examine the role of bilingual diversity and bilingual language experiences as a factor influencing brain responses compared to monolinguals.

Bice and Kroll (2021) investigated the influence of proficiency and working memory on subject-verb agreement. They conducted an analysis using neurophysiological measures, specifically the N400 and P600, indicative of brain responses to morphosyntactic violations. Their study compared Spanish-English heritage bilinguals in both languages with English monolinguals. The findings indicated that proficiency significantly impacted variability in processing the less dominant language among the heritage population. Conversely, for monolinguals, working memory emerged as the primary factor in sentence processing, suggesting that brain responses were similar when individuals from diverse linguistic backgrounds possessed roughly equivalent proficiency levels in their native languages. Therefore, the bilingual experience (to know more than one language) is not associated with working memory abilities but with language proficiency.

Moreover, Torregrossa et al. (2021) explored the influence of executive functions (E.F.s), language exposure, and cross-linguistic effects on bilingual children. They designed a Greek narrative retelling task to examine the use of null subjects or clitic strategies for reference replacement. Participants included Greek-Albanian, Greek-English, and Greek-German children. The findings echoed those of Torregrossa et al., revealing that proficiency in Greek among participants correlated with accurate task performance. Additionally, the study revealed that variability in null-subject or clitic strategy usage was linked to the specific language pair. For instance, Greek-English and Greek-German children tended to employ more fully specified nouns than Greek-Albanian children. Concerning executive functions, the results indicated a stronger interaction between language exposure and executive functions regarding reference usage,

contrary to the authors' expectations..

In summary, the previous studies provide a good starting point for considering that early acquisition of multiple languages does not generally affect childhood cognitive processes. Furthermore, these results suggested that language experiences, cross-linguistic effects, and language expertise are relevant for linguistic information processing, which are not linking causes of general cognitive abilities. The present investigation contributes to the previous results by analyzing whether linguistic experience influences the acquisition of cognitive abilities, namely, Theory of Mind (ToM), because previous studies have found evidence that ToM is a condition for acquiring some grammar structures. One of these structures is evidentiality.

2.2 Theory of mind and evidentiality

Linguistic categories might have cognitive consequences in domains involving higher-level cognitive processing, such as the capacity to understand mental representations to oneself and others or the so-called Theory of Mind. The term Theory of Mind (ToM) was originally introduced by Premack and Woodruff (1978) in their examination of chimpanzees' comprehension of mental states. Later, developmental psychologists embraced the notion of ToM to elucidate the progression of social cognition, as evidenced by studies such as those conducted by Bretherton, McNew, and Beeghly-Smith (1981) and Perner and Wimmer (1985). A linguistic structure that allegedly required the previous development of ToM is evidentiality, which refers to the origin of information in a given utterance (Aikhenvald, 2018). In other words, evidentiality conveys how the speaker perceives the content of the information. Evidentiality varies in the way that it is manifested across languages. For instance, in many languages, evidentiality can be encoded at the morphological level, such as verbal morphemes that express how the speaker perceives the source of information. Previous researchers have concluded that there is a link between ToM and the acquisition of evidentiality across different languages, and the same studies concluded that evidentiality is a protracted process in childhood (Korean: Papafragou et al., 2007; Turkish: Aksu-Koç et al., 2009; Markovits, 2023). Consequently, the existing evidence prompts an important investigation into whether exposure to a language that grammatically marks evidentiality would influence the typical cognitive trajectory in acquiring Theory of Mind abilities.

Theory of Mind allows individuals to articulate their own mental states, understand the mental states of others, and utilize this understanding to anticipate and rationalize behavior (Marschark, 2019). This cognitive achievement includes a myriad of abilities connected to learning a language. Two capacities within the Theory of Mind framework are deemed essential for acquiring evidentiality systems across languages. The source-monitoring ability (SMA) entails various cognitive processes related to recalling the origins of knowledge, memories, and beliefs (Johnson et al., 1993). Another ability associated with acquiring evidentiality is False belief reasoning (FBR). FBR entails inferring another individual's mental state and recognizing that these beliefs may deviate from reality (Bernstein et al., 2017). False belief comprehension typically emerges around the ages of 4 to 5 years (Wellman et al., 2001) and unfolds across two stages (de Villiers, 2007; Wellman and Liu, 2004). The initial phase involves acquiring first-order mental states, enabling a child to deduce the beliefs of a third party (Wimmer and Perner, 1983), typically achieved around the age of four or five (Wellman and Liu, 2004; Wellman et al., 2001). The subsequent development of second-order mental states, typically observed around five to six years of age, involves the ability to infer another individual's mental state regarding a third party (Perner and Wimmer, 1985).

Kandemirci et al. (2023) conducted a cross-linguistic study investigating whether evidentiality impacted the development of ToM. The authors examined SMA and FBR reasoning in Turkish and English monolingual children. Turkish requires that speakers specify past events as a source of information through verbal suffixes, unlike English, which is optional and is manifested at the lexical level. The results showed that direct evidentiality task respons-

es (when children needed to retell a story they witnessed) predicted the source monitoring performance in Turkish speakers. The cross-linguistic results showed that Turkish-speaking children performed better FBR than English-speaking children. In addition, the authors found that better source monitoring skills predicted better FBR performance for Turkish children. Papafragou and Li (2001) investigated the impact of language typology on the comprehension of source-monitoring ability (SMA) in monolingual Korean-speaking and monolingual English-speaking children aged three to four. Notably, unlike English, Korean features an obligatory method of marking evidentiality at the morphological level. Participants completed two Theory of Mind tasks involving recalling witnessed or heard actions.

Additionally, a task-specific to the Korean language assessed the understanding of evidential Korean morphemes in Korean monolingual children. Results showed that Korean participants outperformed English participants in the Theory of Mind tasks. However, Korean children's performance in the language evidentiality task fell below chance levels. Consequently, the authors could not ascertain whether the obligatory morphological marking for evidentiality in Korean predicted superior Theory of Mind performance compared to English monolinguals. These findings are pertinent to the present study as they raise questions about whether acquiring a verbal system that marks morphological evidence confers an advantage in developing Theory of Mind abilities.

In summary, prior studies in monolingual populations have not yielded a definitive consensus regarding whether grammaticalized marking of information sources in a language enhances the mental processes and functions associated with Theory of Mind (ToM). This relationship has been less explored in bilingual populations, particularly in children who have acquired at least one language with grammatical-level evidentiality and one with lexical-level evidentiality. Given that the participants in the current investigation were either bilingual Aymara–Spanish or Spanish monolingual, the results of the ToM tasks (e.g., FBR, SMA) offer an opportunity to investigate whether exposure to two languages in early childhood accelerates ToM abilities compared to Spanish-dominant children in the same age group.

2.3 Aymara evidentiality

In Aymara, there exists a differentiation between two past tense morphemes that convey evidential characteristics (Hardman et al., 2001; Ticona, 2007; Cerron Palomino, 2008). One of these morphemes denotes a direct source of information, indicating when speakers have personally witnessed an action performed by someone else, thereby possessing first-hand knowledge about the information source. This morpheme, *-yä*, is affixed following the verbal root:

1) *Lwuis*u	*-mä*	*panka*	*li*	*-yä*	*-na*
Luis	det	book	to read	Direct-evidentiality	3PS NOM
"Lois reads a book" (the speaker witnessed the action)					

Furthermore, past events that the speaker did not witness, such as historical occurrences or events conveyed through hearsay, are conveyed using the reportative past tense morpheme *-tay* exemplified by the following.

2)	*Mä*	*michi*	*mä*	*wallpa*	*mpi*	*anata*	*tay*	*na*
	det	cat	det	chiken	with	To play	Indirect evidentiality	3PS NOM

"A cat was playing with a chicken (the action was reported by someone else)".

Despite evidentiality becoming a recognized and widely acknowledged morphological category in Aymara (Aikhenvald, 2004; Hardmann et al, 2001; Ticona, 2007; Cerron Palomino, 2008; Markovits, 2023), the language incorporates lexical expressions to denote a reported source of information probably due to long-standing contact with Spanish. For instance, "siwa," derived from the verb "saña" (to

say), conveys assertions based on shared or indirect knowledge (Coler, 2014; Quartararo, 2017). In our present study, we incorporate the verbal morphological aspect of Aymara evidentiality to compare it with a language that expresses evidentiality lexically.

In sum, a cross-linguistic study between bilingual Aymara Spanish who grammaticalize evidentiality through specialized verbal affixes and Spanish monolingual children (who master a language that marks evidentiality at the lexical level) provides a novel area to explore the impact that language experience can have on cognitive development. It is essential to differentiate between linguistic experience and language typology since both terms are mentioned in the current paper. Linguistic experiences refer to the individual's exposure to and interaction with language(s) over their lifetime (Bylund et al., 2018). It encompasses various aspects, including the languages spoken in the individual's environment, the age at which they were exposed to these languages, the amount and type of language input received, and their proficiency in different linguistic domains (De Houwer, 2009).On the other hand, language typology focuses on classifying and studying languages based on their structural properties, such as word order, morphological features, and syntactic patterns (Croft, 2003). The current investigation operationalized linguistic experience as a variable to measure the impact of this factor on cognitive development Thus, the current investigation contributes to the debate about the relation between language and thought during child development.

3. The present study

This research was a methodological replication of Markovits (2023), who provided evidence of the connection between the development of ToM and the acquisition of Aymara evidentiality in early Aymara Spanish bilinguals. We extended the target population by following the testing procedures for Aymara cultural Spanish monolingual children. Crucially, we examined whether bilingual participants, having acquired a language with grammaticalized evidentiality, would demonstrate a cognitive edge in developing Theory of Mind abilities compared to monolingual participants proficient in a language expressing evidentiality lexically. Our study deviated from Markovits (2023) by adopting a between-subject design, evaluating the influence of group factors (specifically, Aymara L1–Spanish L2 and L1 Spanish) on Theory of Mind abilities. Additionally, recognizing age as a significant factor in the Theory of Mind abilities (de Villiers et al., 2009), our research explored age as a proxy variable to assess potential variations in participants' Theory of Mind development across groups.

The current study was guided by the following research inquiries:

a. Does the linguistic background of participants (Aymara–Spanish bilingual and Spanish monolingual) affect their comprehension of Source-Monitoring Ability (SMA) and False Belief Reasoning (FBR) within the Theory of Mind (ToM)?

b. How does age affect the development of False Belief Reasoning (FBR) and Source-Monitoring Ability (SMA) in different languages?

4. Methodology

4.1 Participants

This research comprised 21 children who were bilingual in Aymara and Spanish (referred to as BASp), aged between 4 and 12 years, alongside 19 monolingual Spanish children (MSp) of similar ages to the BASp group. The Aymara-speaking children resided in the Tarapacá region in northern Chile, specifically within the Sibaya community, one of the rural areas where the traditional Aymara culture and Chilean culture have coexisted in the region discussed (Goldstein, 2015). The monolingual children resided in the regional capital, Iquique, approximately three hours away from Sibaya. These monolingual children were raised in an urban setting but belonged to the Aymara ethnic group. Although they had been exposed to aspects of the traditional Aymara culture and were familiar with certain lexical items and phrases in the ancestral language, they did not understand or speak Aymara fluently. Moreover, the participants' parents completed a linguistic background questionnaire

utilizing a Likert scale, which assessed relevant sociolinguistic aspects of the children for the present study.

Table 1 outlines the pertinent demographic and sociolinguistic characteristics of both the bilingual (BASp) and monolingual (MSp) children population.

Table 1. The demographic of the bilingual (BASp) and monolingual (MSp) children.

Group	N	Mean age	First language	Second language	Dominant language
BASp	21	8.5	Aymara	Spanish	Spanish
MSp	19	7.9	Spanish	n/a	Spanish

4.2 Procedure and materials

The experimental phase took place during a single session, where participants underwent three tests in the specified sequence: a. A bilingual language screening test in Aymara-Spanish (15 minutes); b. An FBR task for both groups (5 minutes); c. An SMA task for both groups (5 minutes). The methodological design included the following materials:

Instrument for operationalizing language experience

This study developed two tools to measure linguistic experience as a variable, which included:

(a) Sociolinguistic background questionnaire: The instrument is a modified questionnaire from Fernandez (2014). Participants' parents were asked to complete a questionnaire regarding their children's language development. This questionnaire aimed to gather information about the family's language practices and experiences, the age at which the children acquired Aymara and/or Spanish, the extent of exposure to both languages at home and school, the parents' assessment of their child's proficiency in various aspects of each language (such as speaking, listening, writing, and reading), and the parents' proficiency in Aymara, Spanish, and any other languages.

(b) A bilingual Spanish-Aymara screening test was administered. Participants completed a modified screening examination adapted from the textbook "Para Compartir Voces: Texto de Consulta para Profesores de Castellano Como Segunda Lengua" (GTZ, KFW, and Sánchez, 2001). This test evaluated the children's proficiency levels in both Aymara and Spanish. The maximum attainable score was 43, and a minimum Aymara score of 15 points (i.e., intermediate level) was required to proceed to the Aymara version of the tasks. In case children obtained less than 15 points, they performed only the Spanish version of the test.

Trial stimuli: Theory of Mind (ToM) tasks

(i) False Belief Reasoning (FBR) task

The FBR task evaluated participants' capacity to understand others' beliefs when those beliefs diverged from reality (false belief). This assessment was adapted from the research conducted by Gopnik and Astington (1988). The tasks included the following:

(a) First-order mental state: Participants observed a scenario in which the experimenter (P.I.) displayed a box labeled "stone." Subsequently, the P.I. revealed the box's actual contents, which were a small book. Then, a puppet entered the scene and read the label "stone." Finally, the P.I. asked the participants, "What do you think the puppet believes is inside the box?"

(b) Second-order mental state: Participants observed a scenario featuring two puppets. Puppet 1 read the label on a box, then opened it to see the contents. Puppet 2 then entered the scene and read the label "stone." Subsequently, the P.I. asked the participants, "What do you think Puppet 1 believes about Puppet 2's understanding of the contents?"

Adapting the original version was a cultural adjustment tailored to the target population. Since there is no precise Aymara translation for "chocolates" and "cookies" used in the original task, the label on

the box was changed to "stone" ("*qala"* in Aymara). Upon opening the box, participants found a small book ("*panka*" in Aymara). Task instructions were initially provided in Aymara and then repeated in Spanish for the bilingual group.

(ii) Source-monitoring ability task

(a) Monitoring Own Source of Information: This task evaluated the children's capability to monitor their own sources of information. In the game "Which Hand Has It?" the experimenter (P.I.) showed a red stone to the child and then transferred it from one hand to the other. Subsequently, the child was asked to guess which hand held the stone and to explain their reasoning. The expectation was that the children would indicate they observed the movement of the stone. Following this, the same game was repeated, but the child was instructed to close their eyes while another person whispered the location of the stone. After identifying the stone's location, the children were asked how how they determined its whereabouts. It was anticipated that the children would state that they were informed about the stone's location.

(b) Monitoring Others' Source of Information: In the task concerning monitoring others' sources, the children observed someone else participating in the same game and were subsequently asked how the other individual knew the location of the stone.

5. Results

The analysis presents findings concerning the relationship between Theory of Mind (ToM) task outcomes across different participant groups and the influence of age within each group. We opted for the Generalized Linear Mixed Model (GLMM) for inferential statistics due to its capability to incorporate random effects for certain independent variables. This model facilitated making broad-level inferences applicable to a larger participant population (Clark & Linzer, 2015). The dependent variable in all tasks was the response, categorized binomially based on whether participants provided an expected or unexpected response (i.e., coded as 1 for expected and 0 for unexpected). Independent variables included age and group (monolingual or bilingual), all qualitative (except age), and treated as dummy variables. Consequently, no normality analysis of the data was conducted. Data cleaning procedures were performed using Excel and R. Initially, Excel's filter function was utilized to identify typographical errors at each level of every qualitative variable, and any incorrect labels were rectified. Subsequently, the "na.rm" function was applied in R to eliminate missing values when calculating descriptive statistics.

5.1 Source Monitoring Ability (SMA) Across Groups and Ages

This section presents the analysis of task responses regarding participants' sources of information, encompassing two conditions: Type 1 (recalling seeing the action) and Type 1 hear (recalling hearing the action). Additionally, responses concerning other sources of information are examined across two conditions: Type 2 see (recalling others seeing the action) and Type 2 hear (recalling others hearing the action). These SMA tasks were administered to 21 bilingual Aymara-Spanish children (BASp) and 19 monolingual Spanish children (MSp).

Initially, a descriptive analysis was conducted to examine each group's expected response frequency. **Table 2** displays the expected response frequency (M) for the Type 1 see-and-hear and Type 2 see-and-hear tasks across both groups.

Table 2. Frequency of expected responses for SMA tasks in each condition according to the groups.

Experiment	**Type 1 see**		**Type 1 hearsay**		**Type 2 see**		**Type 2 hearsay**	
	M	SD	M	SD	M	SD	M	SD
BASp	0.67	0.47	0.61	0.49	0.61	0.50	0.61	0.48
BSp	0.85	0.31	0.63	0.49	0.68	0.47	0.68	0.47

Table 2 presents the collective performance of the groups across the four experiments. The mean results for all groups exceeded 0.50 in each task, indicating that more than 50% of the participants chose the expected response. A one-sample t-test was conducted to compare the average scores of the two groups, revealing no significant difference (t = 0.17419, df = 37.224, p-value = 0.8627). Additionally, the proportion of expected responses across different age groups was examined. **Figure 1** depicts the proportion of "1" responses in the tasks categorized by the participants' ages.

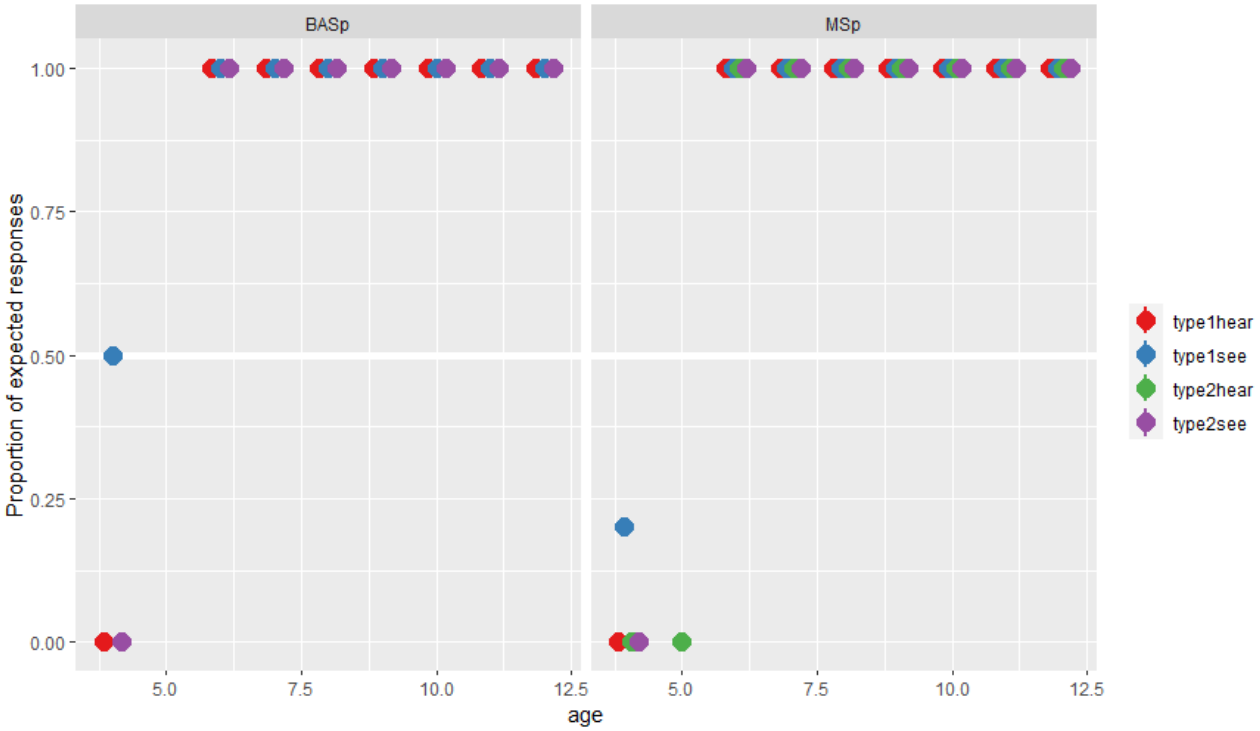

Figure 1. Proportion of expected SMA responses (1) across age and groups.

Figure 1 illustrates that all bilingual participants scored zero before the age of five (M = 0, SD = 0), except for the Type 1 see condition (where participants responded, "I know because I saw it"), where results were at chance level. Similar performance was observed for MSp participants, with mean responses also at zero before age five, except for the Type 1 see condition, where the percentage of "1" responses was below chance (M = 0.20). After reaching the age of five, all participants across both groups demonstrated maximum scores across all four conditions, indicating that participants older than five consistently selected the expected response.

A Generalized Linear Mixed Model (GLMM) was conducted separately for Type 1 (see and hear) and Type 2 (see and hear) conditions to examine the influence of group and age on Source Monitoring Ability (SMA) response. The model for the own source of information condition (Type 1) revealed that the group did not significantly affect SMA responses (BASp: $\beta = 0.48$, S.E. = 0.31, $z = 1.5$, $p = 0.12$; MSp: $\beta = 0.7$, S.E. = 0.34, $z = 2.21$, $p = 0.02$). However, age significantly affected SMA responses ($\beta = 0.15$, S.E. = 0.02, $z = 6.52$, $p < 0.05$). Similarly, the model for the other source of information condition (Type 2) displayed a significant effect of age ($\beta = 2.2$, S.E. = 0.5, $z = 3.90$, $p < 0.05$), but no effect of group (BASp: $\beta = -5.40$, S.E. = 3.47, $z = 0$, $p = 1$; MSp: $\beta = -4.68$, S.E. = 3.3, $z = 0$, $p = 1$).

5.2 False Belief Reasoning (FBR) by Group and Age

The following section displays the outcomes from

the first-order mental state (ftype 1) and second-order mental state (ftype 2) FBR tasks across the two groups. **Table 3** illustrates the percentage of expected responses in the FBR tasks across the groups.

The table indicates that overall performance was highly comparable between the groups. A one-sample t-test revealed no noteworthy variances between the groups' mean (t = 0.38515, df = 78.855, p-value = 0.7012). Furthermore, we analyzed the expected response distribution by age across the groups. **Figure 2** displays how responses are distributed across ages within each group.

Table 3. Frequency of expected responses for FBR tasks in each condition across groups.

Experiment	Ftype1		Ftype 2	
	M	SD	M	SD
BAsp	0.85	0.35	0.81	0.40
BSp	0.84	0.31	0.80	0.41

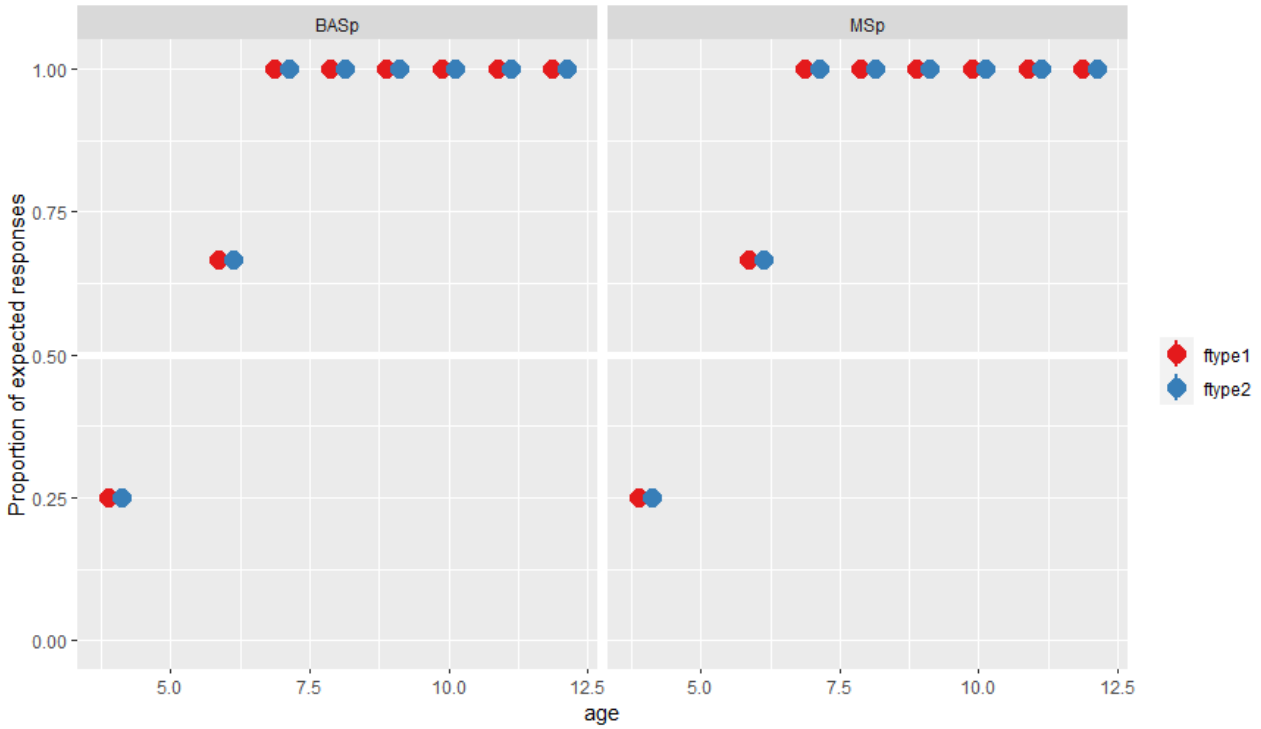

Figure 2. Distribution of expected FBR responses (1) by age across the groups.

Figure 2 illustrates the performance by age across groups. Before five years old, participant's responses were below chance (M = 0.25). The expected response frequency increased (M =0.73) between five and six years old in both groups. After six years, all results were at the top of the grid at the age of seven.

Two GLMMs were conducted (one for f1type and one for f2type responses) to examine whether age and group affected the responses. The model for first-type responses showed that age was a significant factor in FBR response tasks (β = 0.2. S.E. = 0.04, z = 5.51, p < 0.05), in contrast to the group that were no meaningful effect between factors were found (BASp: β = 0.48, S.E. = 0.31, z = 1.5, p = 0.12; MSp: β = 0.7, S.E. = 0.34, z = 2.21, p = 0.02). A second GLMM was conducted for ftype2 responses to examine the association between the variables. The model demonstrated that age factor influenced task responses (β = 0.25, SE = 0.06, z = 3.88, p < 0.05), as opposed to group factor (BASp: β = 1.44, S.E. = 0.55, z = 2.6, p = 0.09; MSp: β = 1.38, SE = 0.55, z = 2.48, p = 0.13).

The findings from both SMA and FBR tasks exhibit similarities and align with prior research, indicating that Theory of Mind (ToM) undergoes progressive development throughout early childhood via cognitive mechanisms (Rai and Mitchell, 2004; Dumontheil et al., 2010). Furthermore, results from both tasks indicate that the presence or absence of obligatory marking of evidentiality at the morphological level does not influence the development of ToM-related abilities.

6. Discussion

The current study examined the relationship between linguistic experience and cognitive development, testing whether language typology influenced the development of ToM abilities. The previous claim was based on studies that proposed a connection between acquiring a grammar structure called evidentiality and two abilities within the ToM framework (SMA/ FBR). Thus, speakers who master a language that marks evidentiality at the grammar level could show an advantage in developing ToM abilities compared to monolinguals who master a language that contains evidentiality at the lexical level. Markovits (2023) demonstrated that comprehension of the Aymara evidentiality system had a significant relationship with understanding SMA and FBR abilities. Hence, the current study inquires whether exposure to Aymara at a very early age impacted ToM development compared to Spanish monolingual children and whether children with different linguistic backgrounds behave similarly about ToM development and age.

6.1 False-belief, Source of Monitory Ability and Age

Regarding FBR and SMA results, the current investigation extends previous works that claimed that ToM is a protracted process in childhood (Perner and Wimmer, 1985; Johnson et al., Lindsay, 1993; Gopnik and Astington, 1988). The current data showed that the ability to understand that another person's belief can differ from reality occurred across the groups at approximately seven years of age. Furthermore, before seven years of age, children fail to recognize and evaluate second-order mental states.

Participants' behavior was similar in the SMA task. Participants developed the ability to verbalize the origin of their own and other s memories after seven years old. Within languages, the ability to make a correct inference and identify the source of their own beliefs appeared earlier in childhood, around four years old (Mossler et al., 1976; O'Neill and Gopnik, 1991; O'Neill and Chong , 2001). The current task showed that all participants performed accurately after six years old. However, the monolingual group scored above chance when they identified the source of their knowledge based on their sensory vision, unlike the bilingual children of the same age. At the same time, the Spanish monolingual group scored on a chance at the age of six and demonstrated an ability to identify the source of their own memory when this memory was told by someone else. Therefore, differences before six years old could be associated with other extralinguistic factors, such as the amount of social interaction, which has been demonstrated as a speed-up factor in ToM development (Yu and Wellman, 2023). According to several cognitive science studies, individuals can build different experiences in their minds without using language (Deacon , 1988; Malt et al., 1999; Clark, 2004). One study that demonstrates how specific language structures do not necessarily constrain conceptual development is the research conducted by Lucy and Gaskins (2003) among the Vezo children of Madagascar. The authors found that Vezo children, whose language lacks specific number terms beyond "one" and "many," still demonstrated an advanced understanding of numerical concepts when tested using non-verbal tasks. Despite their language not providing explicit numerical labels for quantities, the children were able to accurately estimate and compare quantities of objects. This study suggests that while language can influence cognitive development, the absence of specific linguistic structures does not necessarily impede the development of related conceptual understanding. This suggests

that conceptual categories support linguistic structures, and these cognitive representations are universal across languages. Thus, differences across groups reinforced the hypothesis that specific language structures do not constrain conceptual development However, specific grammar structures require mapping onto pre-linguistic representation for accurate target performance.

6.2 Language and Thought

The discussion revolves around two perspectives that posit a close relationship between language and thought but diverge in their interpretation of how language and thought intersect. One perspective suggests that language shapes our perception of the world; an individual's conceptual development might be constrained by language (Sapir, 1924; Whorf, 1956). Conversely, the other perspective argues that while language reflects our conceptual representation of the world, these concepts are universal and should remain unaffected by language differences (Chomsky, 1976; Fodor, 2005). Regardless of the focus, we can interpret that language acquisition or linguistic processing follows a different cognitive path than a more general cognitive mechanism. The former idea is consistent with Friederici (2016), who states that using language engages numerous brain regions, including those responsible for nonverbal processing. However, this activation does not necessarily imply a causal relationship between nonverbal and verbal skills. In this sense, it is possible to state the existence of a neural basis of language modularity. Regarding bilingualism and language modularity, Wartenburger et al. (2003) employed functional magnetic resonance imaging to explore how bilinguals activate and integrate grammatical information from their two languages in groups of Italian-German bilinguals with different L2 acquisition and proficiency ages. The findings reveal that bilingual individuals exhibit early and distinct neural responses to grammatical violations in their respective languages. This suggests that grammatical processing is language-specific and rapidly initiated in the bilingual brain.

While there is no consensus regarding whether bilingualism or monolingualism correlates with a general cognitive advantage in children, the current data indicate that proficiency in the Aymara language among bilingual individuals did not confer an advantage over the monolingual group in Theory of Mind (ToM) tasks. The findings demonstrated that performance levels were comparable across both groups, suggesting that bilingualism plays a pivotal role in developing language-specific mental algorithms tailored to understand and produce language, irrespective of language experience. The former idea is aligned with Abutalebi and Green (2016) who demonstrated that bilingualism can shape cognitive processes related to language comprehension and production, regardless of language experience.

In summary, the findings of this study indicate that age played a significant role in the development of the Theory of Mind (ToM). However, participant responses were only somewhat consistent among individuals under six years old across groups. Regarding first-order ToM ability, groups performed aged-similarly when they needed to make inferences about third-person thoughts when those beliefs did not match reality. Slight differences in SMA responses across groups support the claim that children construct conceptual representations regardless of language typology. There are specific links between the foundational ability to think and language acquisition that have cognitive consequences. However, these consequences are related to language proficiency (and consequently, cross-linguistic effects in the case of Aymara-Spanish bilinguals). However, there are no effects on the conceptual structure across languages.

7. Conclusion

The present investigation aimed to contribute to indigenous language revitalization. Several government initiatives have promoted L2 indigenous language programs in schools, but negative attitudes about early bilingualism hinder the process of learning. The high prestige of Spanish over other languages in the region leads parents to stimulate Spanish monolingual behavior in their children. It is crucial to emphasize that negative attitudes cannot solely be

attributed to social factors; a historical perspective is necessary. This is because Aymara chileanization, which commenced in the mid-nineteenth century, resulted in cultural homogenization that impacted both the Aymara culture and language. Finally, it is crucial to acknowledge that the bilingual experience provides numerous benefits but is unrelated to developing ToM abilities. For endangered languages to be bilingual, supporting children in maintaining strong ties with their family and culture is crucial. Hence, emphasizing the importance of early bilingualism as a value within the community appears vital. The current investigation is a step toward understanding how early Aymara-Spanish bilingualism and cognitive development interact, thus paving the way for a shift in language attitudes.

Author Contributions

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Conflict of interest

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