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Gesture and Bilingualism: evidence from Polish-English preschoolers. A pilot study report

Abstract. Both monolingual and bilingual children use gestures as accompaniment for their uttered words in a conversation. However, their gestural repertoires differ. Language dominance can play a crucial role in how children use gestures to support, augment the meaning of or replace a vocabulary item. In the study, we investigated the relationship between language and gesture in bilingual, Polish-English preschoolers. We assumed that children would produce more co-speech gestures in their dominant language, compared to their non-dominant language. Such a hypothesis has not been traced thoroughly in the research on bilinguals. In the report, we look at the link between bilingualism and gesture use in language acquisition. We present the procedure used in the study, and discuss the analysis of video data obtained from four bilinguals between the ages of 4.5 and 6.5. The recordings document gesticulation and speech of the children in Polish and English during a conversation with the researcher, conducted in the form of a game. We present quantitative (gesture count) and qualitative analysis of the material gathered during that game.

Keywords: gestures; bilingualism; language dominance; iconic gestures; index gestures; gestures development.

1. **Theoretical background**

1.1.   The role of gestures in communication

There are two main perspectives on gestures in face-to-face communication. Adam Kendon emphasises that a gesture has to be meaningful and easily interpretable for the receiver of a message (2004, p. 8). A gesture is supposed to facilitate communication and help the receiver decode and understand the message. It is hence actively created for the receiver. David McNeill, on the other hand, sees gestures as an integral part of discourse and stresses the link between gesture and thought (1995, p. 105). He focuses on the sender and places them in charge of a gesture's meaning and form. In his view, a gesture is created by and for the sender: it supports speech and reflects thinking and recalling ideas. Gestures and speech occur together and can be complementary to one another but they can also occur separately – gestures can take place of words (Bangerter & Louwerse, 2005, p. 1332) or facilitate word retrieval (Kita & Özyürek, 2003), especially when we use a foreign language (Hadar, Dar & Tietelman, 2002).

In our research, we wanted to show the link between speech and gesture use in bilingual children. Therefore, we focused on the co-speech gesture classification proposed by David McNeill (2005) and synthesised by Adam Kendon (2004). McNeill divides gestures into two categories: imagistic gestures representing "the shape of an object, displaying an action of some kind, or representing some pattern of movement" (Kendon, 2004, p. 100); and non-imagistic gestures which "include gestures that point (deictic gestures) and gestures that seem to be simple rhythmic movements only, serving to mark out segments of the discourse or the rhythmic structure of the speech" (Kendon, 2004, p. 100). Within these two classifications, McNeill introduces four categories: iconic, metaphoric, deictic, and beat gestures (McNeill, 2005). The classifications are presented in detail below.

Imagistic gestures include:

- Iconic gestures are based on the resemblance between the form and/or motion of a referent and the shape and/or motion of a gesture. According to McNeill (2005, p. 39), those gestures simply represent objects or actions done with or to these objects.
- Metaphoric gestures present "images of the abstract" (McNeill, 2005, p. 39), they are closely tied to spoken content and represent ideas; for ex-

ample, being promoted or downgraded at work would be related to an up-
ward or downward hand movement (cf. Müller & Cienki, 2009).

Non-imagistic gestures include:

- Deictic gestures, also described as indexes or pointers (Kendon, 2004), in-
  volve the use of the finger, the hand, or other body parts, such as the head,
  feet (McNeill, 2005, p. 39) or the tongue (e.g. in Sign Languages: Stokoe,
  1978). Deictic gestures can be divided into referential ones, when they
  indicate an object's presence in the physical space, and spatiotemporal
  ones, when they refer to events, ideas or places that are not directly acces-
  sible or they belong to either the past or the future (McNeill, 2005, p. 40).
- Beat gestures manifest as synchronised manual movements, often involv-
  ing rhythmic motions of the hands or fingers, that align with the rhythm
  and prosody of speech (McNeill, 2005, p. 40). Beat gestures accentuate
  and emphasise linguistic elements, thereby augmenting the overall ex-
  pressive capacity of language.

1.2. Bilingualism and language acquisition

In our research, we define bilinguals following Bialystok: as "people who are
able to speak two (or more) languages, to some level of proficiency" (2001,
p. 5). There are six factors related to language acquisition, cognitive pro-
cesses behind it, and everyday language use that influence the type of bi-
lingualism an individual presents. In our work, we focus on these factors:
"(a) early/late (Genesee et al., 1978), (b) simultaneous/sequential (Genesee
et al., 1978), (c) dominant/balanced (Peal & Lambert, 1962), (d) additive/sub-
tractive (Lambert, 1974), (e) compound/coordinate/subordinate (Weinreich,
1953), (f) folk/elite (Fishman, 1977).

- The first category concerns the age of language acquisition. Bilinguals
  who acquired both languages during the critical period are described as
  early bilinguals; whereas those who acquired it after the critical period
  are known as late bilinguals.
- The second category is concerned with whether languages were acquired
  simultaneously or successively after the acquisition of L1 during the criti-
  cal period.
- The third category explores the issue of language dominance. Balanced
  bilinguals learn both languages simultaneously with a similar proficien-
  cy level. Balanced bilingualism is often categorised as an early type (Tref-
  fers-Daller, 2019). In contrast, when analysing dominant bilinguals one

can observe significant differences in aspects such as proficiency or time of the acquisition of the dominant language compared to the subordinate language.

- The fourth category is related to the influence L1 has on L2, and *vice versa*, where two possible correlations can be established. In additive bilingualism, the ability to improve one's second language without affecting one's first language proficiency is also of high importance. However, it is also possible that under the influence of a dominant language, a subordinate language becomes replaced by it, or that one of these languages emerges at the expense of the other, resulting in a subtractive bilingual type.
- The fifth category looks at how languages are coded and organised at a cognitive level, and used by bilinguals. How individuals store and retrieve languages based on the connection between a linguistic code and a semantic representation. They can be classified in the following way:
  - compound bilinguals: connect two linguistic codes from two different languages to form one semantic system; yet, separate semantic systems can be developed for each spoken language;
  - coordinate bilinguals: store linguistic codes in two different meaning units which are individual for their languages;
  - subordinate bilinguals: describe mostly late bilinguals, as they structure linguistic codes by creating links between items in subordinate languages and dominant languages.
- The sixth category is elite and folk bilingualism – learned in formal settings and acquired in everyday use, accordingly.

Even though the assessment of language dominance is crucial for understanding bilingualism, language dominance is a broader concept and cannot be assessed based on language proficiency alone (Amengual, 2016). Establishing language dominance is therefore based not only on "unconscious knowledge in the domains of phonetics, prosody, phonology, morphology and syntax, and the largely explicit, conscious knowledge in the lexical domain (form-meaning mappings)" (Hulstijn, 2010, p. 186), but also on such aspects as "who the child lives with, their relationship to the child, the languages spoken and heard by the child each hour of the day" (Bedore et al., 2012; Argyri & Sorace, 2007, p. 83). Looking beyond language proficiency lends perspectives on a bilingual's abilities, and proves that language dominance and language proficiency are not synonymous (Birdsong, 2006 in

Amengual, 2014); hence, input and exposure to a given language should be taken into consideration when assessing linguistic abilities of a child (De Anda et al., 2016). They can be estimated based on the average percentage of use of and exposure to a given language. Only then can the character of language dominance be assessed, as presented in Table 1 (below) (Bedore et al., 2012).

For the purpose of the present pilot study, a child's language proficiency was evaluated based on their language input and language exposure; language history of the family was also taken into consideration, as language dominance can "shift within bilinguals' lifetime" (Amengual, 2014). To gain a better understanding of the language history of each child, we created a questionnaire for parents (Appendix A), and conducted a brief interview with them.

Table 1. Assessing language dominance (Bedore et al., 2012)

a functional monolingual English	80% or more English input-output
a functional monolingual other	80% or more other language input-output
a bilingual English dominant	80-60% English input-output
a bilingual other dominant	80-60% other language input-output
a balanced bilingual	40-60% input-output in each of the languages

1.3. Bilingualism and gesture development

The solution to the problem whether gestures are related to linguistic or cognitive factors can be informative to our knowledge of gesture use and processing. It can also help us understand whether the interplay between language and gesture is affected by age in the case of bilingualism. As Gullberg points out, gestures are essential when discussing children's language development – the same importance can be applied to the issue of early bilinguals (Gullberg, 2008, p. 421; Gullberg, 2012). As far as communication is concerned, one can observe that gesture production appears within the prelinguistic stage of children's development (Babaei et al., 2018). First attempts at communication are produced by means of vocalisation and pointing (Tomasello et al., 2007). Studies have shown that the rising complexity of speech structure is supported by more demanding gestures, such as iconic gestures (Capirici et al., 2005; Murillo et al., 2015). When it comes to early

bilinguals, researchers mostly focus on the differences between their gestures when compared to the gestures of their monolingual peers (Nicoladis, 2009). Based on assumptions concerned with the issue of code-switching, both Nicoladis (2007) and Krauss (2000) suggest that gesture frequency is connected to lexical retrieval. Therefore, bilinguals produce more gestures in the subordinate language because they use them as a compensatory device. However, this observation has been mainly related to the production of iconic gestures (Gullberg, 2008). In general, researchers suggest that bilinguals use gestures more often than monolinguals, as it helps them make up for differences between the two languages and facilitates cognitive processing of language (Nicoladis, 2009).

Iconic gestures are vastly connected to spoken content and to language proficiency due to their ability to facilitate message comprehension and transfer (Nicoladis et al., 2007). However, studies on the frequency of gestures produced by bilinguals show inconsistent results (cf. Marcos, 1979; Nicoladis, 2007). While some showed that bilingual children tend to use iconic gestures more frequently in the subordinate language (Nicoladis et al., 2007), other observed bilinguals to use more iconic gestures in their more proficient language (Nicoladis, 2002a; Nicoladis et al., 1999; Gullberg, 1999). Importantly, these studies were concerned with assessing participants' language proficiency rather than language dominance. Yet, language proficiency can be viewed as an element of language dominance, and not *vice versa* (Montrul, 2015), as shown in Figure 1.
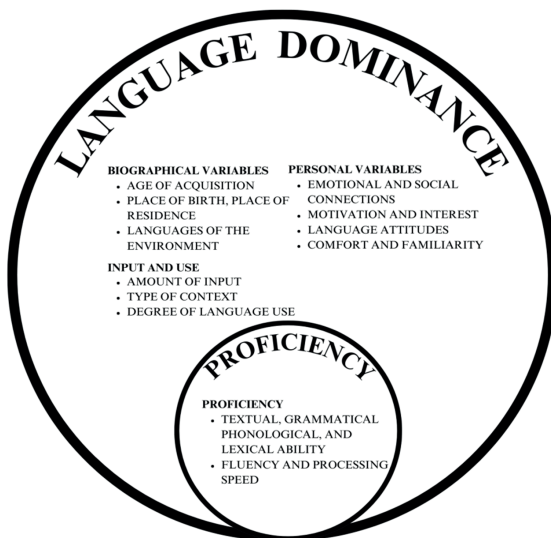

Figure 1. Relationship between dominance and proficiency, adapted from Montrul (2015, p. 17) and augmented for the purpose of the present research

We can distinguish three different approaches to the co-development of language and gesture. In the first approach, gestures can serve as compensation for the inability to speak (Chamberlain et al., 2000). Bilinguals with differing proficiency levels gesture more frequently when using their subordinate language. In the second approach, the development of gesture use has a special link to language use – they are both motor activities that can influence and coordinate one another (Mayberry & Nicoladis, 2000). The third approach states that gestures are "linked to maturation of cognitive skills that are separate from language but that develop within the same time frame" (Mayberry & Nicoladis, 2000, p. 193). This means that bilinguals would produce the same number of gestures no matter what language they used. Gestures can hence be treated as a separate constituent of communication which is not influenced by speech development.

There are distinct views on gesture production and bilingualism. However, we should stress that previous studies did not take into consideration the assessment of language dominance, but classified bilingual participants based on their language proficiency or language development. One has to consider the fact that gestures and speech coexist in communication. In our project, we analyse gestures as co-existing with speech, and the analysis of speech content we present is crucial to understand the context of produced gestures. It allows us to inspect whether observed gestures are used as substitutes for the lack of proficiency in a given language or as support for speech content.

2. Motivation for the study

The intersection of bilingualism and gestures has produced valuable insights into language proficiency dynamics (Marcos, 1979; Nicoladis et al., 2007). Building on this foundation, our study explores deeper into the connection between gestural repertoire and languages spoken by bilinguals. We aim to explore how language dominance and proficiency impact gesture type and frequency during interactions. A correlation between the development of gestures and speech complexity can be observed in studies like Capirci and colleagues (1996; 2005) or Krauss et al. (2000), where iconic gestures seem to stem from cross-modal priming's role in lexical retrieval. The researchers suggest an increased gesture use in a bilingual child's weaker language due to potential challenges in the correct use of vocabulary items (Nicoladis, 2007).

A detailed observation, however, shows a gap in research: previous studies do not look into language dominance – a crucial element in working with bilingual children. Our research addresses this gap by looking at language dominance as a key element in understanding gesture production among bilinguals. Through this, we aspire to provide a more nuanced grasp of how bilingualism, language proficiency, and language dominance interweave, shaping the relationship between gestures and speech in early bilingual development.

2.1. Hypothesis

In our project we ask whether language dominance determines co-speech gesture frequency. We hypothesise that children use more co-speech gestures in their first language (here: dominant language), as opposed to their second language (here: non-dominant language). This hypothesis, if substantiated, could shed light on the ways in which bilingual children navigate and negotiate their linguistic and communicative competencies.

3. Materials and methods

3.1. Preparation

Two families were invited to take part in the research. They received an email with a brief description of the design and a request to confirm if they agree to take part in the study. They were also asked to sign a written consent (GDPR). Four preschoolers were recruited to take part in the game designed for the purpose of the study, which is described in detail in the sections that follow. The choice of participants was intentional as all of them were Polish-English bilinguals living in Poland.

3.2. Materials

Each participant had to describe three randomly given objects of daily use. The overall number of objects used in the study was eleven. We used real objects, which were not related to gender (Table 2).

Table 2. Objects used in the game

fork	spoon	sponge	soap bar
cup	bowl	toothbrush	hairbrush
paintbrush	socks	glasses	

The real objects were presented to each child by a puppet. The research was composed of two parts for each participant (see Section 3.4.): in the dominant and in the non-dominant language. There were two puppets assigned randomly to the children: two participants were playing with a giraffe and two participants with a dragon (Figure 2).

Figure 2. Puppets used in the game: dragon Rokko (left) and giraffe Cza (right)

3.3. Participants

All of the participants who took part in the study were female preschoolers between 4 and 7 years of age. The choice of the participants was not incidental as all of them had similar language backgrounds: they were all born in Poland to Polish-English families. The fathers in each family came from English-speaking countries while the mothers were from Poland. We carefully looked at each participant's development, language history, and the environment they were raised in, to better understand their background and to better account for their verbal and nonverbal communication in the game. Table 3 presents all of the participants: their age, sex, parent's languages, and the language mainly spoken at home. In section 3.3.1. below, we characterise

each of the participants based on the interview conducted with their parents (Appendix A) and the observations made throughout the interaction.

Table 3. Participants

Participant	Age (months)	Sex	Mother's language	Father's language	Lg spoken at home
Participant 1	76	Female	Polish	English	English
Participant 2	53	Female	Polish	English	English
Participant 3	67	Female	Polish	English	English
Participant 4	67	Female	Polish	English	English

3.3.1. Participants' profiles

The 76-month-old female, Participant 1 was classified as an English-dominant bilingual. She presents a strong affinity for English both during self-play at home and in interaction with family members. Despite attending a Polish kindergarten and interacting with Polish-speaking peers, her preference for English remains steadfast. With parents possessing teaching qualifications in English, her exposure to the language is reinforced.

The 53-month-old female, Participant 2, is a sibling of Participant 1 and the middle child out of three. Classified as an English-dominant bilingual, she was influenced by a Polish babysitter in her early years, resulting in increased exposure to Polish when compared to her sister. Nevertheless, her inclination is towards using English, which she resorts to when expressing herself in Polish becomes challenging. She attends a Polish kindergarten; yet, her mother's bilingualism and father's English-exclusive communication have led her to lean towards English dominance.

The first 67-month-old female, Participant 3, was classified as a balanced bilingual. Her mother communicates predominantly in Polish, while her father, an Englishman, communicates exclusively in English. She has English-speaking grandparents involved in raising her, she also attends a Polish kindergarten. Despite high exposure to English, due to her mother's communication preference, Participant 3 prefers speaking Polish.

The second 67-month-old female, Participant 4, is the twin sister of Participant 3 and shares a similar language context. However, due to the substantial influence of her English-speaking grandparents and her father's background, Participant 4 favours English. She was classified as an English-dominant bi-

lingual, despite her interaction with Polish-speaking peers at a Polish kinder-garten, and her mother, who prefers to communicate in Polish.

3.4. Procedure

Each of the participants was visited at home. Before taking part in the study, the participants' parents had to fill out a questionnaire and answer a list of questions (Appendix A). Both the questionnaire and the interview were de-signed to obtain additional information about the parents' language back-ground, family situation, each child's exposure to languages, whether the children attended school or had any extracurricular activities, as well as the overall development of each child, and their hobbies and interests, based on the parents' observations. The information concerning language develop-ment and language exposure was used to assess each child's language dom-inance, whereas additional information about her interests helped to select the topics for the warm-up part of the study.

The game was composed of two warm-up conversations and two rounds of the game proper: Warm-up: L1orL2 test conversation, Round 1: L1orL2 game; Warm-up: L2orL1 test conversation, Round 2: L2orL1 game. For each participant, the order of the starting language was randomised, with the condition that the game would be conducted in the same language as the test conversation (hence: L1orL2). This was done to make sure the child does not use more gestures in the second conversation, when she knows the re-quirements of the game and feels comfortable with the researcher. During test conversations, children were asked about their interests, based on infor-mation given by parents, but also about family members and daily activities. The duration of the test conversation varied for each participant, as it was supposed to help each child feel more comfortable in the new situation, but was no longer than ten minutes. After the test conversation, a puppet was introduced to the child. This event marked the starting point of each game. The puppet, controlled by the researcher, introduced itself to the participant and asked for help in describing a number of objects. In each round, the pup-pet presented only three out of eleven objects in a random order. The objects did not re-appear in the rounds. Each child's task was to explain to the pup-pet how to use each object as the puppet informed the child it did not know how to use them and asked the child for help. After all three objects were de-scribed, the puppet "took a nap" which concluded the round.

The second round of the game began with the puppet waking up from the nap. The test conversation in the second language took longer than the first conversation as the researcher had to make sure that the child switched entirely to speaking the second language. This round was conducted in the same way as the first one.

After completing the game, each participant was given a gift. Then, the gathered videos were annotated for co-speech gestures in ELAN software and classified based on the types established by McNeill (see Section 1.1.). However, only two types of gestures from the classification were taken into consideration: indexes and iconic gestures. Such a decision was made based on previous experiments in which researchers looked at word count increase and associated gesture count increase (e.g. Fasolo & D'Odorico, 2012; Scherer et al., 2013) for, most commonly, indexes and iconic gestures (Morford & Goldin-Meadow, 1992; Zlatev, 2013). Moreover, developmental literature shows that indexes are the first gestures to appear, and which are used throughout one's lifetime (Garber & Goldin-Meadow, 2002; Thompson & Massaro, 1986). Iconic gestures for concrete objects and action-imitation, due to their complexity, tend to follow indexical communication (Özçalışkan & Goldin-Meadow, 2011).

4. Results

The results differed for each participant; therefore, to test the three approaches provided by Mayberry and Nicoladis (2000; see section 1.3.), and address out hypothesis, we analysed the gestures produced alongside speech to find (i) if they substitute unknown or problematic words in the non-dominant language; (ii) if they occur more frequently in the dominant language as a way to support complex structures and longer utterances; or (iii) if there is no relation between these two factors. Table 4 and Table 5, provided below, show that fewer gestures were produced when the children spoke Polish, their non-dominant language, compared to English. This observation does not apply to Participant 3, assessed as balanced bilingual, as neither of the languages spoken by her can be considered dominant.

Table 4. Gestures produced when speaking Polish

Participant	Time	Total gestures	Gesture Iconic gestures	Index gestures
Participant 1	07:23	21	10	11
Participant 2	06:30	6	3	3
Participant 3	04:05	5	2	3
Participant 4	04:03	1	–	1

Participant 1, the oldest of the four participants, used the highest number of gestures throughout the interaction in Polish, compared to other participants. She used almost the same number of iconic and indexical gestures. Participant 4, the youngest of the participants, used the lowest number of gestures throughout the interaction in Polish. Compared to gestures produced when speaking English, gesture count for Polish was higher for participants classified as English-dominant bilinguals.

Table 5. Gestures produced when speaking English

Participant	Time	Gestures	Iconic gestures	Index gestures
Participant 1	09:25	42	16	26
Participant 2	07:23	11	7	4
Participant 3	04:38	6	2	4
Participant 4	04:43	6	4	2

Participant 1, the oldest of the four participants, used the highest number of gestures throughout the interaction in English, when compared to other participants. She used double the number of gestures when speaking English when compared to her performance in Polish – her subordinate language. She used more indexical gestures than iconic ones. The lowest number of gestures throughout the interaction in English was used by Participant 4.

The length of each game differed; therefore, to compare the data, we should transform the data counts into frequencies. This was assured by using Gesture Per Minute (GPM) measure calculated as the number of gestures performed per minute of narration. Table 6 presents the number of gestures per minute for each participant for each game.

Table 6. Frequency of gestures – Gesture per Minute measure

Participant	Gestures per minute when speaking Polish	Gestures per minute when speaking English
Participant 1	2.8	4.4
Participant 2	0.9	1.5
Participant 3	1.2	1.3
Participant 4	0.2	1.2

Again, Participant 1, the oldest of the four participants, used the highest number of gestures per minute throughout the interaction in English and Polish, when compared to other participants. She used almost double the number of gestures when speaking English when compared to her performance in Polish, her subordinate language. Participant 4 performed the lowest number of gestures per minute throughout the interaction in English and Polish. Participant 2 presents a notable pattern in her gesture use. When switching from Polish (0.9 gestures per minute) to English (1.5 gestures per minute), Participant 2 exhibits a significant increase in gesture frequency. This change could indicate a greater comfort or a higher degree of confidence in expressing herself in English, necessitating an increased reliance on gestures for effective communication. Participant 3 demonstrates a near-consistent gesture frequency between the languages, marginally rising from 1.2 in Polish to 1.3 in English. There is a minimal variation in her gesture use, which may suggest that she is proficient in both Polish and English, unlike Participant 2. Further, to see if there is any relationship between language dominance, language development, and language proficiency, we looked at the speech content and co-speech gestures occurring during the interaction.

5. Qualitative analysis of gestures used

This section presents a qualitative analysis of co-speech gestures among bilingual children. We examine how their use of gestures varies depending on language dominance. This analysis is supported by transcriptions of bilinguals' interactions, which enables us to gain a deeper understanding of how gestures complement and augment spoken language. Our analysis of bilingual children's communication reveals that language dominance and gesture use intertwine in interaction.

5.1. English-dominant bilinguals: analysis of co-speech gestures

Participant 1 showed a tendency to support complex/longer utterances with gestures. Her gestures did not serve to substitute spoken content but carried the same meaning as the words. When speaking English, the participant produced 4.4 gestures per minute, when speaking Polish – 2.8 gestures per minute. This shows a tendency to produce gestures in the dominant language. Additionally, the gestures occurred more frequently as clusters accompanying a single utterance. Alongside Polish, gestures occurred in more even time intervals and were distributed evenly throughout the game. This suggests that gesture clusters – or complex gesture units – may be related to the complexity of the structure produced verbally by a child: more complex structures in speech were accompanied by more complex gestures.

In the first example, iconic gestures are used to support the meaning by reproducing spoken content with gestures, as seen in Image 3: the participant holds her hands up, closes and opens the fingertips interchangeably as if they were sticky.

00:03:36.500 – Participant 1
It's weird because I still have **sticky hands** from washing.

Image 3. Participant 1 saying and gesturing "Sticky hands"

The following part of the interview shows how Participant 1 is using gestures alongside complex spoken content: long utterances with proper grammatical structures and a selection of vocabulary, as shown in the transcription below. In the example, the participant is using index gestures to assess the placement of facial parts. In Images 4 and 5, the participant

points with both index fingers to, first, the bridge of her nose, and then, to the tip of her nose.

00:03:56.398 – Puppet (Rokko)
Okay, but can I wash my face with it?
00:03:58.921 – Participant 1
No, because it can go **in your eyes** and then it's so, it can hurt you so much. And if you do it **near your nose** so, it might burst and go in your nose, and I don't know what will happen I only got some water in my nose, and that's not a nice thing with water, but if something goes like soap like something goes like that in your nose uh. But you have such a long nose that you can wash only here.

Image 4. Participant 1 saying and gesturing "In your eyes"

Image 5. Participant 1 saying and gesturing "Near your nose"

When describing parts of the face in Polish, the participant tends to substitute words with gestures, rather than use the actual names of the body parts. For example, instead of saying "ear" she uses the word "here" (Polish "tu") and indicates the body part by using an index gesture as seen in Image 6. For the purpose of the publication, the transcript of the Polish conversation is provided with English translation (in square brackets).

00:01:33.514 – Participant 1
O! I *tu, tu, tu, tu, tu*. Nawet tutaj tak. A to bolało kiedy tutaj tak?
[Eng. Oh! *Here, here, here, here, here*. Even here like this. And did it hurt when it was here like this?]

Image 6. Participant 1 saying and gesturing "Tu" ["Here"] – indicating a body part

It is also interesting to see that the participant uses deictic gestures in this manner extensively when speaking Polish, her non-dominant language. This could serve as evidence for the need to use gestures which serve as complementation or substitution of words when speaking the non-dominant language.

When it comes to Participant 2, a bilingual who is English-dominant, she tends to use gestures in the same manner as her sister, Participant 1. When comparing the frequency of gestures for English and Polish, we observed a difference as the Participant 2's ratio for English is 1.5 gestures per minute whereas in Polish it is only 0.9. This suggests that there is a relationship between language dominance and gesture frequency in children's conversations. She substitutes words with gestures in the non-dominant language as presented in Image 7. In this case, she refers to the action of drinking water from the cup with the word "like this" (Polish "tak") but does not describe it in detailed using speech, but rather demonstrates how to do the very action.

00:00:53.316 – Puppet (Cza)
To jest kubek?
[Eng. Is this a mug?]
00:00:56.033 – Participant 2
Tak
[Eng. Yes]
00:01:06.233 – Puppet (Cza)
Ja umyłbym w tym sobie stópki.
[Eng. I would wash my small feet in it.]
00:01:07.433 – Participant 2
Nie. Po prostu musisz z nim, bierzesz go i potem **tak**.
[Eng. No. You just need with it, you take it and then **like this**]

Image 7. Participant 2 saying and gesturing "Tak" ["Like this"]

When speaking English, she uses gestures to support the meaning by pointing at it while speaking about a mug as presented in Image 8.

00:02:25.497 – Puppet (Cza)
Where?
00:02:35.697 – Participant 2
Here.
00:02:36.897 – Puppet (Cza)
Oh.
00:02:38.097 – Participant 2
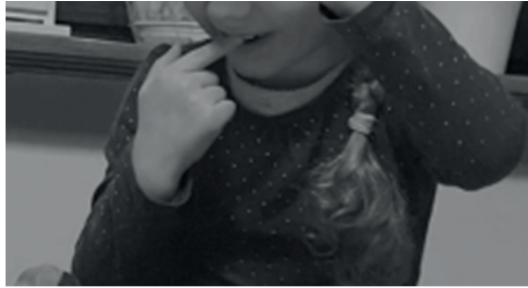***See this white thing in my mouth*** – that's my teeth. Really!

Image 8. Participant 2 saying and gesturing "See this white thing in my mouth"

We do not provide the description of Participant 3 here; she is described separately below, as she is assessed as balanced bilingual (see Section 5.2.).

Although Participant 4 was described as balanced bilingual, her preference for English is very strong, and her performance in the game was analysed as that of the other English-dominant bilinguals. Moreover, the frequency of gestures she performs per minute when she is speaking English differs greatly in comparison to her gestures when she is speaking Polish (English = 1.3; Polish = 0.2). Just as the other English-dominant bilinguals, she tends to use gestures in the dominant language to support the spoken content, in comparison to the non-dominant language in which gestures substitute vocabulary items. The example of gesture used as support is provided in Image 9, from the part of the game in English.

00:03:01.262 – Participant 4
Because it will go in your eyes. I ***put up*** (Image 9) my stool and then.

Image 9. Participant 4 saying and gesturing "Put up"

In this part of the conversation, she uses an index gesture instead of giving a more detailed description of the action that should be done with the object. She uses the word "here" (Polish "tutaj") to describe the location of the object and, in this case, her gesture substitutes the location with additional information that could have been given in speech instead.

> 00:01:58.649 – Participant 4
> Bo **tutaj** (index gesture) się nałoża mydło. [Because **here** you put soap.]

Although Participant 4 cannot be fully described as an English-dominant bilingual, she presents similar tendencies in her gesture use when compared to the rest of the children.

5.2. Balanced bilinguals: analysis of co-speech gestures

The only participant described as balanced bilingual, Participant 3, produced a comparable number of gestures in both languages when chatting with the puppets. We observed a lack of specific relation between gestures and speech as both gestures supporting the meaning of words and those substituting them were produced throughout the conversation in both languages. The frequency and distribution were similar: it was 1.2 gestures per minute when speaking Polish, and 1.3 when speaking English, which was expected due to the balanced bilingual's proficiency in both languages.

6. Conclusions

Participants who took part in the study have similar language backgrounds and language history. They all come from bilingual families speaking English and Polish; yet, they differ in terms of language dominance. During the critical period for language acquisition, each month is crucial in a child's development. When analysing recorded materials, we observed a relation between language dominance and gesture frequency. In 3 out of 4 cases, bilingual participants produced more gestures when speaking their dominant language in a way that supported the meaning (co-speech gesture), whereas in the case of their non-dominant language gestures tended to substitute speech. Only one of the participants was classified as balanced bilingual, and it was observed that she neither had a preference for a particular type of ges-

ture when speaking, nor does she perform an increased number of gestures (measured as GPM) in either of the languages she speaks.

The results of the study suggest that there is a relationship between gesture use and language dominance in bilingual individuals. The frequency of gestures produced by each participant was higher when they were speaking their dominant language compared to their non-dominant language. In the case of one participant, the balanced bilingual, there was no significant difference in the number of gestures produced. We also observed differences in the use of gestures: when speaking their dominant language, children used them to support meaning provided already in speech. Conversely, when participants were communicating in the non-dominant language, the gestures they produced served as substitution for words they could not recall immediately. We did not observe any tendency for co-speech gestures or language-slotted gestures in the case of the balanced bilingual (as none of her languages can be dubbed dominant). Her gestures were used both to support meaning-making and as substitution.

Our observations are a starting, but a very important point in the discussion on gesture use by bilingual individuals. Whether there is a significant relationship between the frequency of gestures produced in a conversation and language spoken by bilingual children remains an open question. We have been working on a more extensive study with a greater number of bilingual participants who differ in language proficiency and family background. We want to see whether our observations are confirmed if we look at a more diverse group that would allow us to conduct statistical analysis.

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APPENDIX A

Information about the child collected for the study:

1. Child's name, child's date of birth and age in months: ....
2. Does the child have siblings? YES / NO (If YES, how many? At what age?): ....
3. Does the child attend a nursery/preschool? YES / NO. If NO, who takes care of the child?
    ....

    3a. If there is/was an additional person taking care of the child, what languages does he/she speak?
    ....
4. Does the child receive counseling or participate in therapeutic workshops (hearing, vision, motor, SI)? YES / NO. If YES, which counseling center/workshop does the child use: ....
5. Does the child take part in additional activities, e.g. dancing, swimming, horseback riding, music classes, art classes, foreign language? Please underline appropriate and/or list others:
    ....
6. In what language does the child communicate at school?
    ....
7. What is the native language of the parents?
    ....
8. In which language does the parent communicate more often with the child?
    ....
9. In which language does the child communicate more often in the home space?
    ....
10. What is the child's linguistic level in terms of languages known by the child? (parent's opinion)
    ....
11. In which language do people in the child's immediate environment communicate with the child?
    – Grandparents
    – Siblings
    – Cousins and extended family
    – Children attending school with the study participant
    – Other people who take an active part in the child's life

12. Does the child show a particular preference for using one of the languages?
    ....

13. Additional comments and information on the child's development:
    ....