

***Spatial deixis in speech and gesture in Brazilian Portuguese:
an experimental pilot-study***

***Dêixis especial na fala e nos gestos no Português Brasileiro:
um estudo-piloto experimental***

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Abstract: Departing from the embodiment assumption that our conceptualizations are grounded in the physical world, gestures should also refer to those conceptualizations (BARSALOU, 1999; CIENKI, 1998A, 1998B, 2008, 2013; GLENBERG & ROBERTSON, 2000; HOSTETTER & ALIBALI, 2008). In this study, we investigate how our conceptualizations of the physical and of the abstract are expressed in speech and gesture, using the four-way spatial distinction found in Brazilian Portuguese between 'aqui' (near to speaker), 'ai' (near to addressee), 'ali' (near to both speaker and addressee), and 'lá' (distant to both). We tested two opposing hypotheses: 1) that gestures used with concrete and abstract deixis may be similar to each other, based on claims from embodiment theory, and 2) that gesture use may differ in concrete and abstract deixis, based on claims from neuroscience and based on patterns of usage of these deictic words found in a corpus of spoken Brazilian Portuguese. Twenty-four participants were asked to act out small scripts with eight contexts, each containing one occurrence of both concrete and abstract uses of 'aqui', 'ai', 'ali', and 'lá'. The results show the semantic opposition between 'aqui' and 'lá' is also present in co-verbal gesture. But there was not a clear difference in gesture use with 'ai' as compared with the other key words, as one might have anticipated from the use of the word in the C-ORAL Brasil corpus. Gestures with concrete use of the key words are similar in some ways to gestures with abstract use, but there are also many differences. In conclusion, imagery seems to be activated with abstract reference using these spatial adverbial pronouns, but the factors motivating the particularities of the differences remain to be explored in future work.

Keywords: Spatial deixis; Experimental Cognitive Linguistics; Gesture Studies.

Resumo: Partindo da afirmação corporificada de que nossas conceptualizações estão ancoradas no mundo físico, os gestos também deveriam se referir a essas conceptualizações BARSALOU, 1999; CIENKI, 1998A, 1998B, 2008, 2013; GLENBERG & ROBERTSON, 2000; HOSTETTER & ALIBALI, 2008). Neste estudo, investigamos como nossas conceptualizações do físico e do abstrato são expressas na fala e nos gestos, utilizando a distinção quaternária, encontrada no Português Brasileiro, entre "aqui" (próximo ao falante), "ai" (próximo ao interlocutor), "ali" (próximo tanto do falante quanto do interlocutor) e "lá" (distante de ambos). Testamos duas hipóteses opostas: 1) a de que os gestos utilizados na dêixis concreta e abstrata seriam similares, com base nas afirmações da teoria corporificada; e 2) a de que o uso dos gestos seria diferente, com base nas afirmações feitas pelas neurociências e ancoradas em padrões de uso dos dêiticos supracitados, coletados de um corpus de fala do Português Brasileiro. Vinte e quatro participantes foram solicitados a encenar pequenos scripts, contendo oito contextos, cada qual com uma ocorrência de uso concreto e uma abstrata dos dêiticos "aqui", "ai", "ali" e "lá". Os resultados demonstraram que a oposição semântica entre "aqui" e "lá" também está presente nos gestos que co-ocorrem com a fala. Entretanto, não há uma diferença clara no uso dos gestos com o "ai", quando comparado às outras palavras-chave, tal como poderia ser antecipado a partir do uso desse dêitico no corpus C-ORAL Brasil. Gestos que co-ocorrem com o uso concreto das palavras-chave são similares, em alguns aspectos, àqueles que co-ocorrem com o uso abstrato, mas há também muitas diferenças. Em conclusão, a imagem parece ser ativada em usos referenciais abstratos, na utilização dos pronomes adverbiais espaciais, mas os fatores que motivam as particularidades das diferenças encontradas necessitam ser exploradas em trabalhos futuros.

Palavras-chave: Dêixis espacial; Linguística Cognitiva Experimental; Estudos de Gesto.

1 Introduction

Embodied cognition takes place in the context of a real-world environment, and it inherently involves perception and action. Conceptualization may depend on the perceptual, motor and even affective content of our experiences (BERGEN et al., 2007), including processes by which our language understanding allows us to conceptually represent abstract concepts.

Several researchers have argued that all concepts are grounded in embodied experiences (BARSALOU, 1999; BARSALOU et al., 2003; BARSALOU & WIEMER-HASTINGS, 2005; LAKOFF, 1987). They argue that concrete concepts (e.g., grasp a cup) are understood by means of mental simulation of our perceptual experiences. When we hold a cup in our hands, we come to understand what it means to grasp an object, to hold onto it so that it does not fall to the floor and break. Abstract concepts (e.g., grasp an idea) may be grounded in those concrete/physical experiences that we extend metaphorically from one situation to another (LAKOFF & JOHNSON, 1999; JOHNSON, 1987). Metaphor allows us to describe abstract concepts in terms of concrete ones through concrete, though metaphorical, simulation (BOULENGER, HAUKE, & PULVERMÜLLER, 2009; GLENBERG & KASCHAK, 2002; MATLOCK, 2004b; SAYGIN et al., 2010; WILSON & GIBBS, 2007). By mapping an action that allows us to physically prevent a cup from dropping, or being lost, onto a mental simulation of holding onto an idea so that it is not lost, the metaphor allows us to extend our conceptualization of things that we retain. This is called the *metaphorical simulation hypothesis*.

It may otherwise be that abstract concepts might be processed through concrete simulation (AZIZ-ZADEH & DAMASIO, 2008; BERGEN et al., 2007; BERGEN, 2012; RICHARDSON et al., 2003; WALLENTIN et al., 2005), but there has been mixed empirical evidence of that hypothesis. However, some empirical evidence has not converged on one single prediction and much more work is required to understand the mechanism of our natural ability to comprehend and produce abstract ideas. The idea of

words mapping across domains may be well accepted, but what is more novel is the proposal that gestures can go beyond directly identifying an entity through pointing. Eye-tracking evidence from narrative comprehension studies has indicated that listeners gaze at locations in space where objects and events appear, both during comprehension (SPIVEY & GENG, 2001) and recall (JOHANSSON, HOLSANOVA, & HOLMQVIST, 2005). Earlier work on mental models has also shown that listeners mentally represent objects described in spatial locations (BOWER & MORROW, 1990). Taken together, these findings suggest that the visual system plays an integral role in natural language understanding and the conceptualizations we share through language. The extent to which spatial imagery contributes to our conceptualizations provides further evidence that our embodied human experience shapes language processing. Similarities between our bodies and experiences yield shared imagery in a sort of common currency that facilitates effective communication (BERGEN et al., 2007).

If our conceptualizations are grounded in the physical world, including our visual interactions with time and space, gestures may also map onto or refer to those conceptualizations (BARSALOU, 1999; CIENKI, 1998a, 1998b, 2008, 2013; GLENBERG & ROBERTSON, 2000; HOSTETTER & ALIBALI, 2008). Metaphorical communication may consist in the words we use or in the gestures we bring to bear, or in a combination of both. We can verbally reference a source domain without accompanying gesture, as in the example of calling on a color, such as *blue*, to indicate sadness: *to be feeling blue*; we can also communicate metaphorically through gesture alone, as when English speakers gesture along a path from left to right to indicate a process being described (CIENKI, 2013). Some cognitive linguists hold the view that these supplemental behaviors co-occur with language such that they gain the status of symbolic units in their own rights. Kendon (1980, 2004), McNeill (1992, 2005), and Sweetser (2007) have each proposed the idea of speech and gesture as interrelated in the production of utterances, and that

those co-related behaviors should be studied in tandem. The study of gesture and cues of speakers' spatial awareness can also provide additional insights into the processes of what Slobin (1987, 1996) calls thinking-for-speaking. Further, because the metaphorical simulation hypothesis extends our concrete conceptualizations into the abstract, based on our embodied cognition, it is likely that gestures may extend to abstract reference, as well (CIENKI, 2013).

One way to investigate our cognitive relationship with the physical world of time and space is through deixis, which introduces context-dependent properties onto natural language. Deixis refers to words and phrases that need additional contextual information to be fully understood. Words are deictic if their semantic meanings are fixed, but their denotations depend on relationships within the context. Spatial deictic terms, in particular, are a fundamental way in which we indicate our relationships with the physical world and may provide insight into how we interact conceptually with each other and the world. Gesture, especially manual gesture, because it is a physical, spatial medium, can directly and iconically reflect spatial conceptualization and imagery. Conceptualization of spatial deixis is understood as a continuum ranging from the more concrete (or proximal) to more abstract (less physically bounded). We also know that speakers use pointing to refer to parts of their narrative, which is a type of abstract deixis (MCNEILL et al., 1993).

In contrast with languages that contain spatial adverbial pronouns featuring a two-way distinction (here/there), such as English, Brazilian Portuguese offers a four-way distinction:

- Aqui — near to speaker
- Aí — near to addressee
- Ali — near both speaker and addressee
- Lá — distant to both

These four-way distinctions seem quite specific for the face-to-face interaction of speaker-addressee, but are they also used for abstraction? If so, are they used equally in abstract and concrete usage? If these quite personal distinctions are used to reference both

concrete and abstract conceptualizations, what does that indicate about the deictic spatializations of abstract concepts? That is, do we think about abstract concepts with that sort of fine-grained specificity?

Given that we know all this about gesture and spatial deixis, do Brazilian Portuguese speakers combine speech and gesture to express these distinctions (aqui, aí, ali, lá)? Do they also use the four-way distinction in their talk about abstract spatial reference through gesture?

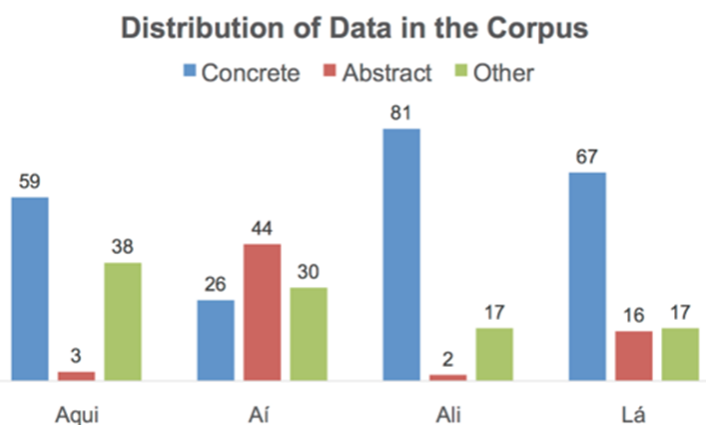
We developed two opposing hypotheses to test these general questions:

1. Gestures used with concrete and abstract deixis may be similar in each instance, based on embodiment theory, or
2. Gestures may be different with concrete and abstract deixis, based on claims derived from existing fMRI and other neural studies, and based on patterns of usage of these deictic words found in a corpus of spoken Brazilian Portuguese.

In order to test these hypotheses, we devised a study as part of a workshop on Empirical Methods in Cognitive Linguistics (see Acknowledgements). The study required participants to “act out” sentences in each context of the four-way spatial deixis found in Brazilian Portuguese. Our approach was to give subjects the opportunity to naturally demonstrate the extent to which they used gesture to accompany and support both concrete and abstract conceptualizations through language, based on the four-way distinction. For these experiments we divided that conceptualization into concrete (reference to physical space) and abstract (reference to space to stand for abstract ideas). The study comprised one very brief (one to four sentences) script to support each of the four different contexts; each context script featured the pronoun applied in both concrete and abstract conceptualizations. In order to construct sentences that would enable subjects to interact as authentically as possible with the scripts, we first conducted a corpus study to determine most frequent usages of the spatial pronouns within the language. Both the corpus and experimental studies are described below.

2 Corpus Procedure

The corpus study was conducted in two phases. Initially, two members of the team combed the C-ORAL Brasil database for instances of each of the four contexts of the spatial pronoun. C-ORAL Brasil contains 208,130 words, and is based on informal spontaneous speech utterances occurring in Brazilian Portuguese. The database includes usages in public and private contexts built from 139 texts, as well as monologues, dialogues and conversations transcribed from audio files. The team conducted the corpus research goal by identifying 100 occurrences of each term for a total of 400 occurrences. Each of the two judges analyzed all occurrences for Concrete, Abstract, Idiom/in between usages: Judge 1 focused on occurrences of *Aí* and *Lá*, and Judge 2 reviewed those of *Aqui* and *Ali*. After the initial review of all occurrences, each judge examined 25% of the occurrences first analyzed by the other judge to confirm inter-rater agreement of the corpus study. Strength of agreement was established based on a Cohen's kappa coefficient to allow for usages occurring by chance [*Aqui*=0.55; *Aí*=0.68; *Ali*=0.76; *Lá*=0.76]. The judges resolved cases of disagreement through discussion. The final result can be visualized below:



From a descriptive point of view, the greater usage of *Aqui*, *Ali* and *Lá* for concrete versus abstract reference, and the opposite pattern for *Aí*, provided bases for comparison with the gesture production in the experiment described below. Namely, more frequent, or otherwise different, use of gestures with

abstract reference with *Aí*, versus with the other three words, would support hypothesis 2 above. In statistical terms, a one-way ANOVA was performed as well as a Tukey's test. The comparison of the means among concrete, abstract and other occurrences of "*aqui*", "*aí*", "*ali*" and "*lá*" showed the following results:

	Aqui	Aí	Ali	Lá	Total	P-value
Concrete	59a	26b	81c	67d	233	< 0.01
Abstract	3a	44b	2a	18d	65	< 0.01
Other	38a	30b	17c	17c	102	< 0.01
Total	100	100	100	100	400	-
Total in the corpus	1509	1609	298	1755	5171	-

Different letters mean statistically different means
Same letters mean statistically equal means

As it can be observed in the table, "*ali*" is used significantly more frequently (N=81) for concrete reference than the other deictics, followed by "*lá*" and "*aqui*", which are also statistically different. Regarding abstract occurrences, "*ali*" is significantly more frequent than the other deictics. The second most frequent occurrence is with "*lá*". The use of "*aqui*" and "*ali*" does not show statistically significant differences. Considering occurrences categorized as "other", "*aqui*" is the deictic that is used more frequently, followed by "*aí*". There are no statistically significant results between "*ali*" and "*lá*".

3 Experimental Method

The experiment was conceived as an act-out task in which each subject was asked to participate in a role-play scenario where experimenters pretended to conduct a screen test with them as part of an audition to be included in an *Empirical Methods in Cognitive Linguistics* (EMCL) film production. The experimental lab was positioned as a film studio and the stimuli were presented to subjects as theatrical scripts.

3.1. Participants

The study consisted of 24 participants, video recorded in two separate classrooms of Federal University of João Pessoa (UFPB), in Brazil. Videos performed without manual gestures were excluded from the sample. When participants performed the script more than once, only the first production, and consequently more spontaneous production was considered.

3.2. Stimuli and design

The act-out task implemented a 4x2 factorial design with the dependent variable being the Gestures produced by subjects and two independent variables (Type of Pronoun; Contexts of Occurrence) in eight (8) experimental conditions. The stimuli used were a series of very brief narratives into which the independent variables were embedded. The texts were devised using examples from actual usage found in the C-ORAL Brasil database. Each set of four scripts featured at least one usage of each four-way spatial pronoun, as well as one concrete and one abstract referent.

3.3. Procedure

Each participant completed a Consent Form before entering the lab, which was described in all verbal and written descriptions as a *studio*. Once each subject entered the *studio*, the *director* explained that s/he was there to *audition* for a part in an EMCL film production and that they would be participating in a *screen test*. The *director's assistant* held a laptop bearing the actor number up to the video camera for three (3) seconds while the *actor* positioned him/herself at a taped line on the floor in front of them and facing a projector screen. Once the *actor* was in place, the *director's assistant* projected the first *script* onto the projector screen and the *director* explained the context of the first *script*. (The first *script* was a practice round and was not coded. The purpose of the

practice round was to allow the *actor* to become more comfortable with working with a script prior to the collection of data.) The *director* explained that the *actor* should read each one- or two-line *script* several times so that his/her *performance* would be more natural, then indicate to the *director* when he/she was ready to be videotaped while *acting out* the *script*. The *director* indicated that each line should be *performed* as naturally as possible. This sequence was repeated until the *actor performed* the practice script and all four experimental scripts. Subjects signaled the *director* when they were ready to begin and the camera was turned on at that point to record the *screen test*. When the participant completed the *screen test*, the experimenter turned off the video camera and thanked him/her for taking part in the session.

3.4. Narrative Stimuli: Scripts

(1) Contexto: O noivo de Aline pensando sobre a festa de casamento.

Nossa, eu queria que tivéssemos uma festa enorme. Ih... Não sei não. Do jeito que a Aline é, vai querer só ir **lá** [concrete] na igreja, casar e pronto. Aquela **lá** [abstract] é assim mesmo...

Context: Aline's fiancé thinking about the wedding party.

Gosh, I wanted us to have a huge party. Well, I really don't know. The way Aline is, she'll just want to go to church, get married, and that's it. She's just like that.

(2) Contexto: Duas amigas fofocando em um bar. Uma delas diz:

Ei tas sabendo de Sally? Mas não fala alto que ela tá logo **ali** [concrete]. Ela disse que recebeu uma herança e que agora vai parar de trabalhar... Pffff! Tudo aquilo **ali** [abstract] que ela falou é mentira.

(2) Context: Two girlfriends gossiping in a bar. One of them says:

Do you know Sally's news? But talk softly, because she is right there. She said she got an inheritance and is now going to stop working. Pshaw! All that stuff she said were lies.

(3) Contexto: Um jogador da reserva vai entrar no jogo. Seu técnico diz:

Neymar, você vai entrar no jogo, **aí** [abstract] é só chutar pro gol. E não faz vergonha não, que sua esposa tá **aí** [concrete]!

(3) Context: A substitute soccer player will enter the field. His coach says:

Neymar, you're going into play, and all you have to do is shoot for the goal. And don't screw up, because your wife is right there.

(4) Contexto: Uma garota falando sobre a festa que vai. **Aqui** [abstract] . . . estou animada pra essa festa . . . mas não sei que roupa usar. . . Hmm . . . talvez essa **aqui** [concrete].

(4) Context: A girl talking about the party she'll be going to later

I am really looking forward to that party, but I don't know what outfit to wear. Hmm, maybe this one here.

4 Results and discussion

Regarding the four keywords, from 24 recordings, key words were more frequently produced (163/192) than omitted (29/192). Furthermore, of the total number of keywords produced, concrete keywords (N=88) did not constitute a more significant amount than did abstract keywords (N=75), $X^2(1, N=163)=1.04$, $p=0.3$. Abstract "ali" was the most omitted key word (9/24). Specifically considering key word replacement, concrete "aqui" was said differently in 5 occurrences. Four were a contraction between preposition de + keyword ("daqui"), and one was replaced by "aí". Concrete "aí" was said differently in 4 occurrences: all of them were replaced by "alí". Abstract "aí" was replaced by "depois" (after that) just once, i.e. it was replaced by a word equivalent in temporal meaning, and Abstract "ali" was replaced by "lá" just once.

Concerning gesture production, since two participants did not produce any type of gesture during the production of the 8 key words, we analyzed the remaining 22 videos. Co-verbal gesture (N=57)

was not produced significantly more frequently than it was omitted (N=47), $X^2(1, N=104)=0.96$, $p=0.3$. Except for abstract "lá" (15 occurrences with gesture out of 22), gesture with concrete keywords was more frequent, whereas gesture was most frequently omitted with concrete "ali" (11/23). It is interesting to note that these results do not lean in favor of either hypothesis 1 or 2, but suggest other factors are playing a role in relation to gesture use with these keywords.

Considering the hand that goes along with the co-verbal gesture, the right hand was used more with concrete key words (22/57) than either the left hand or both hands were. Furthermore, both hands were used more with abstract keywords (22/47) than either single hand was. These results support hypothesis 2. However, both hands were also used more with both concrete (9/15) and abstract (10/13) uses of the key word "aqui". For this word, the results lean in favor of hypothesis 1. We can also note that the left hand was more used with concrete "aí" (8/18) than either the right hand or both hands were, and the right hand was more used with abstract "lá" (9/15) than the left hand or both hands were. These results suggest other factors were in play than those proposed in the hypotheses.

The type of stroke was another variable analyzed in the dataset. A simple stroke was more frequent (83/104) than a complex stroke (21/104). Except for abstract "ali", a simple stroke was more frequent than a complex stroke with all keywords. For "ali", occurrences of simple and complex stroke were equal (4/8). Simple stroke was also more frequent with concrete keywords (48/83) than with abstract keywords (35/83), although the difference was not shown to be significant ($X^2=2.04$, $p=0.15$). Complex stroke was more frequent with abstract keywords (12/21) than with concrete keyword (9/12); although the difference was also not found to be significant. From a descriptive point of view, abstract keywords correspond to 57.1% of occurrences, while concrete keywords correspond to 75%. In other words, complex strokes tend to occur 18% more in concrete occurrences than with abstract ones. These results

could be seen as supporting hypothesis 1. Regarding the use of hands, right hand was more frequent in simple stroke (32/83). In contrast, both hands were more frequent in complex strokes (13/21). There were no occurrences of left hand in complex stroke concerning abstract keywords.

Specifically, regarding complex stroke production, the use of different strokes was more frequent (11/21) than stroke repetition (10/21), although statistically speaking, the results are at chance level. Stroke repetition was more frequent with concrete keywords (6/9) than with abstract keywords (3/9), although the numbers here are too small to test for significance. Different strokes were more frequent with abstract keywords (8/12) than with concrete words (4/12), and also with abstract “aí”. On the other hand, stroke repetition was more frequent with concrete “aí”. These results do not seem to support either hypothesis.

Taking into account the eight modes of representation used in the gestures (pointing, punching, throwing, setting boundaries, sliding, drawing, holding and moulding), pointing was the most frequent category (58/104), followed by throwing (19/104). With concrete keywords, pointing (41/57) and throwing (7/57) are most often used. With abstract keywords, pointing (17/47) and throwing (12/47) are again the most frequent. These results are more in line with hypothesis 1. Interestingly, only abstract key words presented all eight categories of representation in gestures.

Except for keyword “lá”, pointing was the most frequent with concrete key words “aqui” (11/57), “aí” (15/57) and “ali” (11/57). With concrete “aí”, pointing is the most used mode of representation (15/18). On the other hand, with concrete “lá”, throwing is more frequent (6/12) than pointing (4/12). With abstract “aqui”, pointing is the most frequently used mode of representation (7/13), and with abstract “lá”, throwing is the most frequent one (9/15). These differences can be seen as support for hypothesis 2. Nonetheless, with abstract “aí” and “ali” none of the categories seems to be more significant than the others.

In sum, it appears that there is a relation between co-verbal gesture and key word production, but that it is a complex one. It seems that the opposition between “aqui” and “lá” is also present in co-verbal gesture. But there was not a clear difference in gesture use with “aí” as compared with the other key words, as one might have anticipated from the use of the word in the C-ORAL Brasil corpus and based on hypothesis 2. Gestures with concrete use of the key words are similar in some ways to gestures with abstract use, but there are also many differences. In conclusion, imagery seems to be activated with abstract reference using spatial adverbial pronouns (HOSTETTER & ALIBALI, 2008), but the factors motivating the particularities of the differences reported above remain to be explored in future work.

Acknowledgements:

We would like to thank our colleagues at the seventh workshop on Empirical Methods in Cognitive Linguistics, where the project originated. EMCL7 was held at the Federal University of Paraíba (UFPB), João Pessoa, Paraíba, Brazil, in 2015 and was organized by Monica Gonzalez-Marquez and Jan Edson Leite. The present research project was developed by Paulo Ávila, Fábio Barbosa, Sally O. Donlon, Aline Dornelas, Máira Avelar, Andressa Toscano, and Cacilda Vilela in the group led by Alan Cienki and José Ferrari-Neto. We also express our gratitude to the participants of all the video-recorded interaction sessions for their kind cooperation in this research.

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COMO CITAR ESSE ARTIGO

CIENKI, Alan et al. Spatial deixis in Brazilian Portuguese: an experimental pilot-study. *Signo*, Santa Cruz do Sul, v. 44, n. 79, p. 135-142, jan. 2019. ISSN 1982-2014. Disponível em: <<https://online.unisc.br/seer/index.php/signo/article/view/12829>>. Acesso em: _____. doi: <https://doi.org/10.17058/signo.v44i79.12829>.