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Language dominance predicts cognate effects and metalinguistic awareness in preschool bilinguals

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Abstract

The current work investigates whether language dominance predicts transfer of skills across cognitive-linguistic levels from the native language (Spanish) to the second language (English) in bilingual preschoolers. Sensitivity to cognates (*elephant/elefante* in English/Spanish) and metalinguistic awareness (MLA) have both been shown to transfer from the dominant to the nondominant language. Examining these types of transfer together using a continuous measure of language dominance may allow us to better understand the effect of the home language in children learning a majority language in preschool. Forty-six preschool-aged, Spanish-English bilinguals completed English receptive vocabulary and metalinguistic tasks indexing cognate effects and MLA. Language dominance was found to predict crosslinguistic (cognate) facilitation from Spanish to English. In addition, MLA skills also transferred from Spanish to English for children with lower English proficiency, and no transfer of MLA was evident for children with higher English proficiency. Altogether, findings suggest that transfer from a dominant first language to a nondominant second language happens at linguistic and cognitive-linguistic levels in preschoolers, although possibly influenced by second language proficiency. The current study has implications for supporting the home language for holistic cognitive-linguistic development.

Keywords

language transfer; cognates; metalinguistic awareness; bilingual development; language dominance

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Declaration of interest
In accordance with Taylor & Francis policy and our ethical obligation as researchers, we are reporting that we do not have any conflicts of interest that may affect the research reported in the enclosed paper.

Introduction

It is generally accepted that bilinguals are not two monolinguals in one (Grosjean, 1989); rather, as bilingual children develop proficiency in two languages, they develop two systems that are activated in parallel and interact across multiple linguistic features. Interaction occurs at the levels of phonology (e.g. Dickinson, McCabe, Clark-Chiarelli & Wolf, 2004; Fabiano-Smith & Barlow, 2010; Flege, 2007; Shook & Marian, 2013), morpho-syntax (e.g., Cuza, 2013; Hartsuiker, Pickering & Veltkamp, 2004; Hatzidaki, Branigan & Pickering, 2011; Serratrice, Sorace & Paoli, 2004), and lexico-semantics (e.g., De Anda, Hendrickson, Zesiger, Poulin-Dubois & Friend, 2018; Kohnert, Bates & Hernandez, 1999; Von Holzen, Fennell & Mani, 2018); and cross-language interactions are well-established in bilingual adults (e.g., Blumenfeld & Marian, 2007; De Groot, Delmaar & Lupker, 2000; Dijkstra, 2005; Giezen & Emmory, 2016; Marian & Spivey, 2003; Schwartz & Kroll, 2006; Soares & Grosjean, 1984). Not only do the two languages interact, but also there is the possibility for skills in one language to support performance in the other. Such is the case for metalinguistic awareness (MLA), or the capability to decontextualize components of language, as well as manipulate and analyze them outside of the context and use (Gombert, 1992). At the cognitive-linguistic level, MLA has been shown to transfer from a dominant to nondominant language (e.g., Serratrice et al., 2009). For instance, established skills in the more proficient language can benefit a more recently-learned language (e.g., Bialystok, Majumder & Martin, 2003; Francis, 1999; Serratrice, Sorace, Filiaci & Baldo, 2009; Verhoeven, 2007). Transfer at the linguistic level has often been demonstrated by comparing performance on cognates, or translation equivalents across two languages that are similar in both meaning and form (e.g., *elephant-elefante* in English/Spanish) relative to noncognates (e.g., *apple-manzana*). As one example, transfer from the dominant to the nondominant language has been shown, with higher accuracy of cognate versus noncognate words in picture naming in German-English-multilingual children (Poarch & van Hell, 2012). Examining metalinguistic and lexico-semantic types of transfer together allows us to better understand the effect of the home language in children learning a majority language in preschool. Models of linguistic interaction in bilingual adults have sought to explain how interactions between languages may influence processing (e.g., Bates & MacWhinney, 1982; De Bot, 1997; Dijkstra & Van Heuven, 2002; Kroll & Stewart, 1994; Potter, So, Von Eckardt & Feldman, 1984; Shook & Marian, 2013), as crosslinguistic transfer is the application of linguistic knowledge or strategies from one language to another. For the purpose of this paper, we focus on positive transfer (e.g., Cisero & Royer, 1995; Durgunoğlu, Nagy & Hancin-Bhatt, 1993; Jarvis & Odin, 2000; Kuo, Uchikoshi, Kim & Yang, 2016; Moro & Suchtelen, 2017) and use language dominance to make meaningful predictions of crosslinguistic transfer (e.g., Gollan, Fennema-Notestine, Montoya & Jernigan, 2007; Robinson Anthony & Blumenfeld, 2019; Rosselli, Ardila, Jurado & Salvatierra, 2014).

Studies on language dominance patterns in bilingual children have utilized one-dimensional and categorical indices of dominance, and it is recommended that the bilingual experience may best be captured by using more multifaceted and continuous definitions of language dominance (in children: Bedore, Peña, Summers, Boerger, Resendiz, Greene, Bohman & Gillam, 2012; in adults: Luk & Białystok, 2013). As one example, Robinson Anthony and

Blumenfeld (2019) found that where categorical descriptors of bilingualism (e.g., balanced vs. dominant) failed to predict cognate sensitivity in Spanish-English adult bilinguals, a mixed-measure variable reflecting language exposure and output did predict the bilinguals' performance. This difference in predictive power suggests that using a continuous measure may better capture the bilingual experiences, as they relate to language ability tasks.

In children, the two most frequently cited measures of language dominance in early childhood studies are parent-reported proficiency or output, and parent-reported exposure or input. While parent reports have been shown to reasonably predict children's linguistic competences (e.g., Gutierrez–Clellen & Kreiter, 2003; Marchman & Martínez-Sussman 2002; Thal, Jackson-Maldonado & Acosta, 2000), a better understanding of the bilingual exposure and proficiency patterns required for successful language transfer may be obtained by examining a continuous measure of language dominance. Thus, the overarching purpose of this study is to examine whether and how patterns of a continuous definition of language dominance indexed by parent-reported input and output predict crosslinguistic transfer during early childhood cognitive-linguistic development.

Lexico-semantic development and transfer

Examination of lexico-semantic transfer across languages in children requires an understanding of the underlying lexico-semantic system. Here, predictions are made using adult bilingual models of language processing to explain how dual-language acquisition may occur. The Word Association Model posits that bilingual lexicons are developed independently, though semantic access in the second and typically nondominant language is mediated via lexical links to the native language (Potter, So, Von Eckardt & Feldman, 1984). Thus, proficiency of the home language and degree of language dominance support successful lexical processing of the second language. Relatedly, the Concept Mediation Model proposes that independently developing language systems at the lexical level share semantic representations and are thus conceptually mediated (Potter et al., 1984). A third model of lexical processing, the Revised Hierarchical Model (Kroll & Stewart, 1994), integrates lexical and conceptual links from the Word Association and Concept Mediation Models, respectively. To illustrate, Kroll and Stewart found that adult bilinguals demonstrated interference at both semantic and lexical levels, depending on the task (picture naming, translations) and language (dominant, nondominant) used.

Accounts of the bilingual lexico-semantic system thus suggest that the two languages are very much interconnected and interact with each other. Co-activation of crosslinguistic representations allows for language transfer. A class of words that lends itself to the study of lexico-semantic transfer is cognates, which overlap in semantic representations and lexical form (e.g., *elephant-elefante*, Brenders, van Hell & Dijkstra, 2011; Cunningham & Graham, 2000; Schelletter, 2002). Cognate effects, or the pattern of facilitated lexical access for cognate pairs relative to non-cognate pairs (e.g., *apple-manzana*), have been shown to be robust in bilingual adult studies (e.g., Amengual, 2012; Costa, Caramazza & Sebastián-Gallés, 2000). These crosslinguistic transfer effects have more strongly followed a dominant to nondominant language gradient (e.g., Gollan et al., 2007; Robinson Anthony & Blumenfeld, 2019). For example, Rosselli et al. (2014) investigated transfer at the lexico-semantic level using a picture-naming task in a group of young, Spanish-English bilingual adults. The authors found that cognate effects were stronger (i.e., a larger difference between cognate and noncognate accuracy) for participants who were tested in their nondominant language. Stadthagen-González, Gathercole, Pérez-Tattam, and Yavas (2013) similarly found that cognate effects during an English receptive vocabulary measure were more robust in adult bilingual participants whose first and dominant language was Spanish.

In child studies, the effect of crosslinguistic transfer across cognate pairs has also been identified (e.g., Poarch & van Hell, 2012; Potapova, Blumenfeld & Pruitt-Lord, 2016; Schelletter, 2002). For example, in Pérez, Peña, and Bedore (2010), patterns of cognate recognition on a picture vocabulary task revealed that children with more exposure to Spanish knew more English cognate words than their balanced peers and their peers with more exposure to English. These findings are on par with adult studies, where crosslinguistic (cognate) transfer effects have more strongly followed a dominant to nondominant language gradient. However, findings of cognate effects in young bilinguals may be less robust than in work with adult bilinguals, with not all children demonstrating crosslinguistic facilitation (e.g., Kelley & Kohnert, 2011; Potapova et al., 2016; Umbel & Oller, 1994; Umbel, Pearson, Fernández & Oller, 1992). In fact, only 60 percent of children in Kelley and Kohnert's (2012) and Potapova et al.'s (2016) studies demonstrated a cognate effect. Hence, we are motivated to better understand what factors best predict lexical-semantic transfer in developmental contexts. Here, we investigate the relation between language dominance and performance on language tasks that recruit lexico-semantic skills.

Metalinguistic awareness (MLA) and transfer

In addition to patterns of transfer associated with lexico-semantic processing, how bilinguals *think* about language and how they use those skills in accomplishing linguistic goals may provide insight into how cognitive-linguistic processes (i.e., the ability to reason about language) are shared across languages. MLA is defined as the ability to attend to, deconstruct, and manipulate properties of language (Gombert, 1992). MLA has been investigated at the lexical level, exploring how thinking about word forms and their properties interact between languages (e.g., Doherty, 2000; Karmiloff-Smith, Grant, Sims, Jones & Cuckle, 1996; Nagy, 2007; Zipke, Ehri & Cairns, 2009). In addition to its relation to lexical processing, metalinguistic skills in general have been linked to long-term academic success, including boosts in early literacy skills (e.g., Carlisle & Feldman, 1995).

Studies of MLA in general have often focused on monolingual-bilingual differences. It is important to keep in mind that monolingual-bilingual difference studies do not service investigations of the nuances of the dominance continuum, as otherwise heterogeneous groups of bilinguals (and monolinguals) are collapsed into one category, going against recommendations for bilingual studies (e.g., Luk & Bialystok, 2013). Where monolingual-bilingual differences have been found, bilingual children typically outperform their monolingual peers, suggesting that bilingual experience may confer additional 'training' in these skills. Cummins (1978) demonstrated that bilingual English-Irish children outperformed their English-speaking peers in evaluations of ambiguous sentences. The author attributed this effect to the nature of bilingualism in holding multiple forms for similar concepts. Studies in phonological awareness, as well as translation skills, have found similar bilingual effects (e.g., Bialystok, Majumder & Martin, 2003; Campbell & Sais, 1995; Dickinson, McCabe, Clark-Chiarelli & Wolf, 2004; Malakoff & Hakuta, 1991). MLA allows for mapping of a singular meaning onto multiple forms (e.g., word swap task, Piaget, 1929; word manipulation task, Chaney, 1992), and differences in MLA skill across adults has even been extended to multiple language learning (Jessner, 1999).

Like studies of lexical processing, metalinguistic transfer has been shown to be linked to patterns of language dominance. Serratrice et al. (2009) found that knowledge of grammatical structures and syntactic awareness transferred from the dominant language to the nondominant language. Specifically, the authors explored how metalinguistic awareness of noun phrase constructions in the dominant language (either English or Spanish L1) impacted performance in L2 Italian, a language with noun-adjective constructions (e.g., *gatto grigio* - "cat grey"). Participants were typical, six-to-ten-year-old children, and included native speakers of Spanish, a language that also demonstrates noun-adjective constructions (e.g., *gato gris* - "cat grey") and native speakers of English, a language that has a differing noun phrase construction of adjective-noun (e.g., *grey cat*). On an L2 Italian grammaticality judgement task, the Spanish-Italian bilingual children demonstrated significantly higher accuracy in identifying ungrammatical Italian noun-adjective phrases embedded in sentences than their English-Italian bilingual peers. The observed boost in performance for Spanish-Italian bilinguals relative to English-Italian bilinguals suggests positive transfer of L1 Spanish MLA strategies to L2 Italian in the case where two languages aligned in structure (Spanish-Italian) relative to the control case where the two languages were structurally different (English-Italian).

While MLA can encompass multiple facets of cognitive-linguistic ability, fewer studies have investigated specifically lexico-semantic awareness, or awareness of word form-meaning connections (e.g., Archibald & Kerns, 1999; Bialystok, 1987; Cummins, 1978; Cummins & Mulcahy, 1978; Eviatar & Ibrahim, 2000), especially in relation to detailed patterns of language dominance. Here, we investigate the relation between language dominance and performance on MLA tasks that recruit cognitive-lexico-semantic skills to determine when and how cognitive-linguistic facilitation is observed during early bilingual acquisition.

Language dominance and transfer

Language dominance is generally defined as relative proficiency (Gathercole & Thomas, 2009; Hemàndez-Chávez, Burt & Dulay 1978; Silva-Corvalán & Treffers-Daller, 2015). However, studies have varied considerably as to how language dominance is operationalized in developmental contexts, including language dominance metrics based on parent reported proficiency or exposure (Bialystok & Feng, 2009; Bialystok & Feng, 2011; Carlson & Metzoff, 2008; Hoff et al., 2012; Pérez, Peña & Bedore, 2010), as well as a combination of subjective and objective measures (e.g., Genesee, Nicoladis & Paradis, 1995; Bedore et al., 2012).

In studies where relations between language dominance profiles, linguistic transfer, and cognitive-linguistic transfer have been found, it has generally been the case that skills are most robustly transferred from the dominant language to the nondominant language (e.g., Morett & MacWhinney, 2013; Usborne, Caouette, Qumaaluk & Taylor, 2009; Verhoeven, 2009; Yip & Matthews, 2000). For example Foroodi-Nejad and Paradis (2009) examined transfer effects of compound word formation in Persian and English alongside patterns of language dominance in preschool-aged children. The structure of compound words in English, for example, modifier + head in "apple + juice" for *apple juice*, can either match the structure of compound words in Persian, as in modifier + head, "go + ab" for *flower water/flower juice*, or mismatch it, as in head + modifier "ab + sib" for *water apple/apple juice*. Transfer was reasoned to occur when Persian dominant participants favored "head + modifier" compound word constructions in English or when English dominant participants favored "modifier + head" in Persian, an acceptable but noncanonical compound order. Results support the relevance of structural overlap for linguistic transfer and support asymmetrical transfer from the dominant language to the nondominant language, as children preferred a pattern of compound production in their nondominant language based on the dominant language (also see Feinaurer & Hall-Kenyon, 2013). Overall, interactions between linguistic and cognitive-linguistic systems have been observed in developmental contexts, but the literature is still lacking strong support for meaningful, consistent, and parsimonious predictors of transfer patterns. The current work aims to enhance our understanding of transfer by carefully considering the role of language dominance.

Current study

The connection between children's developing bilingualism and language transfer has been established at the linguistic (e.g., lexico-semantic) and cognitive-linguistic levels of performance (e.g., MLA). Yet relatively few studies have investigated the degree of dominance when differences are found. The aim of the current study is to determine whether and how the bilingual experience, indexed by degree of dominance as a multifaceted and continuous variable (e.g., Bedore et al., 2012), predicts patterns of crosslinguistic transfer, in both form-meaning aspects and MLA. Extending from work that treated bilingualism as a categorical descriptor, we hypothesize that a continuous measure of bilingualism will reveal linguistic and cognitive-linguistic transfer from dominant to non-dominant languages.

Method

Participants

Participants in the study were selected retrospectively from a sample of children participating in an ongoing community-based project in a local preschool. The school required below-poverty status for enrollment. Parents completed a lab-developed language questionnaire in their preferred language (e.g., Potapova et al., 2016; Potapova & Pruitt-Lord, 2019) to provide information regarding their child's language experience and development, answering questions and statements such as, "Do you or did you ever have any concerns about your child's speech and/or language?" "What language do you feel your child best understands?" "If more than one language is spoken, please approximate the amount each is heard the child?" and "If more than one language is spoken, please approximate the amount each is spoken by the child." Children whose parents returned signed consent forms were eligible for and included in the larger community-based study.

For inclusion in the present study, children were required to be exposed to Spanish at home and have no report of caregiver concern regarding language development. In addition, children were excluded if parent report did not provide input or output percentages for each language, as these data were necessary to calculate language dominance scores. In total, 46 children from the project's larger sample met all criteria for the present study. Participants completed measures of interest for this study as part of a larger assessment battery associated with the community-based project, including English receptive (including the *Peabody Picture Vocabulary Test-Third Edition*, Dunn & Dunn, 1997) and expressive language measures (including language sampling). Each test was administered according to protocol instructions.

In summary, the developing bilingual children of this study were 4;2 on average with a majority of input and output in Spanish (M = .74, SD = 18.16 and M = .72, SD = 20.56, respectively). All participants were recruited from the same local preschool where English was the language of instruction. In addition, maternal education (M = 10 years, SD = 2.99) was less than that of a high school degree in the United States, on average. To additionally control for individual differences, a nonverbal intelligence measures was administered: all the eligible children of this study had typical nonverbal intelligence scores on the Leiter International Performance Scale-Revised (M = 11.6, SD = 1.93). Overall, the sample population here closely resembles the experience of many bilingual children in the United States who are Spanish heritage speakers and enter schools where English is the majority language (e.g., Bedore & Peña, 2008).

Measures

Linguistic transfer was investigated using the *PPVT-III* (Dunn & Dunn, 1997), administered at the beginning of the academic school year, and cognitive-linguistic transfer was measured using versions of the *Word Manipulation* and *Word Swap* tasks, administered at the end of the academic school year. Play-based language samples collected at the beginning and end of the academic year further informed analyses. Trained undergraduate and graduate students in communication disorders administered all tasks on-site at the local preschool.

Peabody Picture Vocabulary Test-Third Edition—The *PPVT-III* is an English receptive vocabulary measure. A stimulus word was read by an examiner, and children were instructed to point to one of four pictures that best matched each word. The assessment was administered according to protocol guidelines. See Data coding and analyses for information about calculating cognate effects.

Metalinguistic probe—The metalinguistic probe consisted of two metalinguistic awareness (MLA) tasks designed to evaluate children's ability to manipulate vocabulary and grammatical forms: word manipulation and word swap tasks. During the word manipulation task (see Chaney, 1992), participants were instructed to help create a new language. Children were shown a picture of a common object (e.g., a cow) on a tablet computer and were told the new name (e.g., *"This is a 'mib'"*). The image was then removed from the screen and the children were asked a series of questions regarding the properties of the removed image under the guise of the new name (e.g., "*Can you throw a mib*"). The task included a total of four images and four novel names. Each image was accompanied by four critical trials for a total of 16 possible points. During the word swap task (see Piaget, 1929), participants were instructed that two words were swapped in meaning (e.g., "*The sun is the moon and the moon is the sun"*). The children were shown a picture and then asked questions regarding the quality of the item shown (e.g., when shown a picture of the moon, "*What would this item's name be?*"). The task consisted of two word swaps, each with four critical trials for a total of eight possible points. For both tasks, children were scored on accuracy, given one point for each correct response and zero points for each incorrect response for a total of 24 possible points.

Language sampling—Play-based activities are commonly considered appropriate methods for eliciting language samples in young children (e.g., see Eisenberg, Guo & Mucchetti, 2018). Language samples were collected in English using a largely play-based approach at both the beginning and end of the academic year. The play protocol consisted of using a toy car, garage, and picnic set, and wordless picture scenes. The language samples were orthographically transcribed from digital recordings and coded by trained undergraduate and graduate research assistants following the Systemic Analysis of Language Transcripts (SALT, Miller & Iglesias, 2012) software conventions. Relevant language sample measures, including mean length of utterance in words (MLUw, Rojas & Iglesias, 2009) were automatically calculated.

Data coding and analyses

The measures of interest in the present study include language dominance, indexed by questionnaire data, cognate effects, indexed by *PPVT-III* performance, and MLA, indexed by word manipulation and word swap tasks.

Language dominance—To create a continuous and multifactorial language dominance variable, language input and output data from parent questionnaires were combined to capture relative dominance across Spanish and English. First, difference scores were established by subtracting the English values from the Spanish ones (e.g., 90 percent input Spanish – 10 percent input English = input difference score of 80; 95 percent output in Spanish - 5 percent output in English = output difference score of 90). The difference scores across input and output were then averaged to give equal weight to both measures in characterizing the bilingual experience for language dominance (e.g., average of input difference score of 80 and output difference score of 90 = language dominance index of 85). Precedent for using difference scores in establishing language dominance comes from bilingual child and adult literatures (e.g., Bedore et al., 2012; Gollan, Weissberger, Runnqvist, Montoya & Cera, 2012; Robinson Anthony & Blumenfeld, 2019), where a score of zero indexes perfectly balanced bilingualism and perfectly unbalanced bilingualism is indexed by a score of 100.

Cognate effects—Cognate effects are indicative of the cross-language similarity influence on translation equivalents during lexical processing. Cognate effects were determined based on children's performance on the *PPVT-III*. The percent correct of noncognate words was subtracted from the percent correct of cognate words to yield a measure of cognate effects (e.g., 83 percent average correct cognates minus 60 percent average correct noncognates = a cognate effect of 23). Cognate and noncognate status of *PPVT-III* items were previously determined in Potapova et al. (2016). In this study, English monolingual adults were given Spanish translation of *PPVT-III* targets (e.g., Spanish *obelisco* for English *obelisk*) and asked to surmise their English translation equivalents. Words that were accurately translated by at least 75 percent of raters were categorized as cognates (see also Friel & Kennison, 2001; see Potapova et al., 2016 for a list of items identified as cognates based on this back-translation criterion on Form A of the *PPVT-III*).

For cognate effects, *linguistic transfer* was reasoned to be present when stronger performance on cognate vs. noncognate words was identified (Poarch & Van Hell, 2012; Potapova et al., 2016). For answering our research question here, cognate effects were then included in our model as the dependent variable, with language dominance as our independent variable.

Metalinguistic awareness—MLA was indexed using scores on the word manipulation (total points = 16) and word swap tasks (total points = 8) to capture overall metalinguistic skills of lexico-semantic processing. Performance on these tasks was moderately correlated ($r = .35$, $p = .02$), suggesting it was appropriate to combine them into a composite score (Rubin, 2012). The raw scores for both tasks were standardized and summed. For example, on each task, standardized scores were derived by subtracting individual participants' raw score from the group's mean (e.g., Participant A word manipulation score of 12 minus group mean of 11.39 = 0.61; Participant A word swap score of 4 minus group mean of 2.72 = 1.28), and dividing this by the group's standard deviation (e.g., 0.61 divided by 2.84 = Participant A word manipulation standardized score of 0.21; 1.28 divided by 1.66 = Participant A word swap standardized score of 0.77). Then, the two standardized scores for the word manipulation and word swap tasks were summed for each participant as an index of metalinguistic awareness (e.g., Participant A word manipulation standard standardized score of 0.21 plus Participant A word swap standardized score of 0.77 = MLA index of 0.98).

For MLA, *cognitive-linguistic transfer* was reasoned to be present if skills on the English task increased with greater Spanish dominance (e.g., Durgunoğlu, Nagy & Hancin-Bhatt, 1993; Galambos & Hakuta, 1988; Pasquarella, Chen, Lam, Luo & Ramirez, 2011; Verhoeven, 2007).

Results

Measures of interest in this study include language dominance, cognate effects, and MLA; summaries of the participants' performance on each of these measures are available in Table 2. For language dominance, the average index score was 46.24, consistent with Spanish dominance, with a standard deviation of 34.85 and a range from 0 to 100 (i.e., from balanced exposure to exposure almost entirely limited to one language). This wide range suggests that these developing bilinguals showed various language dominance profiles, and most participants clustered between 11 and 81. For cognate effects, the average effect score was 19, consistent with cross-language facilitation, with a standard deviation of 22 and a range from −24 to 71. Cognate effect data for six participants were not available. Eighty percent of children demonstrated positive cognate effects indexing crosslinguistic facilitation from the dominance language (Spanish) to the nondominant language (English). For MLA, the average standardized index score was −.61, with a standard deviation of 2.21 and a range from −4.35 to 3.79.

Regression analyses were used to investigate the relation between language dominance and linguistic transfer, as well as language dominance and cognitive transfer. For linguistic transfer, our dependent variable was cognate effect and our independent variable was language dominance (cognate effect = β0 + β1[language dominance]). For cognitive transfer, our dependent variable was MLA and our independent variable was language dominance (MLA = β0 + β1[language dominance]). In a follow-up analysis of cognitive-linguistic transfer, MLUw was included in the model, as well as a MLUw by language dominance interaction variable (MLA = β0 + β1[language dominance] + β2[MLUw] + β3[language dominance*MLUw]).

Language dominance and crosslinguistic transfer

Regression analysis revealed a significant relation between language dominance and cognate effects on the English receptive vocabulary task (Figure 1; $t(38) = 2.28$, $p = .03$, see Table 3). Children with greater Spanish dominance demonstrated higher magnitudes of cognate-noncognate differences in English than children with more balanced dominance profiles. Beyond these group-level patterns, a total of 8 children did not demonstrate cognate facilitation. That is, their cognate scores were lower than their noncognate scores, with differences between the two word types ranging from 3 to 24. Paired samples t-tests revealed that group performance on cognate and non-cognate targets were not significantly different ($t(5) = 0.31$, $p = .38$); thus, while there was no cognate advantage, there was also no cognate disadvantage. Of these children, two were balanced bilinguals, with a language dominance score of 0. Altogether, findings suggest stronger cognate effects when the language of the task is the participant's nondominant language, reflecting language transfer from the dominant into the nondominant language.

Language dominance and cognitive-linguistic transfer

Initial regression analyses did not reveal a significant relation between language dominance and our composite measure of MLA (Figure 2; $t(44) = -.04$, $p = .96$, see Table 3). As language dominance measures were assessed at the beginning of the school year, and the metalinguistic probe was administered at the end of the school year, we reasoned that the relation between the two might have been affected by fluctuating dominance profiles over the course of the year (e.g., Jia & Aaronson, 1999). To account for such changes, English MLUw from language samples collected at the end of the school year was included in the regression model. Based on a significant correlation between our variable of interest (MLA) and English proficiency indexed by MLUw ($r = .48$, $p < .01$), it was reasoned that MLUw would adequately account for some of the observed variance. A significant overall model with two independent variables (language dominance, MLUw) and their interaction was established ($F(3,38) = 4.68$, $p = 0.007$), with a significant interaction between language dominance and MLUw ($t(38) = -2.48$, $p = .02$), as well as simple effects of language dominance on MLA ($t(38) = 2.46$, $p = .02$) and MLUw on MLA ($t(38) = 3.69$, $p = .001$). Based on the significant interaction between MLUw and language dominance, we split the participants into two groups for isolated analyses of the relation between language dominance and MLA. As such, the participants ($n = 42$) were separated into two groups based on their English MLUw scores, though MLUw data for four participants were not available at the end of the academic school year. As opposed to a median or mean split, the point of crossover (i.e., the point at which linear fits for independent variables intersect) was statistically found to be at a MLUw of 3.31 based on the interaction between language dominance and proficiency in the overall statistical model. Children below the MLUw = 3.31 intersection point became the 'lower English MLUw' group ($n = 23$), and those above the intersection point became the 'higher English MLUw' group ($n = 19$). Splitting groups in this manner allowed us to identify a meaningful proficiency threshold in the current participant cohort.

For children who demonstrated a lower English MLUw at the end of the school year, language dominance was associated with MLA scores, with more unbalanced bilingualism at the beginning of the school year was associated with higher metalinguistic composite scores, and more balanced bilingualism at the beginning of the school year was associated with lower metalinguistic composite scores. Follow-up analyses revealed that this pattern was significant, as visually represented in Figure 3 ($t(21) = 2.24$, $p = .04$). However, for children who demonstrated a higher English MLUw at the end of the school year, a different pattern emerged: more unbalanced bilingualism at the beginning of the school year was associated with lower metalinguistic composites scores, and more balanced bilingualism at the beginning of the school year was associated with higher metalinguistic composite scores. However, regression analyses did not confirm this pattern to be statistically significant ($t(17) = −1.25$, $p = .23$). Therefore, transfer of MLA and skill appears to be influenced by second language proficiency, as a pattern of dominant to nondominant language transfer can be inferred for the lower second language proficiency grouping but not the higher second language proficiency grouping.

Recall that the two MLUw groups were determined based on *end* of year MLUw. To determine whether differences in end of year MLUw may be attributed to earlier differences in English proficiency, further analyses compared MLUw at the *beginning* of the academic year across participant groups. To achieve this aim, the higher MLUw group and the lower MLUw group were each medially split into two dominance categories--either relatively Spanish-dominant or relatively balanced--using their language dominance score. As each MLUw group contained an odd number of participants, children with the median score were assigned to a dominance category with respect to the group mean; that is, if that child's score was below the mean, he or she was considered relatively balanced. Thus, a total of four groups were established: relatively Spanish-dominant within higher MLUw ($n = 9$); relatively balanced within higher MLUw ($n = 10$); relatively Spanish-dominant within lower MLUw ($n = 11$); and relatively balanced within lower MLUw ($n = 12$); note that four children were not included in analyses as language samples were not completed at the beginning of the year. Results indicated that, within the lower English MLUw category, relatively Spanish-dominant and relatively balanced children did not differ significantly on MLUw at the beginning of the year ($t(21) = −0.03$, $p = .98$). At the end of the school year, the relatively-Spanish dominant children did outperform their relatively balanced peers in English MLUw within the lower MLUw group ($t(21) = 3.42$, $p < .01$). The pattern of results differed within the higher MLUw group. Here, the relatively balanced children did not differ from the relatively Spanish-dominant children at either time point ($t(13) = -1.56$, $p = .14$; $t(17) = 3.42$, $p < .01$, respectively). Altogether, these results indicate that within each MLUw category (higher and lower English MLUw), children of differing language dominance profiles performed similarly at the beginning of the academic year; however, within the low MLUw group, children with higher native language dominance ultimately attained significantly higher levels of English proficiency. As such, the results indicate that, for children with relatively lower proficiency in the nondominant language, increased experience with the dominant language is associated with enhanced performance in both metalinguistic and expressive language tasks in the nondominant language.

Discussion

The aim of the current study was to determine whether a continuous measure of language dominance based on parent report of children's language input and output would predict patterns of transfer across linguistic and cognitive-linguistic levels in emergent bilingual preschoolers, as reflected by cognate effects and MLA performance, respectfully. Drawing from studies with categorical definitions of language dominance, it was hypothesized that developing Spanish-English bilinguals would benefit from lexico-semantic knowledge and MLA in their native and dominant language (Spanish), with skills transferring to their nondominant language (English, e.g., Poarch & van Hell, 2012; Serratrice et al., 2007). Present results suggest that transfer from the dominant to the nondominant language happens at both linguistic and cognitive-linguistic levels in bilingual preschoolers. Transfer at the lexico-semantic level was found to be tied to language dominance, with transfer from more dominant to less dominant languages. Interestingly, it appears that, at the cognitive-linguistic (MLA) level, transfer effects were influenced by nondominant language proficiency, with children with relatively *lower* English mean lengths of utterance demonstrating transfer from the dominant to nondominant language. For children with relatively higher English mean length of utterance, no transfer effect was statistically evident. Thus, mechanisms of transfer may differ somewhat across the two processing levels and may be constrained by proficiency in the target language.

Language dominance and crosslinguistic transfer

The results of our study suggest that transfer of lexico-semantic knowledge, indexed by higher accuracy of cognate versus noncognate items, occurs in preschool-aged bilinguals (see also Potapova et al., 2016) and patterns similarly to older children (e.g., Pérez et al., 2010) and adults (e.g., Gollan, Fennema-Notestine, Montoya & Jernigan, 2007; Robinson Anthony & Blumenfeld, 2019). Here we contribute a specific relation between the magnitude of transfer effects and continuous Spanish language dominance. Specifically, the more unbalanced (i.e., Spanish-dominant) children of this study were found to have higher cognate effects in English, indicating that semantic representation and lexical form similarities across languages facilitated linguistic transfer. The more balanced, less Spanish-dominant bilinguals did collectively evince crosslinguistic transfer, as cognate effects in

English were generally positive. However, seven participants, two of whom were absolutely balanced with a language dominance score of zero, did not demonstrate cognate effects. As this current study has posited, cognate facilitation would be more robust in the less dominant language. In the context where two languages are equally dominant (i.e., balanced), the relative proficiency disparity that is associated with transfer of lexico-semantic knowledge from a dominant to a nondominant language would be muted. Beyond these absolutely balanced children, our findings are consistent with studies of cognate effects in bilingual children that have shown that not all children show cognate effects. A total of nine children (20% of participants) across our dominance spectrum showed no cognate effects (see Table 2). Thus, 80% of children in our current study demonstrated cognate effects, in comparison to 60% of children in Kelley and Konhert's (2011) and Potapova et al.'s (2016) studies. Parent-reported Spanish input range differences between studies may account for some of this variation alongside methodological differences. Importantly, our findings suggest that language transfer at the lexico-semantic level may be related to a particular language dominance pattern (i.e., unbalanced bilingualism); the magnitude of transfer effects is related to the target language and dominance relative to the non-target language, as indexed by a multifaceted measure of language dominance.

Language dominance and cognitive-linguistic transfer

Findings of our study suggest that language dominance also predicts transfer from the dominant to the nondominant language at the cognitive-linguistic level, as indexed by MLA performance. However, it appears that the relation between language dominance and cognitive-linguistic transfer is mediated by proficiency in the nondominant target language (English). For the lower English MLUw group, children who were more Spanish-dominant demonstrated better performance on English MLA tasks than their more balanced peers. For the higher English MLUw group, there was no statistically significant evidence to support transfer of cognitive-linguistic skills. Present findings demonstrate a pattern of cognitive-linguistic transfer that supports literature positing dominant to nondominant transfer of cognitive-linguistic skills (e.g., Bialystok et al., 2003; Francis, 1999; Serratrice et al., 2009; Verhoeven, 2007) though we novelly contribute a possible factor of second language proficiency in mediating transfer effects.

One possible explanation for these results may be that the more Spanish-dominant children of our lower English MLUw group may benefit from native language proficiency, consistent with Cummins's (1976) threshold hypothesis. Cummins theorized that children must attain a minimum level of maturation and proficiency in their native language before skills can transfer for second language learning. The Spanish-dominant children within the lower MLUw group, by definition, had relatively more input and output in Spanish than their more balanced counterparts. Although Spanish proficiency was not directly tested for these children, previous correlational research suggests that the Spanish-dominant children obtained higher language proficiency in Spanish than children whose exposure and experience with Spanish and English were more balanced (e.g., Bedore et al., 2012). The finding that more Spanish dominance predicted higher accuracy on an English MLA task for these children suggests that more experience with the native language (Spanish) promotes language skills that are readily available for transfer. Meanwhile, children with a more balanced profile (i.e., the less Spanish dominant profile) within the lower MLUw group did not demonstrate the same cognitive-linguistic transfer on an English task. Null findings for the children with higher English MLUw indicate no transfer from the native language in this group. This pattern of results suggests that native language transfer may play less of a role once sufficiently high second language skills have been attained (e.g., Galambos & Hakuta, 1988). Here, we infer the facilitatory role of native language proficiency, as indexed by dominance groupings, in second language development: the dominant language may reasonably bootstrap development of language skills in the nondominant language, particularly for children with lower levels of performance in the language of assessment.

Implications for practice

The findings of our study have practical implications for educational and speech-language practitioners. In supporting the native language, practitioners can expect to positively impact the majority language of the learning environment (e.g., Hovens, 2002; see Olivares & Lemberger, 2010), as well as foster positive esteem for the language spoken at home and in the community (e.g., Lambson, 2002). Specifically, we provide evidence to support the role of the native language in second language vocabulary bootstrapping and cognitive-linguistic skill flexibility. In making form-meaning mappings, bringing awareness to lexical similarities between the native and academic languages has been shown to facilitate learning, at least in older children (Ramírez, Chen & Pasquarella, 2013). Based on similar language dominance and proficiency patterns as older bilingual children (Pérez, Peña & Bedore, 2010), developing preschool-age bilinguals may be sensitive to cognate status based on Spanish language dominance and may benefit from similar lexical awareness support. Showing such transfer patterns along continuous language dominance profiles and considering proficiency in the majority language provides a framework for the level of transfer from the home language that might be expected at various stages of bilingual development in preschoolers. As such, tools designed to measure relative proficiency, or language dominance, in preschoolers are a vital component to educational and speech-language practices (e.g., Bilingual Input-Output Survey, Bilingual English-Spanish Assessment, Peña, Iglesias, Goldstein & Bedore, 2014; Language Exposure Assessment Tool, De Anda, Bosch, Poulin-Dubois, Zesiger & Friend, 2016). Our study here adds to a literature for supporting the home language when it differs from that of the academic language (e.g., Ding & Yu, 2013; Pham, 2016; Terra, 2018).

Limitations and future directions

One limitation of this study is that we provide data from English language tasks from children who are balanced to Spanish-dominant bilinguals. That is, we only include about two-thirds of the bilingual spectrum. In the future, by looking at the full spectrum of language dominance (e.g., English-dominant to balanced to Spanish-dominant) and including measurements of Spanish language skills (e.g., Spanish vocabulary, Spanish MLA), more complete analyses of transfer effects can be made. For example, we would also expect similar patterns of linguistic and cognitive transfer to occur in English-dominant bilinguals, with weak cognate facilitation and little to no transfer of MLA skills from Spanish to English. These children would be predicted to scaffold from English into Spanish in both linguistic and cognitive linguistic tasks. This premise finds support from the adult literature, as language dominance predicted cognate effects across English and Spanish tasks in Spanish-English bilingual adults (Robinson Anthony & Blumenfeld, 2019). The Spanish-dominant and English-dominant adults of this study each demonstrated greater transfer of linguistic knowledge (i.e., cognate effects) from the dominant to the nondominant language.

Second, our variables for language dominance and MLA are based on parent-reported input/output percentages at the beginning of the school year, and word tasks at the end of the school year, respectively. While we demonstrated that even beginning of the school year dominance profiles have end of the school year cognitive-linguistic predictability, measuring baseline and end of the school year language dominance and MLA will inform us on the relation between the degree of dominance and cognitive-linguistic transfer, as well as the effect of growth on these two variables. As a final note, studies of bilingual language development are complicated by rapid cognitive-linguistic maturation. For this reason, correlating language dominance and cognitive-linguistic skills can be challenging as development of executive function can influence relations. We do not specifically measure executive function here (e.g., attention, inhibitory control, working memory), and future work on language profiles and cognitive-linguistic development may touch on their possible mediating effects. However, we do report novel findings to support future investigations of the relation between developing bilinguals' profiles and linguistic and cognitive-linguistic systems together.

Conclusion

Transfer of linguistic and cognitive skills from a dominant to a nondominant language occurs during early bilingual language development. We find here that language dominance predicts both transfer of lexico-semantic (cognate) knowledge at the linguistic level, as well as MLA at the cognitive-linguistic level. While lexico-semantic knowledge may show somewhat robust transfer effects across the language dominance continuum, MLA transfer may be tied to both degree of dominance and levels of proficiency. We show here that Spanish dominant children with relatively lower second language proficiency, as indexed by English MLUw, benefited from higher levels of exposure to and use of the home language, whereas these effects appear to be muted for bilingual children with higher second language skill. Thus, our study adds to the literature in first and second language development and in supporting the home language for holistic cognitive-linguistic development.

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The data that support the findings of this study are available from Sonja L. Pruitt-Lord (spruitt@sdsu.edu) upon reasonable request. The data are not publicly available due to ongoing collection and analyses, as well as the privacy of the families involved.

APPENDIX

Appendix A.

Item# on the PPVT-III Form B identified as cognates by 75% translation criteria

7	79	117	164
9	80	129	168
10	85	131	169
33	87	139	174
34	89	146	176
39	91	150	178
43	94	151	179
51	102	156	180
59	109	158	185
62	110	160	187
67	111	163	192

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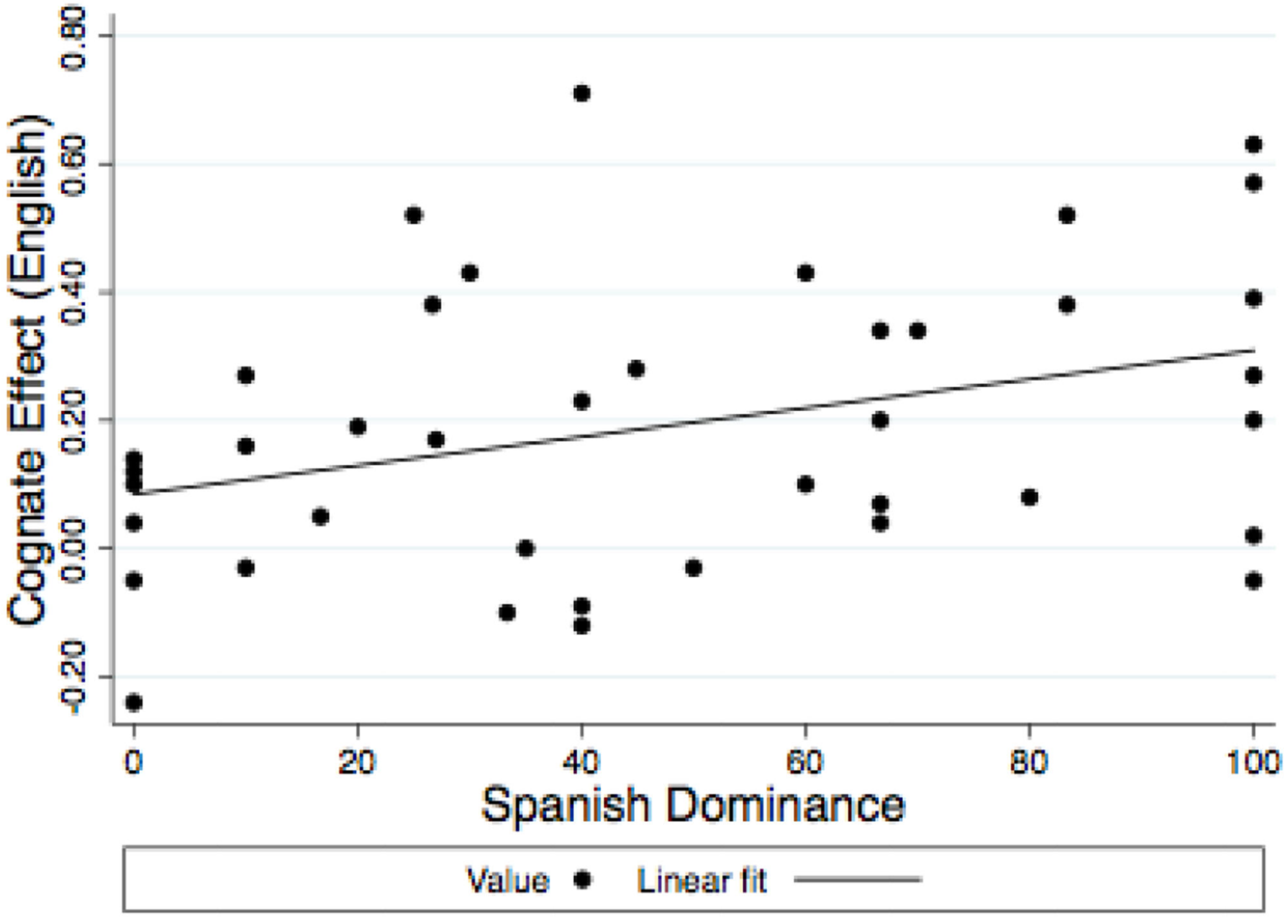

Figure 1.

Spanish language dominance and English cognate effects. Larger cognate effects (cognate minus noncognate accuracy) along the y-axis index more crosslinguistic facilitation. More positive values along the x-axis index more Spanish dominance and less positive values index less Spanish dominance.

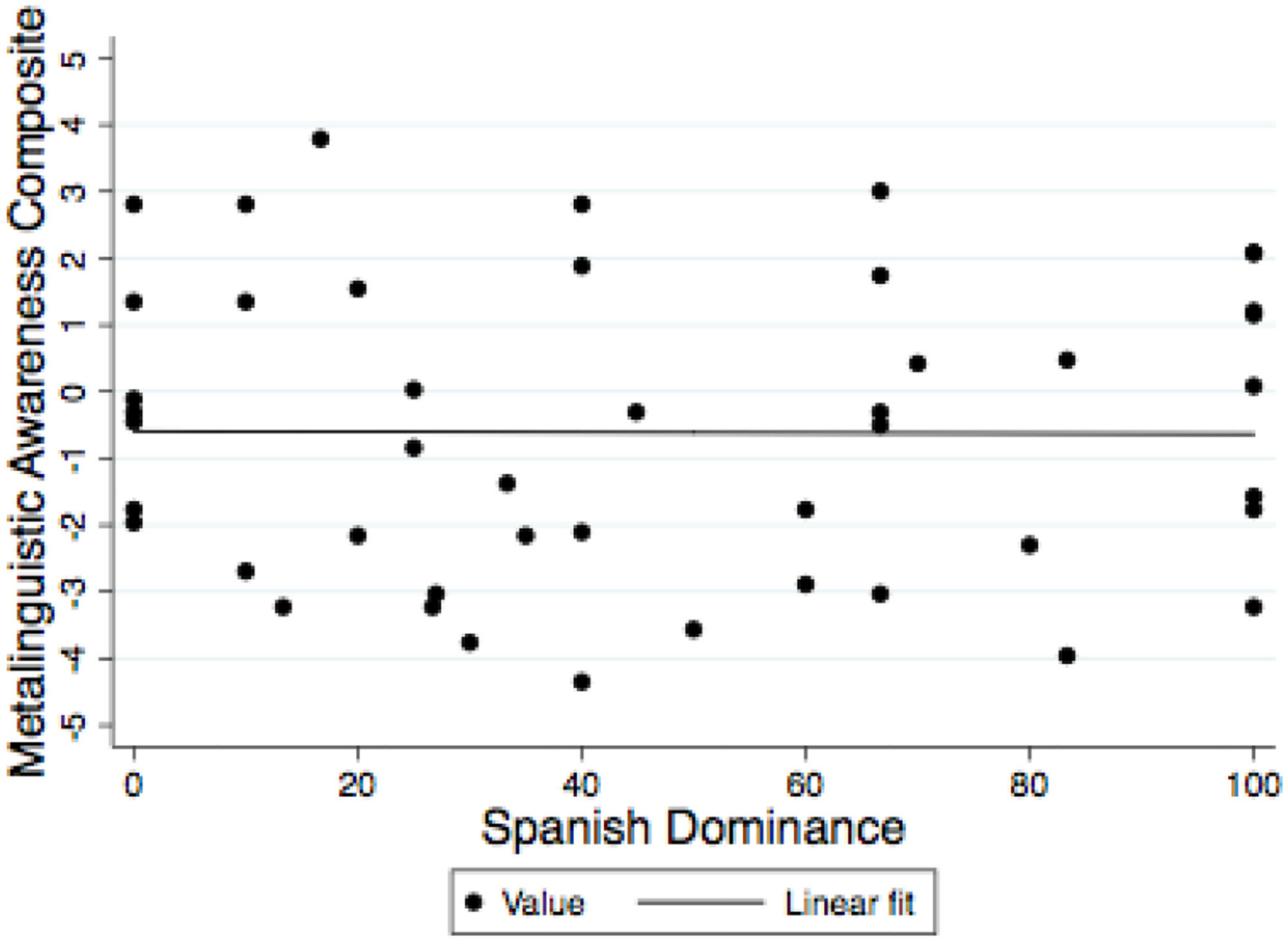

Figure 2.

Spanish language dominance and metalinguistic awareness scores. Metalinguistic composite scores are represented in terms of z-scores. More positive values along the y-axis index better English metalinguistic awareness. More positive values along the x-axis index more Spanish dominance and less positive values index less Spanish dominance.

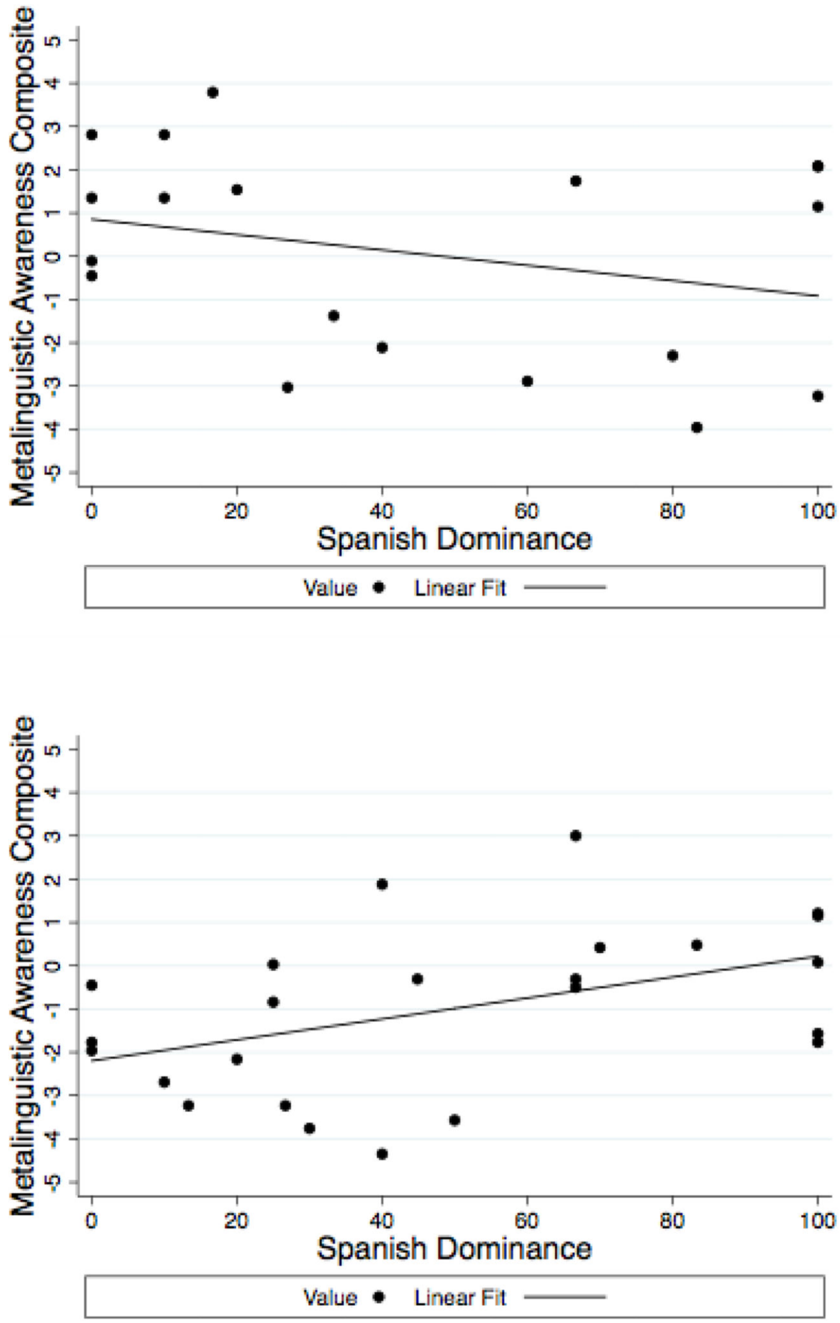

Figure 3.

Spanish language dominance and metalinguistic awareness scores split by end-of-academic-year English mean length of utterance >3.31 (top) and English mean length of utterance <3.31 (bottom). Metalinguistic composite scores are represented in terms of z-scores. More positive values along the y-axis index better English metalinguistic awareness. More positive values along the x-axis index more Spanish dominance and less positive values index less Spanish dominance.

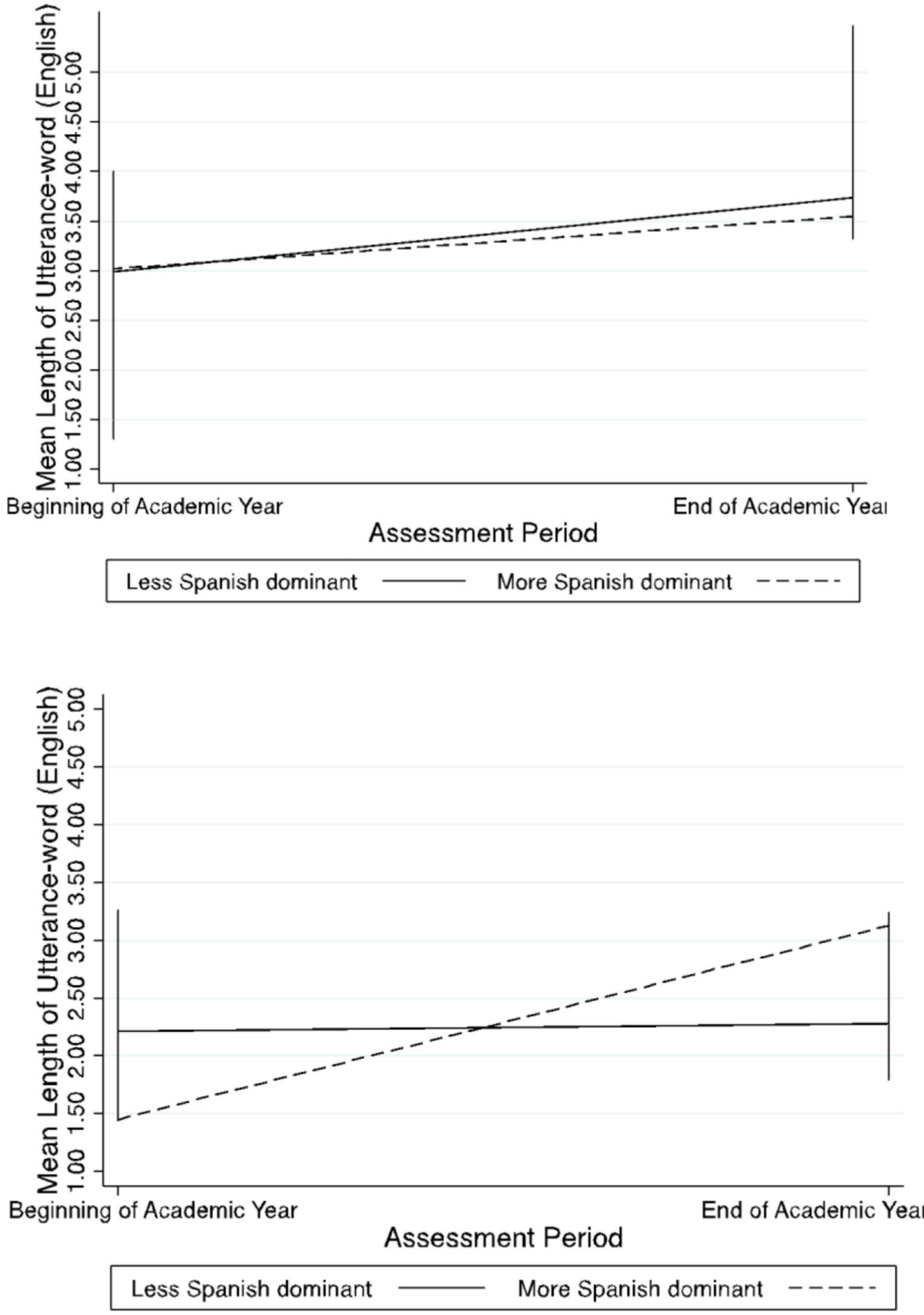

Figure 4.

Change in English mean length of utterance for less Spanish dominant and more Spanish dominant groups split by end-of-academic-year English mean length of utterance >3.31 (top) and English mean length of utterance <3.31 (bottom). More positive values along the y-axis index more English expressive proficiency. Assessment of language samples at the beginning and end of the academic year are categorically represented along the x-axis.

Participants were medially split into ‘less Spanish dominant’ and ‘more Spanish dominant.’
Note. Vertical lines indicated range of values.

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Table 1.

Demographic data on Spanish-English bilingual children

N = 46 (18 males)	*M (SD)*	Range
Age (months)[1]	50 (6.5)	37 – 62
Maternal education (years)[1]	10 (2.99)	2 – 16
Parent-reported input Spanish (%)[1]	74 (18.16)	50 – 100
Parent-reported input English (%)[1]	26 (18.17)	0 – 50
Parent-reported output Spanish (%)[1]	72 (20.56)	33 – 100
Parent-reported output English (%)[1]	28 (20.56)	0 – 67
Peabody Picture Vocabulary Test – Third Edition (raw scores)[2]	24 (15.09)	4 – 62
Leiter International Performance Scale-Revised[3]- Figure Ground and Form Completion subtests averaged (standard scores)	11.60 (1.93)	7 – 16
English mean length of utterance-beginning of academic year[4]	2.36 (0.79)	1.24 – 4
English mean length of utterance-end of academic year[4]	3.19 (0.73)	1.79 – 5.47

Note:

[1]Language background questionnaire.

[2]Dunn & Dunn, 1997.

[3]Roid, Miller, Pomplun & Koch, 2013.

[4]Language samples.

Table 2.

Language dominance, cognate effects, and metalinguistic awareness description

	M (SD)	Range
Language dominance	46.24 (34.85)	0 – 100
Cognate effect	19 (22)	−24 – 71
Metalinguistic awareness	−.61 (2.21)	−4.35 – 3.79

Table 3.

Regression statistics

	F (df)	p	R2	Std. Err.	t (df)	p
cognate effect = β0 + β1(language dominance)	5.22 (1,38)	.03*	.12			
(language dominance)				<.01	2.28 (38)	.03*
MLA = β0 + β1(language dominance)	<0.01 (1,44)	.97	<.01			
(language dominance)				<.01	−0.04 (44)	.97
MLA = β0 + β1(language dominance) + β2(MLUw) + β3(language dominance*MLUw)	4.92 (3,35)	.01*	.30			
(language dominance)				.06	−2.13 (35)	.04*
(language dominance*MLUw)				.02	2.10 (35)	.04*
(MLUw)				.7	3.64 (35)	<.01*

Note: MLA = Metalinguistic awareness index. MLUw = Mean length of utterance in words. β0 = constant value. β1 – β3 = weighted values for each variable, respectively.