Language Sciences 33 (2011) 961–980

Contents lists available at ScienceDirect

Language Sciences

journal homepage: www.elsevier.com/locate/langsci

The Spanish loanword *lado* in Otomi spatial descriptions

Néstor Hernández-Green [a,*], Enrique L. Palancar [b], Selene Hernández-Gómez [c,d]

[a] Centro de Investigaciones y Estudios Superiores en Antropología Social, Juárez 222, Tlalpan Centro, Delegación Tlalpan, Mexico
[b] Surrey Morphology Group, University of Surrey, Faculty of Arts and Human Sciences, AC Building, Guildford, Surrey GU2 7XH, United Kingdom
[c] Universidad Nacional Autónoma de México, Circuito Interior Ciudad Universitaria S/N, CP 04510, Mexico
[d] Universidad Autónoma de Querétaro, Cerro de las Campanas S/N, CP 76010, Col. Las Campanas, Santiago de Querétaro, Querétaro, Mexico

ARTICLE INFO

Article history:
Available online 12 August 2011

Keywords:
Otomi
Oto-Manguean
Frames of reference
Semantic typology
Spatial descriptions

ABSTRACT

The word *lado* 'side' in San Ildefonso Tultepec Otomi (SIT Otomi) is a Spanish loanword and is used in descriptions of location and orientation involving five different types of spatial frames of reference (FoRs) according to data collected with a referential communication task in San Ildefonso Tultepec, Querétaro, Mexico. The task consists of matching pictures featuring both a ball – in different locations – and a chair – with different orientations – through linguistic descriptions of such images (Bohnemeyer, 2008). *Lado* occurs in different constructions involving different FoRs and it constitutes a frequent strategy when the relative FoR is used in SIT Otomi.

1. Introduction

San Ildefonso Tultepec (SIT)[1] Otomi is an indigenous language spoken in the village of San Ildefonso Tultepec in Central Mexico in the state of Querétaro. Together with other Otomi languages, SIT Otomi belongs to the Oto-Pamean family, the northernmost branch of the Oto-Manguean stock of Mesoamerican languages. See Map 1 below.

This article explains how in SIT Otomi the use of the relative *frame of reference* (FoR), a frame which is apparently not favored in the Mesoamerican linguistic area (de Léon and Levinson, 1992; Bohnemeyer, 2008), occurs almost only in conjunction with the loanword *lado* 'side' (< Sp. *lado*). An FoR is a coordinate system that is used in the interpretation of spatial relations between objects (O'Meara and Pérez Báez, 2011); in the relative FoR, the coordinate system depends on the orientation of the observer's body. The goal of this paper is twofold: first, we describe constructions containing *lado* in the five FoRs available in SIT Otomi; second, we point out the relation between the use of *lado* and the existence of the relative FoR in SIT Otomi. Of the five FoRs available in SIT Otomi, the relative FoR is the only one that depends entirely on the use of the word *lado*. To show this, we compare the distribution of relative descriptions with *lado* to descriptions that contain *lado* but involve other FoRs.[2]

Abbreviations: A, adjusted stem; ACT, actualizer; ADV, adverb; ALLO, allocentric; B, bound form; CD, cardinal point; DEIC, deictic; DEL, delimitative; DEF, definite; DIM, diminutive; DIST, distal; DU, dual; EGO, egocentric; EMPH, emphatic; EXTR, extrinsic; FoR, frame of reference; GR, ground; IRR, irrealis; LM, landmark; M, middle voice; MOD, modifier; NP, noun phrase; NPS, non-present stem; P, particle; P.LOC, locative preposition; PL, plural; POSS, possessive; PREP, preposition; PRS, present; REL CL, relative clause; REL, relative clause marker; SG, singular; SIT, San Ildefonso Tultepec; Sp., Spanish; SUBJV, subjunctive; TOP, topological marker; wrt, with respect to.

* Corresponding author. Tel.: +52 442 2173576; fax: +52 722 5321219.
E-mail address: nestorhgreen@gmail.com (N. Hernández-Green).

[1] Deviations from IPA in the transcription of SIT Otomi: < ' > /ʔ/, <f> /pʰ/, <j> /kʰ/, < ñ > /ɲ/, <r> /ɾ/, < r̃ > /ɽ/, < tx > /tʃ/, < x > /ʃ/, <y> /j/, < a̲ > /ɔ/, <e̲> /ɛ/, < o̲ > /ɘ/, < u̲ > /ɨ/, < ä > /ã/.

[2] The linguistic data in this paper were obtained during fieldwork funded by the project *Spatial language and cognition in Mesoamerica* (NSF Award No. BCS-0723694, Jürgen Bohnemeyer, Principal Investigator).

0388-0001/$ - see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.langsci.2011.06.014

Map 1. San Ildefonso Tultepec, Mexico (Adapted from: http://wr.wyndhamrewards.com).

Section 2 contains an overview of FoR theory. A general analysis of FoRs as attested in descriptions collected with the Ball and Chair (B&C) task (Bohnemeyer, 2008) is provided in Section 3. Section 4 presents the types of constructions containing *lado* 'side' in the following order: (a) constructions that occur with absolute and landmark-based FoRs; (b) constructions that occur with the object-centered FoR; (c) constructions that occur with relative and direct FoRs; and (d) constructions that contain topological relations (as opposed to projective relations). The latter are not a type of FoR as they do not involve projection, but the fact that a number of descriptions with *lado* have a topological reading is of interest to the analysis as they often contain "meronyms" – terms that refer to parts of objects, such as *tip*, *edge*, *belly*, etc. –, which are thought to be related to the dispreference of the relative FoR (Bohnemeyer, 2008; O'Meara and Pérez Báez, 2011). In Section 5 the role that *lado* plays in FoRs is described after reviewing the constructions in which it occurs. In Section 6, typological implications of the role of *lado* as a marker of the relative FoR in SIT Otomi are explored.

1.1. Typological description and spatial language in SIT Otomi

SIT Otomi is a tonal, head-marking language, in which subject and object arguments are cross-referenced on the verb. Verbs are inflected for tense/aspect/mood and person of the subject by a set of *portmanteau* clitics that precede the verbal stem. The basic word order for transitive sentences is SVO, while intransitives often take the order VS (Palancar, 2009). The non-existence of verb-final order is a trait shared by all Mesoamerican languages (Campbell et al., 1986).

Spatial descriptions in SIT Otomi have the basic structure [VERB] + [FIGURE] + [RELATOR] + [GROUND], as is illustrated in example (1):

(1)	a.	[Ø='*o*]$_{\text{VERB}}$ [=*r*	*pelo^{h}ta*]$_{\text{FIGURE}}$	[*ka*]$_{\text{RELATOR}}$	[*hg̲i*]$_{\text{GROUND}}$
		3.PRS=be.located.SG=SG	ball	P.LOC	ground
		'The ball is on the ground.' (2/1.12-119)[a]			
	b.	[ø=*ñ-hand-a*]$_{\text{VERB/FIGURE}}$[=*ha*]$_{\text{RELATOR}}$[=*r*	*goxthi*]$_{\text{GROUND}}$		
		3.PRS=M-see-B=P.LOC=SG	door		
		'It [the chair] is facing[b] the door.' (4/1.8-157)			

[a] The numbers after the free translation of examples refer to the B&C task transcriptions as follows: [number of dyad]/[number of set of photographs] · [number of photograph] – [number of text line] (for more information regarding the B&C task, see Section 3).

[b] The middle voice marker /N-/ switches the meaning of the transitive verb *handi* 'see' to the meaning of 'be facing', 'be oriented toward' and 'point toward'. Such marker has an allomorph < ñ > [ɲ] before [h] or [ʔ] : /N-/ → [ɲ]/_h,_ʔ.

A relator is a lexeme[3] or a morpheme that establishes the spatial relation between a figure and a ground. Figure and ground are to be understood as defined by Talmy (2000), who defines the figure as a (conceptually) movable entity, while the ground is the entity with respect to which one characterizes the figure's path, site, or orientation. The description in (1a) locates a ball with respect to the ground, while (1b) expresses the orientation of a chair facing the door. SIT Otomi uses verbs that describe static situations, as in (1), as well as more dynamic verbs in spatial descriptions. Table 1 lists these verbs and their meanings. The verbs in Table 1 can be used either in locative descriptions or in orientation descriptions, except for (a–c), which are only used in locative descriptions. Because the B&C task elicits spatial configurations as descriptions of images, in the data presented

[3] These lexemes are not necessarily adpositions.

Table 1
Verbs of spatial descriptions in SIT Otomi.

	Verb	Gloss	Note	
a.	*'o*	'to be located'	For a one single figure	+static
b.	*'ots'i*	'to be located on surface'	For a one single figure	
c.	*tü*	'to be attached'	In contact with a surface, no evident support	
d.	*'b̲eni*	'to lie'	For a one single figure	
e.	*ñhandi*	'to face'	Orientation	
f.	*kohi*	'to remain'	Static, denied or unwanted movement	– static
g.	*'yo*	'to walk'	Motion, often used as locative verb	
h.	*pa*	'to go'	Motion	

here the verb is normally inflected for third person either in the realis mood in the present (the zero morpheme Ø) or in the subjunctive mood (*di*=).

Relators used in spatial descriptions can include the generic locative preposition *ha*/*ka* or others with more specific semantics, such as the perlocative preposition *po* 'by' (we call the adposition that introduces the path of real or imaginary movement the *perlocative* preposition) or the allative preposition *pa* 'towards'. There are also more specific relators such as *lado* '(on the) side', 'besides', *mo̲ʰte* 'behind', *mfrente* 'in front of', etc. These are the relators in SIT Otomi that most commonly occurred in the B&C task (cf. Section 3), and a number of them are loanwords from Spanish, although their meaning may or may not match their Spanish counterparts.

Finally, grounds used in spatial descriptions in this language are basically objects, places, or people that may or may not be visually accessible in the moment of the description. Other reference entities can be expressed through relative clauses or deictic markers. For examples of such types of ground phrases, consider (2):

(2) a. *no=r* *siya* *di=<g>oh-i*
DEF.SG=SG chair 3.SUBJV=<NPS>remain-F
[*ha* Ø *di=<y>u̲* *ñhadi*]$_{\text{REL CL}}$
where REL 3.SUBJV=<NPS>get.in ADV.sun
'The chair is where the sun sets.' (4/4.4-70)
(Lit. 'The chair remains where the sun gets in.')

b. Ø=*ñ-hand-a* [=*ha* Ø *dí=hüd-i*]$_{\text{REL CL}}$
3.PRS=M-see-B=where REL 1.PRS=sit-F
'It [the chair] is facing where I am sitting.' (2/2.4-30)

c. *nu* *ma* *syento=ga* Ø=*ñ-hand-i* [*ngeʰ=kwa*]$_{\text{DEIC}}$
DEF 1POSS seat=1EMPH 3.PRS=M-see-F DEIC=here
'My seat is facing over here.' (5/4.6-45)

(2a) and (2b) are examples of grounds expressed by means of a relative clause: while the REL CL in (2b) refers to the place where the speaker is sitting (*ha dí hüdi* 'where I am sitting'), (2a) refers to the west as the place where the sun sets (*ha di yu̲ ñhadi* 'where the sun gets in'). Interestingly, there are no terms for 'north' or 'south' in SIT Otomi, and the directions corresponding to 'east' and 'west' are expressed by means of relative clauses such as *ha di yu̲ ñhadi* 'where the sun gets in'. The ground in (2c) corresponds to the place where the speaker is, this time expressed by means of a deictic marker *ngeʰkwa* 'over here'. It is worth pointing out that the arguments of the verb are not overtly expressed in many cases, as we can see in (2b). Nevertheless, it is always possible to retrieve the intended referent from the context.

1.2. Meronymy in SIT Otomi

The project *Spatial language and cognition in Mesoamerica* (which we will abbreviate as MesoSpace) explores the use of FoRs in Mesoamerican languages, and how these FoRs are related to productive meronymy in these languages. Productive meronymy consists of a system of lexemes referring to parts of a whole that can apply in a variety of situations (e.g. different scales, shapes, abstraction levels), and that easily adapt to new situations. One of the MesoSpace hypotheses about FoRs in Mesoamerica is that productive meronymy is related to the dispreference for the relative FoR, as the occurrence of meronyms in Mesoamerican languages "may be a linguistic predictor of a bias against the projection of FoRs derived from the observer's body – the "relative" type of FoRs" (O'Meara and Pérez Báez, 2011, p. 3, Bohnemeyer, 2008; cf. Section 2 for more information on FoRs). The meronymic systems of the Mesoamerican languages studied in the MesoSpace project were explored by means of an elicitation task using images to obtain body part terms and terms for artifact parts, as well as the constructions used to locate figures with respect to those parts. The stimuli presented to the speakers consisted of images of the human body, animals, plants, and artifacts such as tools and a car. The meronymic categories in SIT Otomi are described as follows:

a. **Body part terms**. A selected number of body part terms are quite productive in SIT Otomi, and can be productively extended to refer to plant and object parts as well. These body part terms include *ñö* 'head', *'ye* 'arm', *xutha* 'back', *mui* 'belly', *gü* 'ear', *ne* 'mouth', and *kwa* 'leg'. The criteria for extending these meronyms to refer to non-body parts include shape, location with respect to other parts or the orientation of the object, and function (as in the case of animal body parts).
b. **Geometrical terms**. Other meronyms used in SIT Otomi refer to geometrical properties of parts, such as *ñöni* 'edge', *mbo* 'the inside', *punta* 'tip'. These terms can be applied more freely than body part terms, and to a wider variety of objects; the only domain where they do not apply very often is living creatures.
c. **Locative constructions**. Locative phrases expressing the location with respect to parts follow the structure [RELATOR] + [POSSESSED PART] + [POSSESSOR OF PART]: e.g. *hár punta nor jwai* 'at the tip of the knife' (lit. 'at its tip the knife'). Such structure of locative phrases remains the same whether there is contact or not between the figure and the ground; references to contact are expressed in the verb, and they are not discussed in this paper.

2. Overview of frames of reference

A frame of reference (FoR) is a coordinate system used to locate a figure with respect to a ground. The axes of this coordinate system correspond to the spatial asymmetries of a given entity or event, namely the anchor (Bohnemeyer, 2008). These FoRs are described in the MesoSpace project as follows:

a. **Object-centered FoR**. The anchor is defined by the asymmetries of the ground, the front or the back, for instance, as in *The man is at the back of the car*.
b. **Direct FoR**. In direct FoRs, as described in the MesoSpace project, the anchor is the body of the speaker or addressee, and no projection of the anchor's body is made onto the ground. This lack of projection is what makes the direct FoR different from the relative FoR. Thus, expressions like *The man is in front of me*, or *The man is to your right* use the direct FoR to describe spatial relations. In expressions like *The man is toward me (from the house)*, we also find a direct FoR, even though the ground (*the house*) and the anchor (*me*) are different. In the B&C task in SIT Otomi, only direct descriptions in which ground≠anchor were found. Danziger's, 2010 direct FoR, on the other hand, requires the anchor and the ground to correspond to the same entity.
c. **Landmark-based FoR**. An entity found in the surroundings is taken as the anchor in this frame of reference, as in *The man is toward the house from the car*, where the house is the anchor, and the car is the ground. Landmarks may or may not be visually accessible, and their location must be known to the speaker and the addressee for the descriptions in this FoR to be understood.
d. **Geomorphic FoR**. In the geomorphic FoR the anchor is an environmental gradient, such as the slope of a mountain or the flow of a river. In the expression *The man is uphill*, the geomorphic FoR is used. Examples of this FoR can be found in Meseño Cora (Vázquez Soto, 2011). There were no geomorphic descriptions found in the data resulting from the B&C elicitation task in SIT Otomi.
e. **Absolute FoR.** In this FoR the anchor is either a landmark or a gradient, but it is different from landmark-based and geomorphic FoRs because this time the anchor is abstracted from the real entity or gradient from which it is derived, and a direction such as *uphill* may continue in a straight line even if the slope changes. For a discussion of absolute uses of *uphill* and *downhill*, see Polian and Bohnemeyer, 2011. Other absolute directions are *east* and *west*, originally referring to where the sun rises and sets, but the directions corresponding to *east* and *west* remain the same even if the points on the horizon where the sun rises and sets change during the course of the year.
f. **Relative FoR**. In this FoR the anchor is the speaker's (or the addressee's) body, and it is projected onto the ground to locate figures with respect to it. Thus, in the expression *The man is to the right of the car*, the figure (i.e. the man) is located to the right of the car from the point of view of the observer. If the observer changes his orientation so that the man is between him and the car, the description *The man is to the right of the car* becomes untrue. This means that the orientation or the location of the observer is crucial in descriptions involving relative FoRs.

For the sake of internal consistency it is crucial to mention that in this paper we have adapted a few aspects of the definitions listed above to the use of the FoRs in SIT Otomi. Firstly, we have chosen to classify the FoRs according to whether the anchor is the same as or different from the speaker or the addressee. The reason is that, in SIT Otomi, this classification groups the favored FoRs on one side, absolute, landmark-based, and object-centered, and the disfavored FoRs, relative and direct, on the other side (cf. Section 3.2). We label 'egocentric' those FoRs where the anchor is the same as the observer (i.e. the speaker or the addressee), and we label 'allocentric' the FoRs where the anchor and the observer are different. This 'allocentric' vs. 'egocentric' distinction would also be useful in Tseltal and Juchitán Zapotec (see Polian and Bohnemeyer, 2011, and Pérez Báez, 2011, respectively), where allocentric FoRs, according to the general results the authors present, are favored over egocentric FoRs. Furthermore, we have classified allocentric FoRs into two subgroups: external-reference FoRs, where the anchor is different from the ground (absolute and landmark-based FoRs), and object-centered FoRs, where the anchor is the same as the ground. Secondly, we have used the label

'direct' for those descriptions where the speaker uses his or her own body – or the addressee's body – as landmark (e.g. *toward me from the tree*), and where the anchor (the speaker) is different from the ground (e.g. *the tree*).

Languages vary in terms of their FoR preferences (Pederson et al., 1998); Mesoamerican languages are thought to prefer FoRs other than the relative (de Léon and Levinson, 1992). In this article, we explore how SIT Otomi uses the relative FoR in conjunction with the Spanish loanword *lado*.

2.1. Examples of spatial descriptions in SIT Otomi

The present section presents examples of how the FoRs described in Section 2 are used in SIT Otomi. Again, we have labeled as 'direct' those descriptions where the speaker uses his or her own body – or the addressee's body – as a landmark. The following examples describe the photograph in Fig. 1:

(3) a. *nu=yá* *gwa* *ya* *di=ñ-hand-i* [ø *di=<b>o̲x-a=ñhadi*]$_{\text{REL CL}}$
DEF.PL=PL.3POSS leg P 3.SUBJV=M-see-F REL 3.SUBJV=<NPS>rise.A-B=ADV.sun
Absolute: 'Its legs are pointing where the sun rises.' (4/3.5-8)

b. *Ø = ñ-hand-a = ka* *t'o̲ho̲* *no=r* *syento*
3.PRS=M-see-B=P.LOC hill DEF.SG=SG seat
Landmark-based: 'The seat is pointing toward the hill.' (3/3.5-143)

c. *pe* *no=r* *pelo^{h}ta* *Ø='be̲ng-a=n'a* *lado*
but DEF.SG=SG ball 3.PRS=lie.A-B=one side
Object-centered: 'But the ball lies on its [(i.e. the chair's]) side.' (5/3.5-23)

d. *di = ñ-hand-a*[= *ha* *Ø* *dí = hü = hu̲*]$_{\text{REL CL}}$
3.SUBJV=M-see-B=P.LOC REL 1.PRS=sit.A=1PL
Direct: 'It's facing where we are sitting.' (2/3.5-121)

The descriptions in (3) provide a sample of the wide variety of FoRs that speakers of SIT Otomi can use. However, as we shall see in the following sections, the relative FoR is not favored in SIT Otomi. For an example of a description involving a relative FoR, see the description of the location of the ball with respect to the chair in Fig. 2, which is provided in (4):

(4) *'ne* *Ø=kwat'-a=de* *mo̲^{h}te*
and 3.PRS=be.stuck-B=P.LOC behind
Relative: 'And it is behind it.' (3/4.4-100)

Referring to Fig. 2, the sentence in (4) where the ball is said to be behind the chair must be interpreted as a relative description. This is because the ball is behind the chair from the point of view of the speaker, and not at the intrinsic back of the chair.

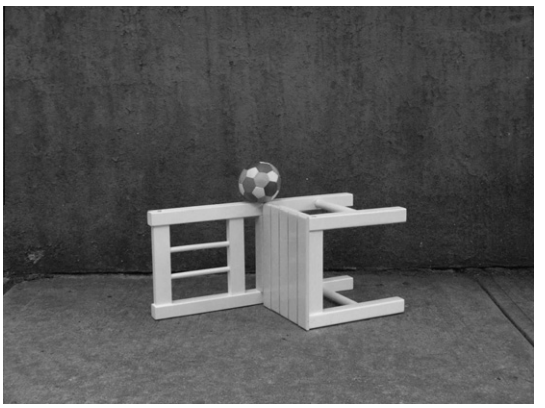

Fig. 1. Spatial relations between a ball and a chair.

Fig. 2. Spatial relations between a ball and a chair.

3. Studying FoRs in spatial descriptions in SIT Otomi: methodology and results

This section presents the methodology and the results of the B&C elicitation task in SIT Otomi. The B&C elicitation task is an image-matching task where two speakers were presented four identical sets of twelve photographs each. All the photographs show different arrays of a ball and a chair with the chair featuring different orientations (cf. Figs. 1 and 2); the ball-chair arrays and the chair's orientation are such that no FoR is favored. These sets of pictures were inspired by the pictures used in the Men & Tree task (Danziger, 1992), but with improvements (see O'Meara and Pérez Báez, 2011). The photographs are placed on a table in a 3 × 4 array in front of two speakers. One of the speakers – namely the director – is asked to describe one of the pictures to the other speaker – the matcher – for the matcher to find the described photograph in his or her own set of pictures; once the matcher has found the photograph – or failed to find it – the director proceeds to describe another picture. This continues with all the photographs in the set, and when all the photographs in one set have been described, the task continues with the next set until all the photographs have been described. A screen is placed between the director and the matcher to avoid eye contact or the use of gestures to communicate so that the speakers only rely on verbal descriptions. The B&C task was conducted with five dyads, i.e. ten speakers of SIT Otomi in San Ildefonso Tultepec from March 30 to April 3, 2008.

A second non-linguistic task called New Animals – modeled after Animals In a Row (Levinson and Schmitt, 1993) – was also conducted to elicit the use of FoRs in cognition (see O'Meara and Pérez Báez, 2011). In the New Animals task, a speaker is

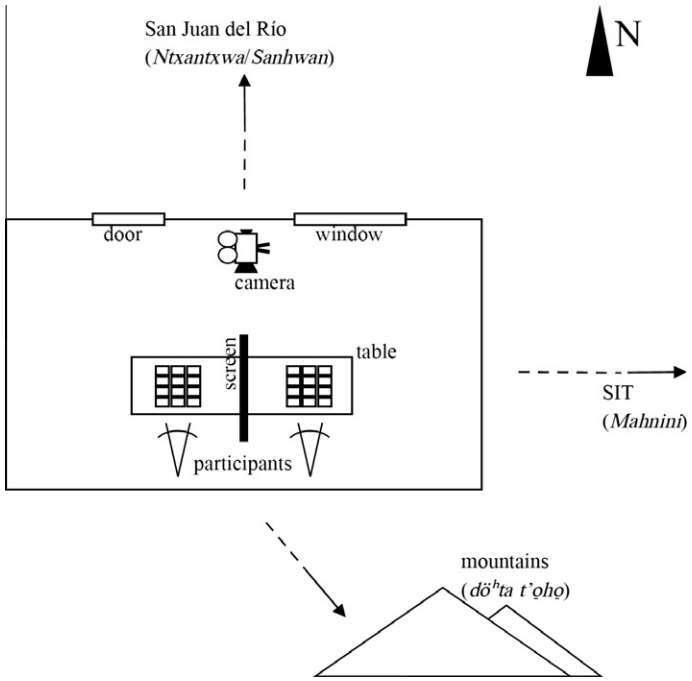

Fig. 3. B&C elicitation task in San Ildefonso Tultepec, Querétaro (Mexico).

presented with an array of three toy farm animals in a row on a table top. The speaker is asked to memorize the array, turn 180° to another table and reproduce the original array of three animals, picking them out of a set of four animals. There are two possible codable response types in this task: one response involves the relative FoR, if the speaker reproduces the array in the same relation to his own right-left axis in the original array; the other possible response type involves the absolute FoR, if the speaker reproduces the array keeping its orientation with respect to the environment, and not with respect to his own body. The New Animals non-linguistic task was conducted with sixteen speakers of SIT Otomi, ten of which had also participated in the B&C referential communication task.

3.1. Speakers and setting of the B&C task in SIT

A total of ten adult native speakers – between 35 and 76 years old – participated in the B&C task in dyads: eight female speakers and two male speakers. Seven of the ten speakers had a good command of Spanish, even though Otomi is their dominant language; the remaining three were monolingual Otomi speakers. We did not explore the effect of age, gender or proficiency in Spanish on the results presented in this article. The setting of the task is shown in Fig. 3. All participants were facing north while performing the task, but this fact was not explicitly acknowledged either by them or by the researchers. Fig. 3 shows two salient nearby towns: San Juan del Río, a town to the north, and the urban center of the village (San Ildefonso Tultepec itself) to the east. A group of mountains to the southeast is also shown. The stimuli were set on a table and the participants were prevented from seeing each other's gestures by a cardboard screen. The task was video recorded and all the descriptions produced were transcribed. The descriptions were then coded for analysis according to what FoR was used.

3.2. Results

The percentages in Table 2 are based on the coded data collected from the B&C task in SIT Otomi, and only the descriptions of the location of the ball with respect to the chair and the orientation of the chair are taken into account. We have also included, for comparison, the percentages of topological relations. Remember that topological relations do not involve FoRs, and they include proximity, contact, and containment relations. As for the location of the ball with respect to the chair, object-centered propositions[4] are clearly favored, as is shown in Table 2.[5]

Propositions involving object-centered FoRs constitute 19% of the total propositions of the location of the ball with respect to the chair across the data from all of the speakers that completed the B&C task. FoRs labeled as external reference include the absolute and landmark-based FoRs. Object-centered and external-reference FoRs – i.e. allocentric FoRs – comprise 34.7% of the propositions. The egocentric FoR types, involving relative and direct FoRs, on the other hand, labeled as observer-centered in Table 2, add up to only 7% of the propositions. The propositions in Table 2 that are coded as "undetermined" correspond to ambiguous instances of propositions that could *either* be interpreted as relative or object-centered; we were unable to determine the appropriate coding because of this ambiguity. We have included the topological propositions among the percentages to point out that, even when FoRs are available, topological propositions are a very common strategy (52.5%) for locating a figure with respect to a ground in SIT Otomi. According to the B&C results in Bohnemeyer (2011),

Table 2
FoRs in descriptions of the location of the ball with respect to the chair.

Type of FoR		Type of proposition	FoR/topological relation	% of Ball–Chair propositions
None	1.	No FoR	Topological (with respect to the chair)	23.3
			Topological (with respect to part)	29.2
Allocentric	2.	Object-centered	Object-centered	19
	3.	External reference	Absolute	11.9
			Landmark-based	3.8
Egocentric	4.	Observer-centered	Relative	4.9
			Direct	2.1
			Undetermined	5.9

[4] Descriptions may consist of one or more propositions, and the propositions in a description do not necessarily belong to the same FoR:

Ø='bɇng-a=r	*pelo^{h}ta*	*[n'a lado]*$_{REL}$	*[ha*	*Ø*	*di=<y>u̲*	*ñhadi]*$_{ABS}$
3.PRS=lie.A=B=SG	ball	one side	where	REL	3.SUBJV=<NPS>get.in	ADV.sun

'The ball is lying beside [the chair] where the sun sets.'

In the description above, two propositions – *n'a lado* 'one side' and *ha di yu̲ ñhadi* 'where the sun sets' – are instances of different FoRs; in the statistics presented in this paper, we count propositions.

[5] Remember that we do not use the label 'direct' as described in Danziger (2010), but as an FoR that takes the speaker's or the addressee's body as a landmark.

topological descriptions were very common in the task in Yucatec as well. We have decided to present topological propositions because they might have a connection with the development of object-centered propositions in SIT Otomi, as half of the topological propositions took one part of the chair as ground (cf. Table 2). This is shown in example (5).

(5)

gi=pe-'-Ø=no=r	*pelo^{h}ta*	[…]*mero*	***há* = *r***	***gwa***
2.IRR=put.A-B-3OBJ=DEF.SG=SG	ball	precisely	P.LOC.3POSS=SG	**leg**

'Put the ball right at its legs.' (3/4.7-105, 106)

Expressions such as the ones presented in (5) are probably the origin of the intrinsic (i.e. object-centered FoR) use of meronyms – including body parts – in SIT Otomi and other languages: consider the relator *behind* in English. In fact, it is sometimes hard to tell whether expressions such as *at the back* are object-centered or topological with respect to a part. Nevertheless, even when there is sometimes no clear or formal distinction, expressions such as *behind* and *at the back* suggest that object-centered and topological relations with respect to parts are related to some extent. However, at this point it is not entirely clear if this is the case in SIT Otomi and thus, further research should be made on this issue in SIT Otomi.

Fig. 4 shows the FoR preferences in SIT Otomi in descriptions of spatial configurations of a figure and ground in terms of FoR types as in Table 2. Based on the data regarding descriptions of the location of the ball with respect to the chair, it becomes clear that SIT Otomi speakers do not favor the use of observer-centered FoRs. The same tendency is found in descriptions of the orientation of the chair, where external-reference FoRs (i.e. absolute and landmark-based FoRs) are preferred. The relevant data are given in Table 3.

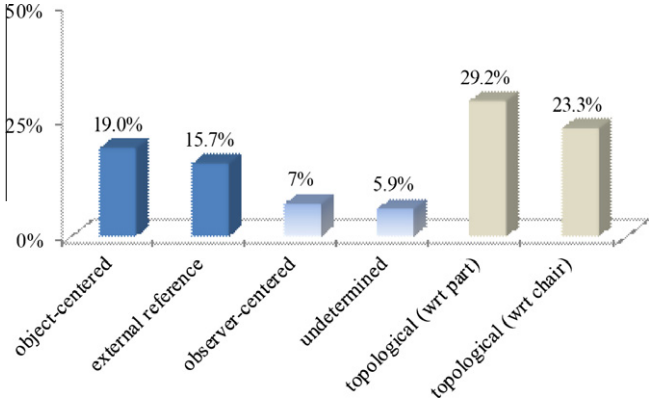

Fig. 4. Ball-chair descriptions per type of FoR.

Table 3
Orientation of the chair per FoR type.

	Type of FoR	FoR	% of chair orientation propositions
1.	External reference	Landmark-based	46.4
		Absolute	39.5
2.	Observer-centered	Direct	14.2

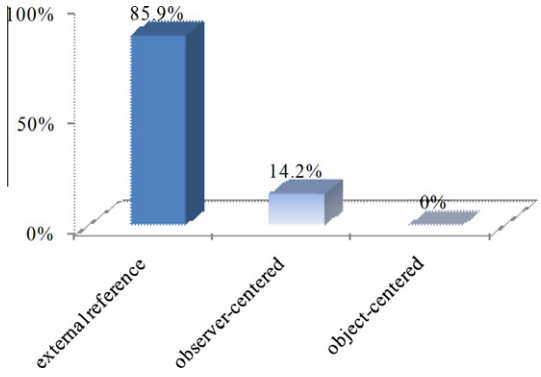

Fig. 5. Orientation of the chair per type of FoR.

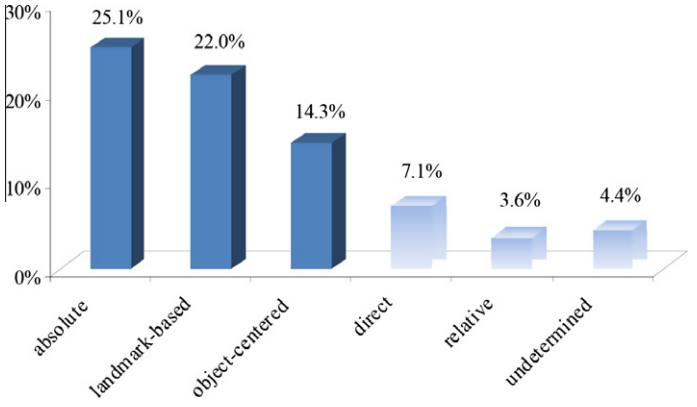

Fig. 6. General results of FoRs in the Ball & Chair task.

Object-centered FoRs are not used in descriptions of the orientation of the chair, as objects cannot be oriented with respect to themselves. External-reference FoRs are preferred and observer-centered FoRs are used infrequently. The relative FoR is not used at all in these descriptions either. Fig. 5 presents the distribution of the different types of FoRs found in descriptions of the orientation of the chair.

In Fig. 6 we show the ratio in percentage of propositions for each FoR combining both descriptions of the location of the ball with respect to the chair and descriptions of the orientation of the chair. Fig. 6 shows that observer-centered FoRs (i.e. relative and direct) are dispreferred in SIT Otomi when it comes to verbal descriptions involving FoRs. This fact is not entirely surprising if understood within a Mesoamerican language area context, as other languages in the area, namely Mopan, Tseltal, and Totonac, have been described as favoring absolute or object-centered FoRs (Majid et al., 2004). Juchitan Zapotec (Oto-Manguean) and Meseño Cora (Uto-Aztecan), for instance, show a preference for the absolute and geomorphic FoRs, respectively (Pérez Báez, 2011; Vázquez Soto, 2011). Interestingly, the occurrence of the relative FoR in SIT Otomi appears to strongly correlate with the use of the borrowed lexeme *lado* 'side' (<Sp. *lado*). Section 4 presents the constructions of *lado* found in the data from the B&C task in SIT Otomi.

4. Constructions involving *lado*

The following sections present the constructions where *lado* was used in conjunction with different FoRs in the Ball & Chair task; each section corresponds to one group of FoR types. Section 4.1 groups absolute and landmark-based FoRs because the constructions in which *lado* appears are very similar, and these FoRs use points of reference that correspond neither to the chair nor to the ball (external-reference) to describe the ball-chair array. Section 4.2 describes the constructions with *lado* involving the object-centered FoR. Section 4.3 describes the constructions where *lado* is used in utterances involving egocentric FoRs (i.e. relative and direct). Constructions with *lado* are the main strategy in the relative FoR; without them, the relative FoR would be rather marginal in SIT Otomi. This is one of the main points in this article. Finally, in Section 4.4 we present the constructions with *lado* involving topological relations that exist between the ball and the chair.

4.1. External-reference FoRs

The word *lado* appears in 28.9% of the propositions involving absolute and landmark-based FoRs; these frames are used in 47.1% of the propositions in the task. Two examples are given in (6):

(6) a. *no=r* *pelo^{h}ta* *Ø='b̲e̲n=s̲e̲* ***lado***
DEF.SG=SG ball 3.PRS=lie.A=ALONE **side**
[Ø *di=<y>u̲* *hyadi*]$_{REL\ CL}$
REL 3.SUBJV=<NPS>get.in sun
'The ball is lying on the side where the sun sets (with respect to the chair).' (2/1.8-152)
(Lit. 'The ball lies alone *side* where the sun gets in.')

b. *yá* *gwa* *bí='yo* ***po*** ***lado*** [*nge^{h}* *Sanhwan*]$_{NP}$
PL.3POSS leg 3.PRS.DIST=walk **by** **side** DEIC San.Juan
'Its legs are toward San Juan.' (2/1.6-185)
(Lit. 'Its legs are walking by the *side* of San Juan there.')

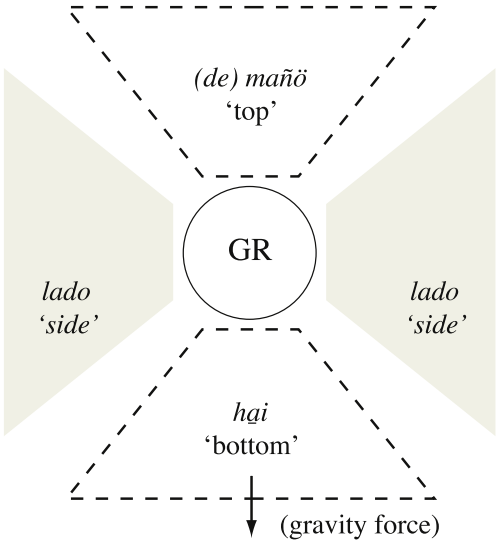

Fig. 7. Referential properties of *lado* 'side' in SIT Otomi.

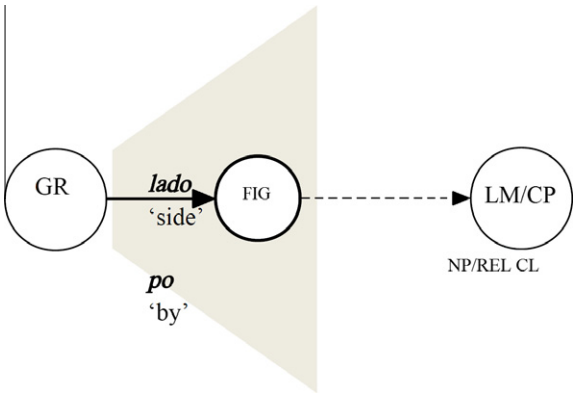

Fig. 8. Referential properties of *lado* in external-reference FoRs.

In (6a), *lado* is followed by a cardinal point, expressed by the relative clause in brackets, while in (6b) it is followed by the name of the nearby town of San Juan. In both cases, *lado* refers to the region adjacent to the ground that is oriented toward a cardinal point or a landmark, both of which are points of reference known to the speaker and the hearer. Interestingly, the basic FoR-unspecified referential properties of *lado* observable throughout the data are those of an adjacent region, although it can also refer to a facet of the ground in some instances of the object-centered FoR. For this purpose, consider the diagram in Fig. 7.

In the example in (6b), the marker *po* 'by' (<Sp. *por*) is a perlocative preposition that indicates, together with *lado*, the path the figure follows toward a known point of reference (e.g., toward the direction where the sun sets, or toward San Juan). This is represented in Fig. 8, where the shaded shape is the specific adjacent region to the ground (GR) with respect to which the figure (FIG) is located; this region extends in the direction of a landmark or a cardinal point. The landmark (LM) or cardinal point (CP) that define the orientation of the figure in external-reference constructions is expressed as either an NP (as is the case for landmark-based FoRs) or a relative clause (as is the case for absolute FoRs).

In SIT Otomi, the directions corresponding to 'east' and 'west' are always referred to by means of a relative clause, as in (6a). In external reference FoRs, grounds and landmarks (or cardinal points) often occur with *lado* and may be introduced by the preposition *po* 'by' in SIT Otomi.

4.2. Lado in constructions involving object-centered descriptions

In the data collected from the B&C referential communication task in SIT Otomi, 25.6% of the object-centered propositions of the location of the ball with respect to the chair contain the word *lado*. The description in (7) provides an instance of one of them:

(7)	Ø='*ox-a=no=r*	*pelo^{h}ta*	***n'a***	***lado***
	3.PRS=be.located.on.surface.A-B=DEF.SG=SG	ball	**one**	**side**
	'The ball is on its [the chair's] side.'[c] (1/3.5-20)			
	(Lit. 'The ball is on one side.')			

[c] The verb *'ots'i* 'be located on surface' (in its bound form *'oxa* in the example) implies contact between the figure and the ground. We have translated *n'a lado* as 'its side' (possessed) because the surface the verb refers to is the intrinsic side of the chair, and it cannot refer to any other regions (i.e. floating besides, lying on the floor next to the chair).

The description of the location of the ball in (7) can clearly be classified as involving an object-centered FoR, because in the photograph the ball is sitting on the intrinsic side of the chair and the chair is in a non-canonical position. In Fig. 9 the relative and intrinsic sides of the chair do not coincide, and therefore no ambiguity is expected in (7). In SIT Otomi, intrinsic sides are defined as the facets of the ground away from the top–bottom and front–back axes, as is shown in Figs. 10.1 and 10.2. The front-back axis is defined by the speaker assigning a front and a back to an object according to its inherent features. The up–down axis is defined by the gravitational force vector (Fig. 10.1). If the orientation of the object changes, the facet that would normally be aligned with gravity continues to be labeled as the bottom, even if it is not aligned with the

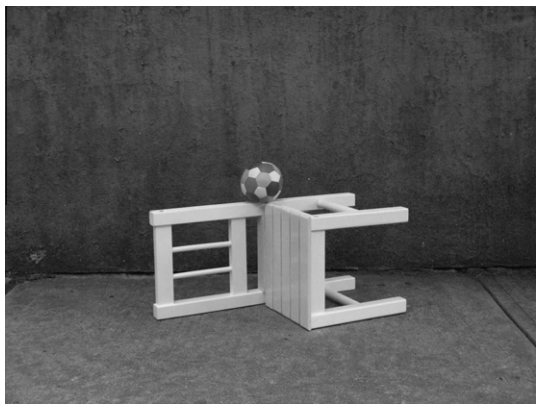

Fig. 9. Picture 3.5 of the B&C task.

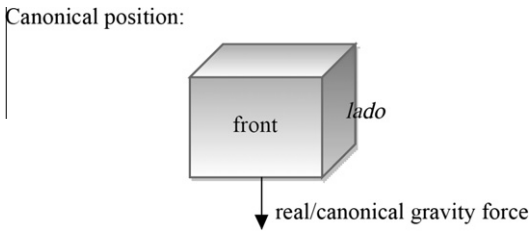

Fig. 10.1. Intrinsic *lado* in canonical position.

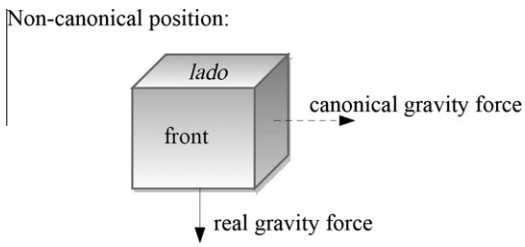

Fig. 10.2. Intrinsic *lado* in non-canonical position.

Fig. 11. Picture 1.8 of the B&C task.

gravitational force vector anymore (Fig. 10.2). An example of this would be saying that a ball that is located at the legs of the chair in Fig. 9 is *under the chair*.

The sentence in (7) describes the picture in Fig. 9, where *n'a lado* '(at) one side' can only be interpreted as involving an object-centered FoR. Other descriptions with *n'a lado* are ambiguous with pictures where the intrinsic side and the relative side of the chair coincide, as is shown in (8):

(8) Ø='b̲eng-a=no=r — *pelo^{h}ta* — ***n'a*** — ***lado***
3.PRS=lie.A-B=DEF.SG=SG — ball — **one** — **side**
'The ball is lying on the side.'[d] (1/1.8-34)
(Lit. 'The ball is lying one side.')

[d] The subject of the verb '*b̲eni* 'lie' (in its bound form '*b̲enga* in the example) is understood as being lying on the floor. This is why we have not translated *n'a lado* as 'its side' (possessed) as we did in example (7), because the ball, as subject of the verb '*b̲eni* 'lie', is not supposed to be in contact with any part of the chair, but on the floor.

Considering the configuration of the ball and chair in the photograph in Fig. 11, the expression *n'a lado* 'one side' can be interpreted as describing either an object-centered FoR or a relative FoR. Such ambiguous propositions where the intrinsic and the relative side coincide are not very numerous in the data collected using the B&C task: they amount to only 5.9% of the propositions of the location of the ball with respect to the chair, as is discussed in Section 3. These propositions are coded as undetermined and considered to be neither object-centered nor relative.

4.3. Observer-centered descriptions with lado

Observer-centered FoRs altogether – i.e. direct and relative FoRs – are found in only 10.7%[6] of the propositions that were collected as part of the B&C task. Among those, 7.1% involve a direct FoR,[7] and only 10.6% of these direct propositions contain the loanword *lado*; that is less than 1% of the total number of propositions. One example of such a proposition is given in (9):

(9) ***lado*** — [Ø — *dí = hü = hu̲*]$_{\text{REL CL}}$ — *ja=Ø='bem='pu̲*
side — REL — 1.PRS=sit.A=1PL — ACT=3.PRS=lie.A=there
'It's lying on the side where we are sitting.' (2/4.7-86)
(Lit. 'Side we are sitting there it indeed lies.')

The construction *lado* + REL CL as exemplified in (9) is similar to that of (6b) in Section 4.1, where a landmark-based FoR was used in a description of the location of the ball with respect to the chair. In (9), the landmark corresponds with the bodies of the speaker and the addressee, and the description involves a direct FoR, as defined for the purpose of the present paper in Section 2. Though the ball and the chair are not perfectly aligned with the observer's body, the picture gives the impression that the ball is nearer to the observer than the chair is.

The relative FoR was the least favored in responses to the task, accounting for only 3.6% of the total number of propositions. However, the majority of these expressions (82.6%, cf. Fig. 19, Section 5) contain *lado*. The next example shows the use of the expression *n'a lado* 'one side' to describe the location of the ball with respect to the chair in a description that involves

[6] 7.1% direct + 3.6% relative (cf. Fig. 6).
[7] Remember that we use the label 'direct' to refer to an FoR that takes the speaker's or the addressee's body as a landmark.

Fig. 12. Picture 4.7 of the B&C task.

Fig. 13. Picture 2.10 of the B&C task.

a relative FoR. This same expression was used to describe a different picture in the B&C task, which is illustrated in (7), but in that case, the expression involved an object-centered FoR (see Fig. 12).

(10)

*Ø='beng-a=**n'a***	***lado***	*no=r*	*pelo^{h}ta*
3.PRS=lie.A-B=**one**	**side**	DEF=SG	ball

'The ball is lying on the side [of the chair].' (1/2.10-22)
(Lit. 'The ball is lying one side.')

The expression *n'a lado* unambiguously involves a relative FoR in (10), as the intrinsic side and the relative side in Fig. 13 do not coincide as they do in Fig. 11 in Section 4.2. Although it can also be found in object-centered propositions, this particular construction *n'a lado* 'one side' is the most common strategy in propositions involving the relative FoR in the B&C task in SIT Otomi (cf. Table 4, Section 5). Fig. 14 attempts to represent what the referential properties of *n'a lado* 'one side' are. In utterances involving relative FoRs, the truth conditions of the utterance depend on the orientation of the observer. From the point of view of the observer (C), as is shown in Fig. 14, there are two regions corresponding to the 'sides' of the ground. The figure, located on one of these sides is referred to as being located ***n'a*** *lado* '**one** side' with respect to the ground. The expression *n'a lado* 'one side' is not strictly associated with object-centered interpretations either, as relative interpretations of it can be found in the B&C task with the chair in a non-canonical position (see Fig. 15), as is shown in (11):

(11)

Ø='beng-a=no=r	*pelo^{h}ta*	***n'a***	***lado***
3.PRS=lie.A-B=DEF=SG	ball	**one**	**side**

'The ball is lying on the side.' (2/1.10-23)

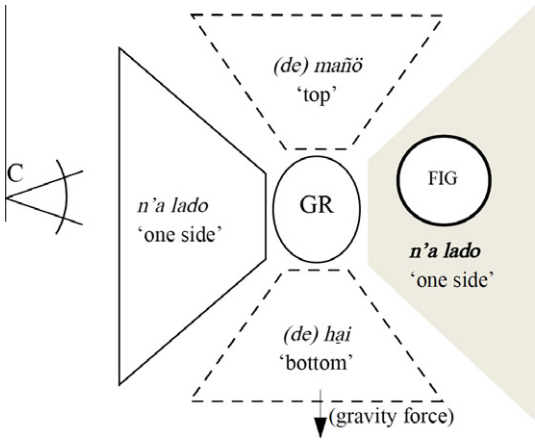

Fig. 14. Referential properties of relative *n'a lado* 'one side'.

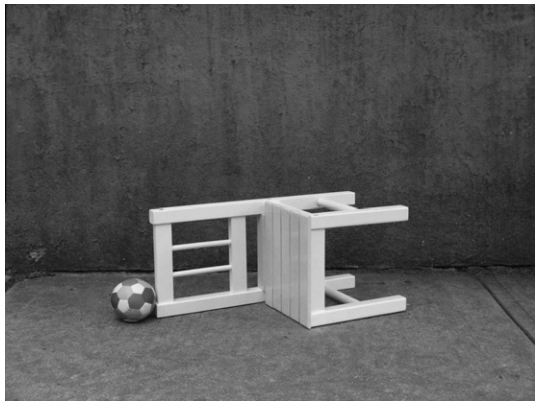

Fig. 15. Picture 1.10 of the B&C task.

The description in (11) does not reference the inherent facets of the chair. Here the observer's sides are projected onto the image he or she is describing. Such projection of the body of the observer onto the array of figure and ground (i.e. the relative FoR) is hardly attested in SIT Otomi if the word *lado* is not used.

4.4. Topological descriptions with lado

The loanword *lado* can also be interpreted as a linguistic index of topological relation between the ground and the figure when modified by the diminutive *txi-*, or when used in diminutive constructions. Such constructions feature a relation of proximity rather than a projective one. The example in (12) shows such a description:

(12)

Ø='b̲eng-a=há=r	*gwa*	***n'a***	***txi-lado***
3.PRS=lie.A-B=P.LOC.3POSS=SG	leg	**one**	DIM-**side**

'It's near its legs.' (2/1.7-157)
(Lit. 'It's lying at its legs one little side.')

The projective propositions of the object-centered type presented in Section 4.2 do not make use of the diminutive *txi-* as the proposition in (12) does. This topological proposition with the diminutive marker has some variants, all of them containing the diminutive marker *txi-*: *txi-lado* [DIM-side], *n'a txi-lado* [one DIM-side], *n'a txi-lado=tho* [one DIM-side=DEL], and *n'a txi-t̲ui n'a lado* [one DIM-bit one side]. Nevertheless, there is one example of a topological interpretation of *lado* without the diminutive, with the expression *n'a lado*; this expression can also be found in propositions that involve a relative or object-centered FoR, as was shown in Section 4.3. See the example in (13), a proposition of the location of the ball with respect to the chair, which is shown in Fig. 16:

Fig. 16. Picture 1.7 of the B&C task.

(13) *Ø='ben=se* ***n'a*** ***lado**='ya*
3.PRS=lie.A=ALONE **one** **side**=P
'It's near it.' (2/1.7-159)
(Lit. 'It's lying alone one side.')

This proposition, which contains *n'a lado*, was uttered immediately after the proposition in (12), which contains *n'a txi-lado*, so (13) might be the mere repetition of the same topological relation established in (12). At this point, the question arises as to whether *lado* is actually just a topological marker of proximity. The idea seems plausible, provided that all the propositions considered as relative in Section 4.3 could also be interpreted as topological instead of involving a projective relation, and all ambiguities with respect to interpretations involving object-centered FoRs in some images would thus be explained. Nevertheless, *lado per se* could hardly function as a topological marker, given that one can find very simple and precise propositions of photos where the object-centered FoR – or relative FoR – is unmistakably used. For example, consider the description in (14):

(14) *no=r* *njwat'i* *Ø=hüd-i*
DEF.SG=SG chair 3.PRS=sit-F
Ø='beng-a=no=r *pelo*^{h}*ta* ***n'a*** ***lado***
3.PRS=lie.A-B=DEF.SG=SG ball **one** **side**
'The chair is sitting, and the ball is lying on the side.' (1/1.8-34)
(Lit. 'The chair is sitting the ball is lying one side.')

The matcher in the B&C task found the right photo with the instructions in (14) alone. If *n'a lado* was just a mere topological marker, the matcher would have needed more hints in order to find the correct photograph among the different configurations that were in front of them. The most common interpretation of utterances involving *n'a lado* in the B&C task involves a relative or object-centered FoR; *n'a lado* can hardly be interpreted as a topological proposition in (14). Another example suggesting that topological interpretations of *n'a lado* are not common is shown in (15):

(15) ***n'a*** ***lado**=tho* *ja=Ø='bem='pu*
one **side**=DEL ACT=3.PRS=lie.A=there
'Right on the side, there it's lying.' (5/3.8-41)[e]
(Lit. 'Just one side it's lying there.')

[e] Although the picture shows a ball hovering over the chair, we think that the speakers see the chair and the ball as flat objects lying side by side, and not as a three-dimensional array.

In (15), it is almost unambiguous that the director is describing a topological relation between the ball and the chair, provided that the ball is neither on the side of the chair that would result under an object-centered or relative FoR interpretation. However, the matcher was never able to find the photograph with these instructions as the photograph described could be almost anypicture in the set. It was not until the director literally said that the ball was 'flying', as is provided in (16), that the matcher was able to find the right picture at the very end of the task (see Figs. 17 and 18):

Fig. 17. Picture 1.8 of the B&C task.

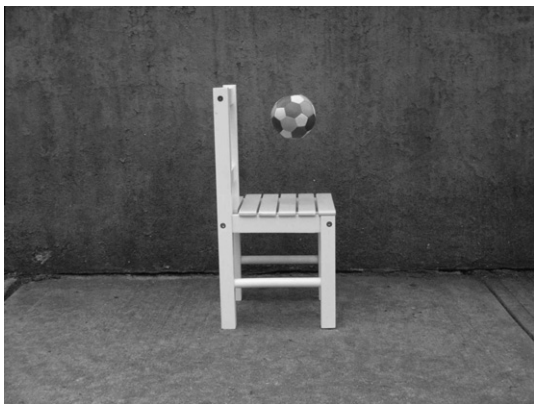

Fig. 18. Picture 3.8 of the B&C task.

(16) *'ne* *Ø=n-tsa=gwi*
and 3.PRS=M-fly=DU
'And it's flying with respect to it [the chair].' (5/3.8-95)
(Lit. 'And it is flying with it.')

The diminutive marker *txi-* and *lado* together are used in the descriptions of topological relations. Topological interpretations of *lado* without the diminutive marker are very low (16.6%). Fig. 19 represents the referential properties of topological constructions with *lado*, where the marker *txi-* contributes a component of 'short distance' to the expression.

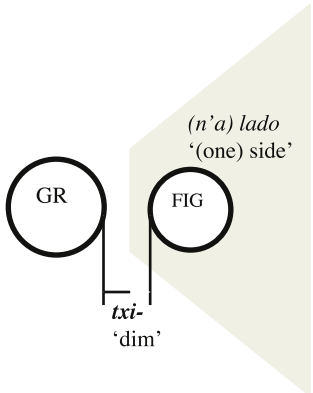

Fig. 19. Referential properties of *n'a txilado* 'one little side'.

5. Expressions with *lado* involving FoRs in SIT Otomi

Even though *lado* can be found in constructions involving different FoRs, as well as in topological propositions that do not involve an FoR, it occurs in patterns that are particular to each FoR available in SIT Otomi. This section discusses this distribution throughout the data collected by using the B&C task. Table 4 shows all the construction types involving *lado*, the FoRs involved, and the number of propositions in which they appear.

The 149 propositions with *lado* listed in Table 4 represent 24% of all the propositions elicited in the B&C task. Constructions with *lado* 'side' and *po lado* 'by side' are the most common, and they normally appear with (a) NPs referring to landmarks (which generally occur in descriptions involving landmark-based FoRs) or parts of the ground (which generally occur in descriptions involving object-centered FoRs), (b) relative clauses (REL CL) that refer to cardinal directions (which generally occur in descriptions involving absolute FoRs) or the place where the observer is located (which generally occur in descriptions involving direct FoRs), or (c) deictic expressions such as *nge^{h}kwa* 'over here' and *nge^{h}nu* 'over there' (which generally occur in descriptions involving direct FoRs). Although deictics are excluded from the analysis in the MesoSpace introductory article (O'Meara and Pérez Báez, 2011), it is important to clarify that the particular deictics *nge^{h}kwa* 'over here' and *nge^{h}nu* 'over there' in SIT Otomi were taken into account because they refer to the region nearer to or farther from the speaker, taking the chair (i.e. the ground) as the point of reference. In other words, these deictics make use of the direct FoR, and it is important to code all instances of FoRs in the data (for an approach that addresses this point, see Danziger, 2010).

Table 4
Constructions using *lado* across FoRs.

Type of FoR (if applicable)	Construction	Gloss	# of propositions	%	Total propositions
Absolute	***po lado***+REL CL	**'by side**+REL CL'	**24**	**60.0**	**60**
	lado+REL CL	**'side**+REL CL'	**15**	**37.5**	
	de lado + REL CL	'by side+REL CL'	1	2.5	
Landmark-based	***po lado***+NP	'by side+NP'	**32**	**84.2**	**38**
	lado+NP	'side+NP'	6	15.8	
Object-centered	*po lado*(+PART)	'by side (+PART)'	7	30.4	**23**
	n'a lado	'one side'	6	26.1	
	lado(+PART)	'side (+PART)'	5	21.7	
	de lado(+PART)	'by side (+PART)'	3	13.0	
	al lado	'on the side'	2	8.7	
Direct	*lado*+REL CL	'side+REL CL'	2	40	**5**
	po lado+DEIC	'by side+DEIC'	2	40	
	lado+DEIC	'side+DEIC'	1	20	
Topological	(***n'a***)***txi-lado***(+PART)	'little side (+PART)'	**14**	**58.3**	**24**
	n'a lado(+PART)	'one side (+PART)'	7	29.2	
	(*po*)*lado*(+TOP)	'(by) side (+TOP)'	3	12.5	
Relative	***n'a lado***	'one side'	**15**	**78.9**	**19**
	lado	'side'	2	10.5	
	po lado+PART	'by side+PART'	1	5.3	
	de lado+PART	'by side+PART'	1	5.3	
		Total			**149**

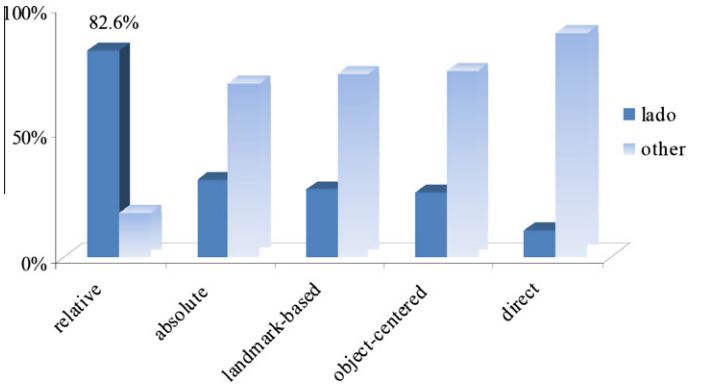

Fig. 20. Constructions with *lado* vs. other constructions.

The diminutive *txi-* and *lado* are only found together in topological propositions, which do not involve an FoR. As for the relative FoR, the most common construction is *n'a lado* 'one side', although it is also found in object-centered propositions. As Table 4 shows, the different FoRs do not appear with just any construction, but each constructional pattern is, to some extent, particular to a given FoR. Constructions containing *lado* have different distributions throughout FoRs, as is shown in Fig. 20. Fig. 20 does not take into account topological or FoR-undetermined propositions. The graph shows the strong correlation between *lado* and the relative FoR. While the relative FoR is only attested in 4.9% of the total propositions of the location of the ball with respect to the chair (cf. Table 2, Section 3) and not found at all in the descriptions of the orientation of the chair, its co-occurrence with *lado* in the B&C task is proportionally much greater than in any other FoR. For example, only 42 out of 161 landmark-based propositions (26.1%) and 41 out of 160 absolute propositions (25.6%) make use of the marker *lado*; in contrast, 47 out of 51 (92.2%) relative propositions contain the loanword *lado*. This makes evident the crucial role it plays in the occurrence of relative FoRs in the B&C task in SIT Otomi. The remaining 17.4% of relative propositions make use of the markers *mo̲^{h}te* 'behind' and *xu̲tha* 'back'. These two markers are also found in object-centered propositions.

6. FoRs in SIT Otomi and their typological implications

In general, SIT Otomi appears to support the hypothesis of the MesoSpace project (O'Meara and Pérez Báez, 2011) as it pertains to the dispreference of relative FoRs because of the high percentage of propositions involving allocentric FoRs (absolute, landmark-based, and object-centered) in contrast with the low percentage of propositions involving egocentric FoRs (relative and direct) as is shown in Fig. 21. Comparing the occurrences of the loanword *lado* among egocentric FoRs, we find that utterances involving a direct FoR exist without this marker, while there are almost no instances of utterances involving a relative FoR without it (see Fig. 22).

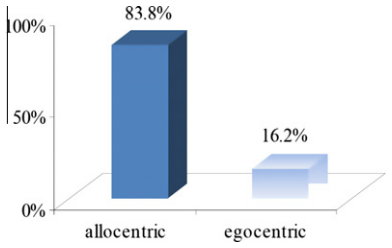

Fig. 21. Allocentric vs. egocentric FoRs in SIT Otomi.

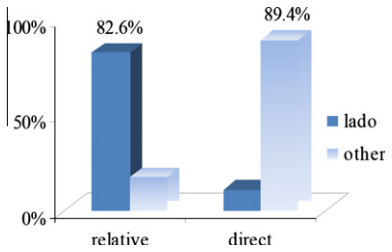

Fig. 22. Constructions with *lado* in egocentric FoRs.

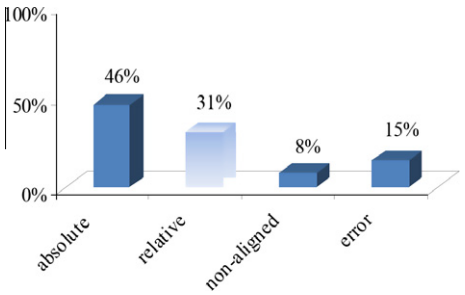

Fig. 23. Types of responses to the New-Animals task in SIT Otomi.

As for the New Animals non-linguistic task (cf. Section 3), however, the responses given by the speakers show a slight preference for non-relative FoRs, as is shown in Fig. 23; the category labeled 'non-aligned' includes responses where the order of the animals was correct but the animals were facing the opposite direction.

If the differences between the absolute and the relative responses (ratio 3:2) are considered as significant, the results of the New Animals task in SIT Otomi support the MesoSpace hypothesis about the dispreference of the relative FoR in Mesoamerican languages. If they are considered as non-significant, however, they suggest that there is no clear alignment between linguistic and cognitive behavior among the speakers of SIT Otomi who participated in the MesoSpace project. Two implications derive from Figs. 21 and 22: (a) speakers of SIT Otomi, as speakers of other Mesoamerican languages (see Vázquez Soto, 2011, Polian and Bohnemeyer, 2011, and Pérez Báez, 2011), prefer allocentric over egocentric FoRs; and (b) descriptions involving relative FoRs, which are types of egocentric FoRs, rely almost exclusively on one lexical item, namely *lado* 'side', which emphasizes the markedness of relative FoRs in SIT Otomi.

7. Conclusions

There are a variety of strategies, including the use of topological and projective relations, to describe spatial relations in SIT Otomi. These strategies include the majority of the FoRs considered in the Mesospace project, with uses of the direct FoR limited to taking the speaker's or addressee's body as a landmark. In SIT Otomi, most FoRs are fairly common ways of describing the location of a figure with respect to a ground and the orientation of figure objects.

Just as other Mesoamerican languages like Tseltal and Juchitán Zapotec (Polian and Bohnemeyer, and Pérez Báez, respectively, 2011), our data from the B&C task strongly suggest that SIT Otomi prefers types of allocentric (absolute, landmark-based, and object-centered) FoRs over egocentric (relative and direct) FoRs.

The loanword *lado* 'side' appears in utterances involving five FoR types, as well as in topological descriptions of figure-ground configurations, with a specific spatial interpretation according to the construction it is found in. Constructions of (*po*) *lado* + landmark/cardinal direction, for instance, have absolute, landmark-based, or direct interpretations, as a point of reference different from the ground is provided. These constructions may or may not include the perlocative preposition *po* 'by'. The construction *n'a lado* 'one side' can be interpreted as either involving a relative or object-centered FoR, which can sometimes be ambiguous: the marker *n'a* 'one' may profile one of the two adjacent regions on both sides of the ground from the point of view of the observer (which involves a relative FoR) or the inherent sides of the ground (which involves an object-centered FoR). In addition, constructions with DIM + *lado* have a topological reading meaning 'near'. This topological component of proximity is given by the interpretation of diminutives as 'short distance' in these constructions.

These constructions are specifications of a more general conceptualization of the word *lado* 'side', that of a region adjacent to the ground, as we have suggested in Fig. 7 in Section 4. Given the low occurrence of egocentric propositions as compared with allocentric FoRs, as well as the practically non-existent use of the relative FoR without the word *lado*, we claim that utterances involving egocentric FoRs are marked in SIT Otomi. This fact aligns SIT Otomi with other Mesoamerican languages that prefer types of allocentric FoRs over egocentric FoRs (see Vázquez Soto, Polian and Bohnemeyer, 2011, and Pérez Báez, 2011). Nevertheless, the relative FoR can still be found in spatial descriptions, almost exclusively related to a specific lexeme, the loanword *lado*.

As for the non-linguistic task, there is no clear preference for relative or absolute responses. This contrasts with the results of the linguistic task, where egocentric FoRs are dispreferred, and it might suggest that the alignment between language and cognition is not firmly established among the participants of these tasks in San Ildefonso Tultepec. This area of language-cognition alignment surely needs deeper exploration in SIT Otomi, and it could be one of the issues to be treated in further research.

Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant No. (NSF Award No. BCS-0723694). We would like to thank Eve Danziger, Jürgen Bohnemeyer, and Gilles Polian for their discussions of FoR coding, as well as Gabriela Pérez Báez and Carolyn O'Meara for their comments and remarks on the preliminary versions of this paper. Special thanks also to Verónica Vázquez, Alejandra Capistrán, Elena Benedicto and Rodrigo Romero for their openness to discussion and feedback during the MesoSpace project. Shortcomings and deficiencies remain our own responsibility.

References

Bohnemeyer, J., 2011. Spatial frames of reference in Yucatec: referential promiscuity and task-specificity. Language Sciences 33 (6), 892–914.

Bohnemeyer, J., 2008. Elicitation task: frames of reference in discourse – the Ball & Chair pictures. In: Pérez Báez, G. (Ed.), MesoSpace: Spatial Language and Cognition in Mesoamerica. 2008 Field Manual, University at Buffalo – SUNY (ms.).

Campbell, L., Kaufman, T., Smith-Stark, T., 1986. Meso-America as a linguistic area. Language 62 (3), 530–570.

Danziger, E., 2010. Deixis, gesture, and cognition in spatial frame of reference typology. Studies in Language 34 (1), 167–185.

Danziger, E., 1992. Photo-photo matching games: men and tree. In: Danziger, E. (Ed.), 'Manual' for the Space Stimuli Kit 1.0. Max Planck Institute for Psycholinguistics, Nijmegen, pp. 7–11.

de Léon, L., Levinson, S.C., 1992. Spatial description in Mesoamerican languages: introduction. Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung 45, 527–529.

Levinson, S.C., Schmitt, B. (1993). Animals in a Row. In: Cognition and Space Kit Version 1.0. Nijmegen: Cognitive Anthropology Research Group at the Max Planck Institute for Psycholinguistics, pp. 65–69.
Majid, A., Bowerman, M., Kita, S., Haun, D.B.M., Levinson, S.C., 2004. Can language restructure cognition? The case for space. Trends in Cognitive Sciences 8 (3), 108–114.
O'Meara, C., Pérez Báez, G., 2011. Spatial frames of reference in Mesoamerican languages. Language Sciences 33 (6), 837–852.
Palancar, E.L., 2009. Gramática del Hñöñhö: Otomí de San Ildefonso Tultepec, Querétaro, vol. I. Plaza y Valdés, Mexico City.
Pederson, E., Danziger, E., Levinson, S.C., Kita, S., Senft, G., Wilkins, D., 1998. Semantic typology and spatial conceptualization. Language 74 (3), 557–589.
Pérez Báez, G., 2011. Spatial frames of reference preferences in Juchitán Zapotec. Language Sciences 33 (6), 943–960.
Polian, G., Bohnemeyer, J., 2011. Uniformity and variation in Tseltal reference frame use. Language Science 33 (6), 868–891.
Talmy, L., 2000. Toward a Cognitive Semantics, vol. I. MIT Press, Cambridge, MA.
Vázquez Soto, V., 2011. The "uphill" and "downhill" system in Meseño Cora. Language Sciences 33 (6), 981–1005.