

A slightly different version of this will appear in the BUCLD 38 Proceedings  
To be published in 2014 by Cascadilla Press

## **ASL Dominant Code-Blending in the Whispering of Bimodal Bilingual Children**

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Bimodal bilingualism is a form of bilingualism in which an individual has knowledge of multiple languages in different modalities, such as English (a spoken language) and ASL (American Sign Language, a sign language). In many ways bimodal bilingualism is similar to the more common “unimodal bilingualism” of multiple spoken languages: when a user has fluent command of two or more languages, sometimes the structures of one language may influence the other. For example, in the case of English/ASL bilingualism, sometimes spoken English words may follow (some parts of) the rules of grammatical structure in ASL, while conversely sometimes ASL signs (produced in the manual mode with the hands) may follow the grammatical structure of English (Emmorey et al. 2005, Emmorey et al. 2008, Lillo-Martin et al. 2012, Chen Pichler et al. in press, a.o.). As with unimodal bilinguals, instances of language influence are not necessarily an indication of pathology or incomplete language acquisition, but are a natural occurrence in fluent bilingual language production, especially in bilingual contexts that license both languages.

One important difference between unimodal and bimodal bilingualism, however, lies in the possible ways that multiple languages can be active at the same time. This is typically evident in unimodal bilinguals through codeswitching, which involves alternating between two languages, as in (1).

- (1) *Mi hermano* bought some ice cream. *Adult code switching, Spanish-English*  
my brother (MacSwan 2010)  
'My brother bought some ice-cream.'

Codeswitching is not uncommon in speech between two fluent bilingual adults who know the same languages. In *bimodal* bilingualism, however, code-switching is quite rare; instead, bimodal bilinguals more commonly make use of *code-blending* (Emmorey et al. 2005, Emmorey et al. 2008) in which it's

possible to have simultaneous production of both languages, as in (2).

(2) **Speech:** He's like hmm [all of a sudden]    *Adult code blending, ASL-English*  
**Sign:**                                      LOOK-AT-ME    (*Emmorey et al. 2005*)  
 'He's like, hmm, and then all of a sudden he looked at me.'

Code-blending is a natural outcome of bimodal bilingual production that uses both English and ASL lexical items and may follow parts of either grammar throughout an utterance. In some cases there will be predominantly signing with some speech, in other cases predominantly speech with some signs (as in (2)), and some cases may be more mixed. Moreover, in this paper we will also use “code blending” to refer to utterances which may be entirely in one modality, but exhibit grammatical influence from the language in the other modality<sup>1</sup>. In other words, the language of the surfacing lexical items may not necessarily be the language governing the syntax of the production, but when the production fits the grammar of another of the bilingual's languages, this suggests the presence of code blending. All of these options occur naturally in the productions of bimodal bilingual children who have a native command of both ASL and English. In this way, code blending is unlike intentionally created educational methods for “English on the hands” (“SimCom” or “Signing Exact English”) which are more unwieldy, tend to strictly follow English grammar, and are not naturally produced by children before instruction.

In this paper we present the first investigation of a type of code blending that we have found to be quite common among bimodal bilingual children<sup>2</sup>, yet is previously undescribed: bimodal bilingual *whispering*. By *whispering*, we mean the use of English lexical items produced with little or no vibrations of the vocal cords by bimodal bilingual children to accompany signing, not in a “quiet” or “secretive” context. We are crucially distinguishing *whispering*, in which the content is decipherable through the auditory modality, from *mouthing* -- a phenomenon in which English-like counterparts accompany corresponding ASL signs but where *no auditory production is present* (Valli et al. 2011). In all of our data, we require the presence of a comprehensible auditory signal to code for

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<sup>1</sup> This terminology has been used by Lillo-Martin et al. (2012) and Koulidobrova (2012) a.o., but differs from Emmorey et al. (2005), who reserve “code blending” for productions that involve both overt speech and sign.

<sup>2</sup> By “bimodal bilingual children” we are including both typically hearing children with deaf parents (CODAs) and deaf children of deaf parents who go on to receive cochlear implants (CIs).

whispering. Three examples of bimodal bilingual whispering follow in (3)-(5).

- (3) **Sign:** YELLOW RED  
**Whisp:** yellow red  
 [The blocks are ...] ‘Yellow, red’  
*[EVA, CODA, age 2;02, to Deaf father]*
- (4) **Sign:** GOLF gesture(ball going up) BALL gesture(ball going up in arc)  
**Whisp:** golf sound-effect ball sound-effect  
 ‘In golf the ball goes high up, the ball goes like this...’  
*[ELI, CI, age 3;00 to Deaf father]*
- (5) \_\_\_\_\_ negative head shake \_\_\_\_\_ nod  
**Sign:** WHY? WE WANT HAVE #DRUGS, DIE KNOW.  
**Whisp:** don’t want have drugs die know.  
 ‘Why? Because we don’t want to have drugs, because you can die, you know?’  
*[BEN, CODA, age 7;06, to Deaf experimenter]*

This whispering phenomenon raises a number of questions. First, why do bimodal bilingual children whisper when signing with deaf interlocutors, for whom the whispered speech will be inaccessible? Who benefits from whispering - the speaker or the addressee? What is the linguistic status of this whispering: is it more likely to take on the grammar of the spoken or the sign language, or both equally? Finally, how many children whisper, with whom, and does whispering change through development? In the end, we will argue that whispering happens in ASL-dominant contexts for the sake of the speaker, not the interlocutor, creating the opportunity for reducing the effort of suppressing one of the bilingual’s two languages, English, while following the grammar of ASL.

In Section 1 we discuss our data collection methods. In Section 2 we look at a range of data to determine which bimodal bilingual children are most prone to whispering. Section 3 discusses the interlocutors with whom bimodal bilingual children are most likely to whisper. Section 4 follows whispering through development. Section 5 discusses potential benefits to whispering versus full voicing in bimodal bilingual production, and Section 6 concludes.

## 1. Corpus data

We first noticed bimodal bilingual whispering in a large corpus created as part of the Development of Bimodal Bilingualism project (Quadros et al. 2012).

The corpus is comprised of longitudinal free play sessions of approximately one hour recorded in familiar environments such as the child's home or in a lab to which the child makes regular visits (e.g. at Gallaudet University). At the time of this writing, the corpus contains 242 transcribed sessions from 10 children with at least one Deaf, signing parent ranging over a variety of different ages (1;04-7;06), audiological statuses (both typically hearing children as well as children with cochlear implants), and types of interlocutors (deaf, hearing non-signers, and hearing bimodal bilinguals). The wide variety of types of bimodal bilingual children's language production available in the corpus made it ideal for a first investigation of whispering to determine when and why bimodal bilingual children whisper. As in any corpus study, we are limited by the existing data, and we perform most of our analyses on a focused subset of this data, but we are hopeful that the wide variation in session types increases the likelihood that our generalizations will hold beyond this corpus.

What kind of productions should one focus on to study whispering? Let us consider the possible ways in which a bimodal bilingual child can choose to communicate with their interlocutor (details about different interlocutors are discussed later). If we distinguish whispered speech from fully voiced speech, the bimodal bilingual has five possibilities for language mixing:

- Sign only (no speech)
- Fully-Voiced Speech only (no signs)
- Fully-Voiced Speech and Signs
- Whispered speech only (no signs)
- Whispered Speech and Signs

As other work in our lab has shown, most bimodal bilingual children are quite comfortable and proficient in using their sign language (Davidson et al. 2013, Kozak et al. 2013), and so the first possibility (sign only) is one they can easily take advantage of. However, the focus of the current paper is on whispered speech, so we exclude sign-only utterances from further analysis. Furthermore, we will not be focusing on signs even when they are mixed with the spoken language; we will merely be concerned with when the bimodal bilingual makes use of full voicing versus whispering in the speech mode. Therefore, we will categorize both Fully-Voiced Speech only (no signs) and Fully-Voiced Speech with Signs as "Fully Voiced Speech", and similarly we will categorize Whispered speech (no signs) and Whispered Speech with Signs as "Whispered Speech". Our reason for essentially ignoring the overt production of signs during speech

is motivated by previous findings on bimodal bilingualism: the languages of bimodal bilinguals influence each other even when there is no overt production of the other language. For example, bimodal bilinguals are more likely than monolingual English speakers to drop subjects in their English productions because the grammar of ASL permits null subjects, while English does not (Koulidobrova 2012). Therefore, since we expect that the grammar of ASL may be active during English production even when there are no overt signs present, we will focus on the distribution of “Whispered Speech” (again, with or without signs) compared to “Fully-Voiced Speech” (with or without signs) in the corpus of bimodal bilingual children’s language production.

## 2. Who whispers?

By searching the transcriptions of every utterance in 242 hours of language production, we were able to determine that of the 10 bimodal bilingual children in our corpus, 8 produced non-secretive, whispered speech while signing in ASL. These 8 whisperers include 4 children with cochlear implants and all children tested at Gallaudet University, both of which we have found anecdotally to correlate with more balanced bilingualism, i.e. strong use of ASL in addition to English. Only 2 children did not exhibit any whispering in the corpus, but both had small samples of data (one was only 2 hours, one was 4 hours), so even these may whisper but were never caught on camera doing so in our corpus.

No two bilingual children have exactly the same experiences with two languages, and choice of language production varies widely from one context to another depending on the child’s age, their interlocutors, the surrounding language environment, and many other factors.

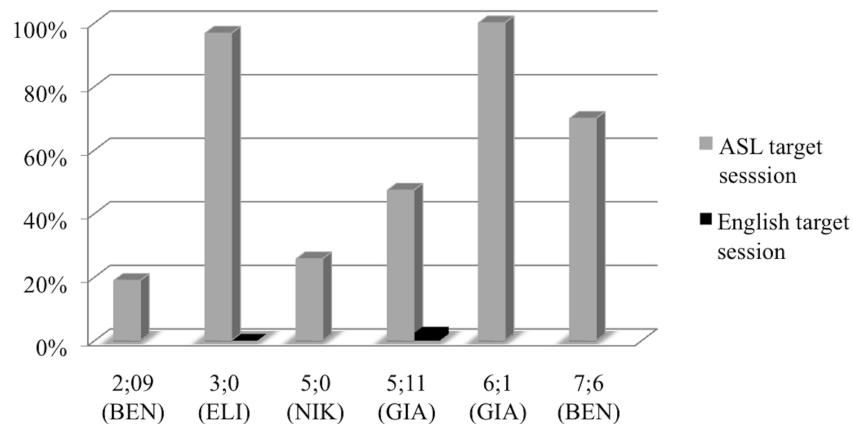
**Table 1.** Whispered versus voiced utterances per session. CHI=child, TL=target language, CODA=bimodal bilingual, CI=bimodal bilingual with cochlear implant.

CHI	AGE	TL	ENGLISH UTTERANCES			Interlocutors
			Whispered	Voiced	TOTAL	
BEN	2;09	ASL	64	274	338	DEAF, DEAF
ELI	3;0	ASL	118	4	122	DEAF, CODA
ELI	3;0	ENG	0	108	108	HEAR, HEAR
NIK	5;0	ASL	17	49	66	DEAF, CODA, CI
GIA	5;10	ENG	5	213	218	CODA
GIA	5;11	ASL	62	69	131	CODA, CODA
GIA	6;1	ASL	90	0	90	DEAF
BEN	7;6	ASL	100	43	143	DEAF, CODA
TOTAL			456	760	1,216	

To determine the distribution of whispering while varying some of these factors, we chose 8 videotaped sessions in the corpus from 4 children for further investigation at the level of individual utterances (Table 1). We deliberately chose the videos from among the most productive whisperers to maximize the amount of whispered utterances in the data and to analyze its structure in those who use it the most. Of these prodigious whisperers, 3 children had cochlear implants (“ELI”, “GIA”, “NIK”) and 1 child had typical hearing (“BEN”). Table 2 provides details of each session, including total whispered and voiced utterances.

One feature of the Development of Bimodal Bilingualism corpus is that each session has a target language: native speaking adult interlocutors interact with the child in English in a English language target session, while (usually deaf) native signing adult interlocutors interact with the child in ASL in an ASL session. Thus, we can compare the number of spoken language utterances that are whispered out of the total number of spoken utterances in ASL versus English sessions. Out of the 8 sessions chosen for detailed analysis, in 6 the bimodal children were interacting with signers targeting ASL, and in 2 with speakers targeting English.

Figure 1 shows the percentage of whispering chronologically across subjects. Although the amount of whispering varies across subjects and ages, it does not decrease with age. It overwhelmingly occurs in ASL target sessions: in the ASL sessions, the percentage of English utterances that were whispered ranged from 18-98%, while it was less than 5% in any English session (Figure 1). This is our first indication that whispering is a form of bimodal bilingual speech used primarily in ASL-dominant contexts.

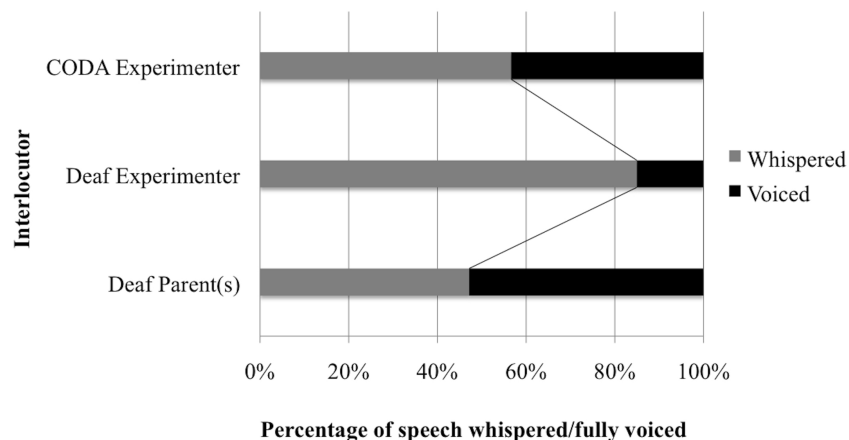


**Figure 1.** Percentage of total spoken utterances that are whispered

### 3. Who are the interlocutors of a whisperer?

We have seen that whispering occurs almost entirely in ASL target sessions, but the ASL target sessions sometimes focus on interactions between the child and a deaf parent, while in others they focus on interactions with deaf experimenters or bimodal bilingual experimenters who use only ASL during the session. To determine which interlocutors children were most likely to whisper with in their spoken language productions instead of using full voice, we coded each utterance in the ASL sessions for interlocutor: CODA experimenters, Deaf experimenters, or Deaf parents. Each utterance that included any speech was also coded for voicing (whispered or voiced). Fully-signed utterances were excluded.

Our results indicate that when interacting with bimodal bilingual experimenters in ASL-targeted sessions, the bimodal bilingual children used whispering for their English speech approximately 57% of the time versus 43% fully voiced (Figure 2). This is less whispering than with deaf experimenters, with whom the children whispered their English speech 85% of the time versus 15% fully voiced, consistent with our hypothesis that children use whispering in the most ASL-like situations. Interestingly, children were also less likely to use whispering with their deaf parents (47% versus 52% fully voiced) as a percentage of total spoken utterances. Our finding that Deaf experimenters were the interlocutors most likely to be whispered to further supports our hypothesis that whispering occurs in ASL dominant contexts, although it is an open question why deaf parents are less likely to be whispered to than deaf experimenters.



**Figure 2.** Whispered speech based on type of interlocutor

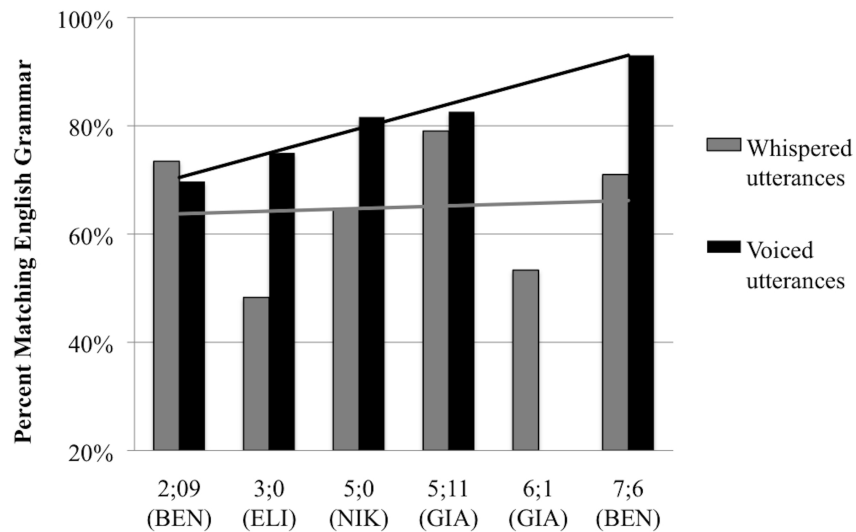
#### 4. Whispering through Development

Our study has focused on whispering in bimodal bilingual children, not adults. One question that this raises is how whispering changes over development: do bimodal bilingual children stop whispering as they grow older, or alter how or when they whisper? We saw in section 2 that the total percentage of whispered utterances does not decrease in our sample as children grow older, but the use of whispering might very well vary.

To determine how children use bimodal bilingual whispering as they grow older, we investigated the grammaticality of children's spoken utterances across time. Each spoken utterance (whether fully voiced or whispered, with signs or without) was coded for English grammaticality: a native English speaker judged each utterance for compatibility with adult-like English grammar. Both full utterances and partial utterances (e.g. answers to questions, partial utterances, etc.) were coded for English grammaticality.

Our results show that bimodal bilingual children increasingly distinguish whispering from full voicing as they grow older (Figure 3).





**Figure 3.** Whispering vs. fully voiced utterances through development

Through time, the English grammaticality in voiced utterances increases, as we would expect as children more fully acquire English grammar. However, this is not the case for whispered utterances, in which the English grammaticality remains constant (lower than full voicing). We take this to indicate that full voicing is used when more English-based syntax is present, while whispered is used more often with ASL-based syntax. This demonstrates an impressive sensitivity to the language environment (ASL or English) at every moment in the session. Crucially, these comparisons of grammaticality between whispers and full voicing is between utterances by the same children in the very same sessions, so differences cannot be attributed to developmental differences. Of course, it's true that the rate of match to English grammar is still generally high for whispering (never less than 50%), but we expect this is due to overlap in the grammars between ASL and English: both are SVO languages, and many utterances were quite short and would not differentiate between the languages.

### 5. Reasons for whispering

All of our results to this point lead us to the question: *why* do children whisper? The frequency of whispering with deaf interlocutors leads us to conclude that it is not produced for comprehension by the interlocutors, which suggests that the reasons are internal to the speaker. It is curious, then, that

bimodal bilingual children opt for whispering instead of either fully voicing or simply just signing.

One possible explanation for the presence of more than one language/modality in (bimodal) bilinguals is the Inhibitory Control or Language Suppression model in bilingualism (Paradis 2007, Kovács 2007). According to this model, bilinguals have a better control of task inhibition due to the fact that they are learning how to suppress one of their languages in various contexts throughout their entire life. Considerable experimental evidence suggests that bilinguals have both languages activated to some degree, even when one of them does not surface explicitly. In other words, language suppression is cognitively more costly than keeping both languages active (Emmorey et al. 2008). As a result, bilinguals in general keep both languages active at all times, accounting for the frequency of code switching in bilingual contexts. Bimodal bilinguals can uniquely reduce this cost by allowing both languages to surface simultaneously.

Since we have seen that whispering happens in predominantly ASL contexts with deaf signers and does not follow the grammaticality patterns of English like fully voiced utterances, it is likely that the underlying grammatical structure is from ASL. What is unique about whispering is that while the child is in an ASL context, communicating with deaf interlocutors, they also allow English lexical items to surface through the whispering to ease the pressure to fully suppress English. Of course, some degree of suppression does take place of the English grammar, if not the lexical items. In bimodal bilingualism, this type of partial suppression (of the grammar if not the lexical items) is available due to the different modalities, an option that is not available for unimodal bilinguals. In other words, suppression is not just restricted to overt phonological production (whether it is spoken or signed), but also grammatical structures.

In summary, our data show that there seems to be a degree of language influence that is tied to the usage of fully voiced speech versus whispering, that is, a connection to how present the syntax of the languages will be. When signing ASL, bimodal bilinguals can reduce pressure to suppress English by whispering.

## **6. Conclusions**

In this paper we have investigated a previously undescribed aspect of bimodal bilingual language production: whispered speech. Our work had a two-fold purpose: first, to offer a description of the phenomenon, including who

whispers and in what contexts, and second, to determine why whispering happens in a way that can inform more general theories of bilingual language development and language production.

What we found is that children who are growing up using both a spoken and sign language are extremely adept at navigating different language contexts, and get increasingly better as they grow older. Whispering is a strategy employed by a large majority (and possibly all) balanced bimodal bilingual children to use in sign-language dominant contexts, frequently with deaf interlocutors. In such contexts, whispering is quite evidently not for the sake of the interlocutor, but rather for the speaker: it permits the bimodal bilingual's spoken language to manifest while remaining at an appropriate volume level for sign language conversation ("voice off") and expending less physical effort than is required for fully voiced utterances, and at the same time reducing pressure for the bimodal bilingual to suppress their spoken language. We have only used a rudimentary analysis of the English utterances, comparing the grammaticality (from an adult perspective) of both fully voiced and whispering utterances, but even at this level of analysis we found that fully voiced utterances increased in grammaticality throughout development while whispered utterances do not. Instead, whispered utterances exhibit a near constant rate of grammaticality throughout development, a rate which we expect reflects the overlap between the grammar of ASL and English. This would be the case if whispering is a spoken-language manifestation of an underlying grammar that is based more on ASL than on English.

A number of continuations of our work would help elucidate the situation further. First, we hope to analyze the signs that accompanied whispering for grammaticality in ASL: this would confirm that the constant rate of ungrammaticality of whispered utterances is due to matching the grammar of ASL, and not another factor. This was beyond what we were able to do with our current data set for various reasons, including the difficulty in determining utterance boundaries in a corpus of ASL, but we hope to do so in the future. In addition, our sample of free play from different children at different ages was chosen to provide a variety of language situations, but we would like to attempt a more extensive and systematic choice of corpus free play sessions to verify that the same results hold.

We leave with a comment about the ease with which bimodal bilingual children are able to navigate multiple language contexts. As spoken language bimodal bilingual developmental researchers are well-aware, children very quickly pick up on what language should be used in what situation. In addition to this

metalinguistic knowledge about language use present for any bilingual, bimodal bilingual children have an additional speech context which they encounter on a regular basis: interpreting for deaf parents in a hearing-dominant context. Some have suggested to us that bimodal bilingual children learn to whisper by necessity through the many mixed-language use contexts they may find themselves in throughout childhood. We expect that whispering indeed can be useful for some children who are signing for their parents and making the sign language content more available to non-signing interlocutors at the same time, but we think that this is an effect, not a cause, of the phenomenon for two reasons. First, children at ages as young as 2 years (see EVA, example (3) above) whisper with deaf signing interlocutors before they likely have encountered contexts in which they are expected to interpret. Second, our results showed that bimodal bilingual children whisper *more* frequently with deaf experimenters than with bimodal bilingual interlocutors, with whom they are more likely to produce an English-based fully-voiced set of blends (as in (2) above). In addition, some adult bimodal bilinguals have shared with us their anecdotal impression that only very strong balanced bilinguals (i.e. strong in ASL in addition to English) whisper while signing as adults (versus full voicing). We speculate that a reduction in whispering by most bimodal bilingual adults is a result of English becoming an increasingly dominant language for them, versus young children who still live in their Deaf parents' house and interact more with Deaf family than with hearing peers. Of course, a more extensive empirical study should be done before we can make any claims about whispering in adult bimodal bilinguals.

To conclude, we have seen that bimodal bilingual children are expert users of both languages and experts in navigating a variety of language contexts. Bimodal bilingual whispering provides a unique device in which they can produce language in both modalities, generally following the grammar of the sign language, while expending minimal effort and not violating any social conventions against full voicing language in deaf, signing contexts.

### **Acknowledgements**

We extend warm thanks to the bimodal bilingual children and their families who participated in the corpus project, to the research assistants and collaborators from the Lillo-Martin lab at UConn and the Chen Pichler lab at Gallaudet who helped make this data possible, and to Helen Koulidobrova and Diane Lillo-Martin for helpful comments. We also gratefully acknowledge financial support from the Gallaudet Research Institute and the National Institutes of

Health (National Institute on Deafness and Other Communication Disorders), award number R01DC009263 to Diane Lillo-Martin, Deborah Chen Pichler, and Ronice Müller de Quadros. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIDCD or the NIH.

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