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Effects of Multilingualism on the Use of Linguistic Spatial Frames of Reference in Dholuo

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Abstract

The influence of multilingualism on the nature of spatial frames of reference remains largely unexplored in spatial cognition studies. The present study investigates verbal spatial representation amongst Dholuo multilinguals. It employs a photo-object matching game where participants were engaged in dyads. A total of 80 multilingual Dholuo speakers were involved across Dholuo and English language contexts. Findings indicate the presence of multiple linguistic spatial frames of reference across both language contexts. The findings further reveal a preference for relative and object-centred frames of reference, depending on whether the spatially related objects have inherent orientations or not. Given that the L1-Dholuo L2-English participants used the relative frames of reference system much more often than the monolingual Dholuo speakers in a previous study, the results may partly be explained in terms of the influence of English and its dominant relative frame of reference. The approach adopted herein is novel in the sense that it focuses on multilingualism, in contrast to the previous studies, which gave prominence to monolingual populations. This presents a different perspective on viewing and conceiving of spatial representation not used before in the literature on linguistic spatial frames.

Keywords: linguistic spatial frames of reference; feature categories; multilingualism; default system

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1 Introduction

The concept of frames of reference, as it is presently used in spatial cognition, owes its origin to the Gestalt theories of perception, where it was used as a principle of visual perceptual organization (Levinson 2003, 24). For instance, Rock (1992) notes that within the Gestalt framework, when a bigger structure surrounds a smaller one, the larger one acts as the 'frame of reference' for the smaller one. Frame of reference was thus defined by the Gestaltists as a unit or organization of units that collectively serve to define a coordinate system with respect to which certain properties of objects, including the phenomenal self, are gauged (Rock 1992, 404). Levinson (2003, 24) refers to frame of reference as a constant perceptual window through which motion is viewed. The literature reveals that all languages use linguistic spatial frames of reference (FoRs) and that these FoRs are categorized into classes. The number of FoRs differs from language to language. Further, documentation has shown that languages that have more than one linguistic spatial frame of reference, in most cases, do have a default FoR. A default/primary FoR refers to the dominant FoR that speakers of a particular language use.

Whereas such conclusions as "most languages have a primary linguistic FoR" are not in question, basing them on monolingual populations is. Despite more than half of the world's population being bilinguals (Ansaldo et al. 2008; Grosjean 2013), available spatial cognition studies (see, e.g. Pederson et al. 1998; O'Meara and Pérez Báez 2011) have mainly focussed on monolingualism. Since it is possible that using an L2 could influence the linguistic FoR that a speaker adopts (Levinson 2003; Bohnemeyer 2011), it is important to consider the role that multilingualism plays in explaining the linguistic FoRs used. Linguistic FoR herein means the presence and use of all the linguistic spatial frames of reference available in the language.

To the best of my knowledge, no available study on linguistic spatial frames of reference within the African context has explicitly foregrounded multilingualism as a basis for investigating the representation of linguistic spatial FoRs. The few studies (e.g. Eggleston et al. 2011; O'Meara 2011; Romero-Méndez 2011; Soto 2011) that have engaged with bilingual participants largely downplay the possible effects of the second language in the representation of linguistic spatial FoR. Moreover, the rich linguistic environment of Kenya, where a child is exposed to their first language (e.g. Dholuo) at home but learns other languages (e.g. English) at school, provides a compelling case for adopting such a multilingual approach.

This study explores the possible relationship between multilingualism and linguistic spatial frames of reference. Specifically, the study seeks to find out whether the use of English in addition to the L1 (Dholuo) has any effect on the representation of linguistic spatial FoRs. This is achieved by comparing the results from the present study to those of Ogelo (2017), which engaged with Dholuo near-monolinguals.[1] Further, the possible effects of language context in spatial representation are also explored by conducting investigations in both Dholuo and English contexts and comparing the outcomes. The investigation focuses on the use of linguistic FoRs and, as such, employs a photo-object referential communication task through which verbal data are elicited. Details of the photo-object task are discussed in Section 4.

This article is structured as follows: Section 2 details the background to the study, which introduces the categorization of linguistic spatial FoRs and explains how bi/multilingualism is

[1] Near-monolinguals, as used in Ogelo (2017), means native speakers of Dholuo who have a degree of knowledge of another language but cannot meaningfully use it. The terms 'monolingualism', 'bi/multilingualism', etc., as used in this study, are explained in Section 5.

operationalized, as well as introducing the previous empirical research on the use of linguistic FoRs. Section 3 introduces the Dholuo language, while Section 4 gives the methodology. Section 5 presents the results. The study concludes with a discussion in Section 6 and a conclusion in Section 7.

2 Background

2.1 Linguistic spatial frames of reference

Jager and Postma (2003, 504) state that spatial representations can be categorized into coordinate and categorical relations. Coordinate relations use metric units that define the exact distances between located objects within space. Categorical relations, on the other hand, employ a more general structure that divides the visual-spatial scene into layouts that enable the loose location of objects in relation to other objects around the ego. Categorical spatial relations are divided into two main subdomains: kinesis and stasis. Kinesis involves the motion or movement of objects in relation to other objects within space, while stasis involves the locational relationships of static objects. The subdomain of stasis is further divided into angular (e.g. those that use linguistic spatial frames of reference) and non-angular (e.g. topological relations) spatial descriptions (Levinson and Wilkins 2006, 3).[2]

According to Levinson and Wilkins (2006, 3), non-angular spatial descriptions involve coincidence, contact, or containment between the figure and ground;[3] for example, the locative relationships expressed by the English prepositions *in*, *on*, and *at*. Talmy (2000, 2007) defines the figure as a conceptually movable object whose location is to be identified and the ground as the entity with respect to which the figure's location is to be identified. The angular descriptions apply to objects where the figure and the ground are separated in space, and locating the figure would need specific angles or coordinate systems (Levinson and Wilkins 2006, 4).

Despite topological relations being categorized as non-projective, there are arguments to the contrary. Zlatev (2007, 329), for instance, points out that topological relations are indeed non-projective but make use of the object-centred FoR. Similarly, Levinson (2003, 72) mentions that some topological notions do involve intrinsic features of landmark properties; for example, the coin is *under* the mat, *under* conflating both a topological notion and an intrinsic feature, that is, the bottom part of the mat. The present study, however, takes the more restrictive view, which considers the class of topological relations to involve objects that are in contact with or contiguous to each other and thus do not use any linguistic FoR in their descriptions. Such a position is similar to the one taken in several previous studies (see, e.g. Levinson and Wilkins 2006; O'Meara 2011; O'Meara and Pérez Báez 2011; Romero-Méndez 2011). Figure 1 presents the hierarchical structure of spatial representation as described above.[4]

[2] The projective vs. non-projective distinction has been used by some scholars instead of the angular vs. non-angular distinction (see e.g. O'Meara 2011; Pérez Báez 2011; Romero-Méndez 2011; Soto 2011).

[3] The terms 'figure' and 'ground' were originally used by the Gestalt theorists but were given a distinct semantic interpretation by Talmy (2007). The figure can also be referred to as the 'referent' (Levinson 2003), 'theme' (Gruber 1965), or 'trajector' (Langacker 1987; Zlatev 2007), while the ground also has the labels 'relatum' (Levinson 2003) and 'landmark' (Langacker 1987; Zlatev 2007). The terms 'figure' and 'ground' are preferred to other labels in this study.

[4] For a related hierarchical model of spatial representation see Levinson and Wilkins (2006, 3).

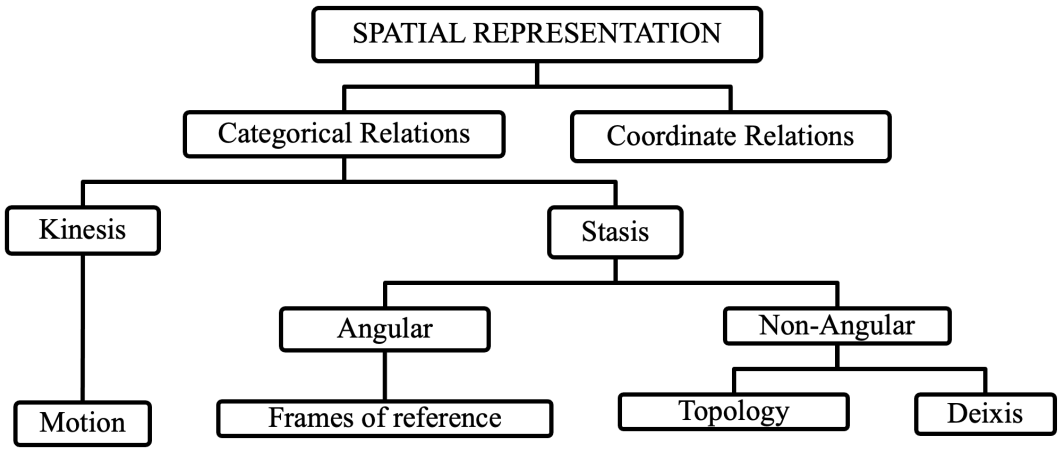

Figure 1: Hierarchical spatial representation

One of the traditional classifications of linguistic frames of reference is that of intrinsic, relative, and absolute FoRs (Levinson 2003, 35). According to Levinson (2003, 37), the intrinsic and absolute FoRs involve a binary relationship, while the relative FoR involves a ternary relationship. A binary relationship involves two arguments, the figure and the ground, while a ternary relationship involves a figure, a ground, and a viewpoint. Consider Figure 2.

Figure 2: Projective relations

Figure 2 is an image of a house (ground) and a girl (figure). The descriptions in example (1) below show the possible responses to the question 'Where is the girl?' based on Figure 2.

(1) a. The girl is to the left of the house
b. The girl is west of the house
c. The girl is in front of the house

Utterance (1a) presupposes a viewpoint which is distinct from the ground and the figure. It makes use of the speaker's[5] own bodily coordinates to assign direction to the ground and figure. The girl, therefore, is deemed to be to the left of the house from the perspective of the speaker. Such a description illustrates the relative frame of reference. Descriptions involving the relative FoR express a ternary relationship between the figure, the ground, and the speech act participant (SAP). The SAP uses their bodily coordinates to define the location of the figure vis-à-vis that of the ground. These egocentric axes can be mapped onto the ground under translation, reflection, or rotation (see Levinson 2003, 85). These spatial descriptions may occur both when reference is made in relation to a ground with no inherent features, such as a tree (which has no inherent front or back), and when a ground has such features but the SAP ignores them and instead uses their own bodily coordinates.

In (1b), the relationship between the figure and the ground is based on fixed bearings, which are independent of the spatial scene. In this case, the speaker uses the cardinal directions to define the location of the girl in relation to the house. Such an utterance is considered to have used the absolute FoR.

In the case of (1c), a facet of the ground is named. Note that the facets of the ground are conceptually assigned in a particular manner or learned over time and, as such, do vary from language to language (Levinson 2003, 41). In other cases, it is not just the parts of the objects that have intrinsic properties but the object itself. In the case above, the figure is indicated to lie on an axis extended from the intrinsic object (or part of the object). This type of utterance utilizes the intrinsic FoR typology.

Danziger (2010) introduces the concept of 'anchor', which she defines as the zero point from which a vector which identifies the direction to be followed from the ground to the figure is calculated. Such a zero point is fixed and immovable in relation to other elements of the spatial scene. Based on the concept of the anchor, she proposes a distinction between an utterance such as *the man is in front of me/you*, which has a human anchor (me/you), and one such as *the man is in front of the car,* which has a non-human anchor (the car). The former would be deemed to be using the direct FoR, and the latter the object-centred (OBC) FoR. Within the Levinsonian classification model, both utterances would be regarded as using the intrinsic FoR, since they both involve a figure-ground binary relationship and have grounds that have defined facets, that is, the grounds are featured.

O'Meara and Pérez Báez (2011) use other linguistic spatial FoRs, including the geomorphic FoR. These FoRs have the anchor on a slope or an incline, for example, upstream/downhill, etc. The coordinates originate from the environmental gradient and extend outwards onto a figure. For instance, in the example *The girl is downhill*, downhill is the incline from which the coordinates emanate.

Danziger's direct and OBC FoR distinction becomes important in relation to ground/figure

[5] While, in example (1a), the speech act participant (SAP) is the speaker, it must not necessarily be so. Danziger (2011) defines a speech act participant as the "locus of psychological perspective of a spatial representation". The SAP is, in most cases, the speaker, but can also be the addressee or any third person who has the characteristics of a SAP. The SAP can also be a generic observer (Danziger 2011). Levinson (2003) refers to the SAP as the 'viewpoint'.

rotation sensitivities (see, e.g., Danziger 2010, 175–177). This mainly applies to non-verbal tasks such as the 'animals-in-a-row' experiment (Levinson 2003), in which the figure or the ground is rotated. The present study, however, focuses on linguistic descriptions, so the direct/ OBC FoR distinction is irrelevant. This means, therefore, that the study uses a classification criterion involving the relative, the intrinsic, and the geomorphic FoRs, and a non-FoR category labelled 'undefined'. Utterances which involved motion descriptions, topological relations, deixis, and general non-FoR descriptions were categorized as 'undefined'. The study uses the geomorphic as opposed to the absolute FoR (as defined in this section), because descriptions utilizing the latter were not present in the findings.

2.1.2 Default linguistic FoR

A default/primary linguistic FoR is one that speakers of a particular language favour over the rest of the FoRs. There are languages such as Guugu Yimithirr (Pama-Nyungan, Australia) and Mopan (Mayan, Belize) which almost exclusively use the absolute and the intrinsic frames of reference, respectively (Pederson et al. 1998; Levinson 2003) for locative descriptions. The majority of other languages, however, use two or more linguistic FoRs, one of which is regarded as the default system.

Findings from several languages, such as Tamil (Dravidian), Dutch (Indo-European), Japanese (Japonic), Arrernte (Pama-Nyungan), Yélî Dnye (isolate), Tzeltal (Mayan), Ewe (Niger-Congo), and others, show the presence of a default FoR (Ameka and Essegbey 2006; Brown 2006; Kita 2006; Levinson 2006; Pederson 2006; Staden et al. 2006; Wilkins 2006). Relatedly, in Pederson et al. (1998), 11 out of 13 languages investigated had evidence of a default spatial frames system. The same is true for Dholuo in Ogelo (2017), where the intrinsic FoR was the most preferred. It should be noted that in these studies, most of the participants engaged with were monolinguals. We explore the possibility of a relationship between monolingualism and the presence of a default FoR. This will be discussed in detail later.

2.2 Previous empirical work on linguistic frames of reference

Empirical research involving spatial frames of reference abounds in the literature. It is, therefore, reasonable to present only the most recent work and the work most relevant to this study. Preceding this review, we highlight the use of the concepts of monolingualism and multilingualism in the literature reviewed.

Some variables (e.g. proficiency, usage, competence, etc.) dictate how the concepts of monolingualism and bi/multilingualism are perceived, making it difficult to pin them to any specific definitions. As such, they are used loosely in several studies. For instance, Pederson et al. (1998, 558) observe that the majority of the participants in their study were from "traditional and non-literate" societies. They further mention that each of the researchers was able to conduct their research "monolingually". This leaves the reader with the task of interpreting what "traditional and non-literate" and "monolingually" mean. Relatedly, in the studies reported by O'Meara and Pérez Báez (2011), terms such as "monolingual", "bilingual", "literate and bilingual", "mixed degree of bilingualism", etc., are used without details of what they specifically entail. Again, it is left to the reader to decipher what these terms mean.

The interpretation of monolingualism and bi(multi)lingualism used in reviewing the literature in this study follows Bloomfield (1933), Weinreich (1953), and Kemp (2009). These con-

cepts exist in a continuum with varying degrees of proficiencies and use. Monolingualism is defined as having knowledge and meaningful use of one language or of varieties of the language or different registers of the language. We treat bilingualism and multilingualism as similar (see, e.g., Saville-Troike 2006), despite views to the contrary (see De Angelis 2007). Bi(multi)lingualism is therefore defined as any degree of knowledge and meaningful use of two or more languages by an individual. The linguistic background of the participants in this study is provided in Table 1 in Section 4.1, which spells out how multilingualism is used in the present study.

Levinson's (2003) seminal work on linguistic frames of reference lays the groundwork for subsequent studies, particularly on the convergence between linguistic and non-linguistic FoRs. His findings, which largely depended on qualitative and anecdotal data for the linguistic distinctions, showed a preference for the absolute FoR amongst the Guugu Yimidhirr (Pama-Nyungan). Amongst the Tzeltal (Mayan), the same absolute encodings were witnessed, though there were relative and intrinsic usages as well. Of particular relevance to the present study is Levinson's observation that despite the Guugu Yimidhirr participants all being bilinguals (L1-Guugu Yimidhirr, L2-English) and the language of instruction being English, there was no significant usage of the relative FoR associated with English. Considering that the participants engaged with were the older generation (55 to 75 years), who would normally prefer to speak Guugu Yimidhirr rather than English amongst themselves (Levinson 2003, 121), this outcome seems plausible.

O'Meara and Pérez Báez (2011) present a report on a collection of studies dubbed the 'MesoSpace project', where the use of linguistic FoR was extensively investigated in 13 different languages. These studies used a ball and a chair (B&C) photo series task.[6] The findings were diverse, although all languages were shown to use various FoRs to varying degrees. As mentioned earlier, the MesoSpace studies reported engaging with participants of mixed linguistic backgrounds, ranging from "monolingual and illiterate" to "bilingual". However, little emphasis was laid on the possible impact that the participants' knowledge of an additional language brought to their use of linguistic FoRs.

In languages such as Jaminjung, Malak-Malak, and Kriol (all Australian), there is evidence that the intrinsic, relative, and absolute FoRs are all used, but there is a strong preference for the absolute system (Hoffmann 2019). Other languages, such as English, Dutch, Japanese, etc., also utilize the relative, intrinsic, and absolute FoRs, but use the relative FoR as the primary system (Pederson et al. 1998).

Lastly, Ogelo (2017) conducted empirical research on spatial relationships in Dholuo. Part of the research aims was to discover the types of spatial frames of reference in Dholuo and to establish whether the relationship between the linguistic FoRs and the non-linguistic domains reveals linguistic relativity. The research employed a mixed design involving experiments, interviews, and questionnaires. The participants engaged with were pupils in grades 5–6 who were mostly taught in Dholuo. They were thus categorized as near-monolinguals. To identify the types of linguistic frames of reference available in Dholuo, pairs of figurines of animals, trees, etc., were arranged along a horizontal plane, and participants were asked to describe their positions. The findings showed the presence of the intrinsic, the relative, and the absolute linguistic FoRs, with the intrinsic FoR being the most dominant.

This review reveals not only the nature of linguistic FoR as demonstrated by these studies,

[6] This elicitation task is a photo-photo task that was developed by Bohnemeyer (2008) as an improvement to the Man and Tree (M&T) game (Levinson et al. 1992). See Bohnemeyer (2008) for details of this task, including how it improves on the M&T game .

but also an underlying factor that hinges on the monolingualism/multilingualism of the participants.

3 Dholuo language and its speakers

Dholuo is a Nilo-Saharan, East Sudanic, Western Nilotic language spoken in Kenya and northern parts of Tanzania by the Luo people. The current number of Luos in Kenya is slightly over five million (11% of the total population) (KNBS 2020). Dholuo has two mutually intelligible dialects: the Kisumu-South Nyanza dialect (KSN) and the Boro-Ukwala dialect (BU). The differences between the two dialects are marked by vocabulary and pronunciation (Stafford 1967), though such differences do not affect the spatial terminologies used in Dholuo.

The KSN is considered the standard dialect since it is found in most Luo literature, including the Bible and elementary school readers. It also has a wider geographical area of usage and is the preferred dialect for radio broadcasts. Dholuo is my mother tongue, and I was born in a place where the KSN dialect is spoken. I therefore speak and understand it very well. Although the difference in dialect does not impact this research, the study is based on the KSN dialect.

Several aspects of the Dholuo language, such as grammar (Stafford 1967; Tucker 1994; Okombo 1997), phonology (Owino 2003), and morphosyntax (Suleh 2013), have been extensively investigated and documented. However, for the present study, the focus has been placed on the multilingualism of Dholuo speakers and its manifestation in spatial representation.

3.1 Spatial relators in Dholuo

Spatial relators are special descriptors that speakers use in expressing spatial relationships. Descriptions involving spatial relationships in Dholuo make use of these spatial relators. Examples of such spatial relators include prepositions, adverbials, and nouns. Ochola (2011) identifies prepositions in Dholuo as simple and complex. Simple prepositions are one-word prepositions that stand alone, while complex prepositions are attached to nouns. Tucker (1994, 235–244) refers to those prepositions attached to nouns as 'nomino-prepositions'. Simple prepositions in Dholuo are not normally used with spatial frame descriptions but with topological relations (as defined in Section 2). For instance, the locative marker *e* is mostly used in isolation to denote 'at, in or on', as in (2).

(2) *Mbura nind-o e par*
cat sleep-INF/IPFV on mat
'The cat is sleeping <u>on</u> the mat.'

The *e* preposition can also be attached to specific nouns (mostly body-part nouns), giving rise to complex nomino-prepositions; for example, *e* 'on' + *wich* 'head' = *e-wi* 'on top'. Other complex prepositions include *e-bath* 'beside', *e-nyim* 'in front of', *e-kor* 'in the middle', etc. The nomino-prepositions can be used for spatial frame descriptions; see (3).

(3) *Nyathi o-chung' e-nyim mtoka*
child 3SG.SM-stand.IPFV in-front car
'The child is standing <u>in front of</u> the car.'

Other spatial relators combine an adjective and a preposition; for example, *piny mar* 'lower side/part of', *malo mar* 'the upper side/part of', as in (4).

(4)	*Puoth-a*	*nigi*	*piny*	*mar*	*pidh*	*cha*
	farm-GEN	LOC	down	of	hill	that

'My farm is <u>on the lower side of</u> that hill'.

In other instances, the left (*acham*) and right (*achich*) relations are used as spatial relators in Dholuo, as in (5).

(5)	*Mama*	*o-chung*	*kor*	*ka*	*achich*	mara
	mother	3SG.SM-stand.IPFV	side	of	right	of.me

'Mother is standing <u>to my right</u>'.

3.2 The multilingual set-up of Dholuo, English, and Kiswahili

The multilingual setting in Kenya is such that a speaker of Dholuo lives and interacts with others in an environment where other languages (e.g. English, Kiswahili, etc.) are spoken. Being a former colony of the British, Kenya has adopted the colonialist language as an official language (Oostendorp 2012). In some cases, particularly in rural areas, a child is exposed to their mother tongue, for example, Dholuo, at home but learns English and Kiswahili in school. If more than one language is used in the home, the child learns both (all) of them, sometimes simultaneously. Most children, therefore, grow up speaking a mother tongue, which may be an indigenous language or Kiswahili, and pick up English in schools. The multilingual linguistic environment of Dholuo, English, and Kiswahili is characterized by a fluidity where speakers switch between languages according to the context of speech.

4 Methods

4.1 Participants

80 Dholuo-English-Kiswahili (DEK) multilingual speakers were involved in the experiment. The participants were residents of the Nyanza region of Kenya, where most Dholuo speakers are found. They were all students at universities or colleges within this region. University and college students were chosen because they could provide the requisite data and were sufficiently multilingual. A language questionnaire (self-reports) was used to capture the details of participants' linguistic background (a sample of this questionnaire is attached in Appendix C). The participants were asked to rate their proficiency in English, Dholuo, or any other language they spoke on a 5-point Likert scale (where 1 represented 'Rudimentary' and 5 'Excellent'); average language proficiencies are indicated in Table 1.

Table 1: Dholuo multilingual speakers' linguistic backgrounds (SD in parentheses)

DHOLUO MULTILINGUAL SPEAKERS				
Language	Spoken by % of participants	Proficiency (1–5)	Mean age of acquisition	Frequency of use (1–5)
Dholuo	100	4.0 (1.2)	from birth	3.8 (1.3)
Kiswahili	100	3.6 (1.0)	4.7 (2.8)	3.5 (1.1)
English	100	3.9 (0.9)	6.0 (2.2)	3.5 (1.0)
Ekegusi	2.4	3.3 (2.1)	11.3 (8.3)	2.8 (1.7)
Kiluhyia	3.0	2.4 (1.1)	9.6 (6.1)	2.0 (1.2)
Kikuria	1.2	3 (2.8)	11.5 (10.6)	3.0 (2.8)
Kikamba	1.2	2.5 (0.7)	15.0 (1.4)	2.5 (0.7)
Kikuyu	1.2	2.5 (0.7)	4.0 (2.8)	1.5 (0.7)
French	4.2	2.4 (1.1)	10.7 (4.7)	2.0 (0.8)
German	0.6	3	13	2

Table 1 shows that all the participants reported high levels of proficiency in Dholuo (80%), English (78%), and Kiswahili (72%) which they spoke 76% (Dholuo) and 70% (both Kiswahili and English) of the time. This information shows that the participants were sufficiently multilingual for the purposes of the study.

After receiving formal written permission to conduct research at the target institutions, the administration introduced the researcher to the student leaders of the various Luo students' associations. The student leaders circulated posters by pinning them on the noticeboards or sharing them through social media. Interested participants then met the researcher at an appointed time, where the research details, including the contents of the consent forms, were explained (a sample of the consent form is attached in Appendix D). Participants willing to volunteer for the exercise were informed of the date, venue, and time. On the day of the experiments, the volunteers read the consent forms again and signed them (in duplicate). The researcher gave the participant one consent form and retained the other copy. There was no compensation for participating in the research, except for the research assistants and the student leaders. However, the participants received a token of appreciation through 'airtime' for sparing time to volunteer.

4.2 Materials

The study used a new man and tree (NMT) photo-object referential communication task, which is unique to this study. It was developed under the 'Each field worker makes their own' category, in line with the modification guidelines presented in Levinson et al. (1992, 9). It has both real objects and their corresponding photographs. For this study, the objects and photographs were human figurines, toys of animals, a tree, a ball, a net, a house, and a table. Some of these toys were featured (e.g. the human figurines, the house, etc.), while others were unfeatured (e.g. the tree, the ball, and the net).[7] The objects were placed along the horizontal plane some distance

[7] Feature, as used here, means the observable attributes of an object (e.g. the front, back, sides, etc.) An unfeatured object lacks these attributes. Featured objects in most cases are used with the intrinsic FoR.

apart in pairs to form categories in terms of their featured/unfeatured properties and then photographed. The actual objects were used alongside the photographs in the experimental task.

There were three feature categories, namely:

- the unfeatured-unfeatured category, which had a pairing of two unfeatured objects (e.g. a ball (figure) and a tree (ground));
- the featured-unfeatured category, which had a featured and an unfeatured object pairing (e.g. man (figure) and tree (ground))
- the featured-featured category, which brought together two featured objects (e.g. cow (figure) and house (ground)).

See Appendices A and B for these categories and picture stimuli, respectively.

Each of the categories had six picture stimuli. The participants described all of the 18 pictures once. The total number of observations for both language contexts was 720. Additionally, there was a contact category which contained a ball/bottle (figure) on top of a table (ground). The contact category was used for the practice session.

This task improves on both the M&T and the B&C photo-photo referential communication tasks. For instance, one of the shortcomings of the M&T task was that it disfavoured intrinsic inferences, since it used a tree (which is unfeatured) as a ground. The NMT corrects this through the featured-featured category, which has a featured object as a ground. Second, while the B&C task used real objects, which was considered an improvement on the M&T task, the orientation in some of the stimuli appeared unreal, for example, a ball hanging in the air against an upside-down chair (see Figure 4 in Appendix E). This is corrected by the NMT task, which uses more natural figure-ground configurations (see Appendix B).

4.3 Procedure

The participants were put into pairs. 40 dyads (20 for Dholuo and 20 for English contexts) were involved in the experiments. For each language context, the conversation between the experimenter and the participants, as well as between the participants themselves, was conducted in the said language. If the participants digressed to another language, they were gently reminded to stick to the language in focus. The Dholuo and English tasks were done on different dates by different participants. For each task, one of the participants was the director, while the other was the recreator. The assignment of director/recreator roles was done arbitrarily. Each participant maintained their role throughout the task.

The pair were seated side by side, screened from each other by an opaque board that divided the presentation table into two halves. The director was given 18 photographs placed before them on the presentation table. Each of the photographs belonged to one of the following categories: the unfeatured-unfeatured, featured-unfeatured, or featured-featured categories. The photographs were not arranged in any order. The recreator was given the actual objects, which were also not placed in any particular order. The director picked one photograph at a time and described it. The recreator then selected the appropriate combinations of the actual objects as per the director's instructions. The director only moved on to the following picture once the recreator had signalled that they were satisfied. Once the recreation was complete, a picture of the array was taken, and the objects were removed from the presentation table and placed on a side table.

A practice trial preceded the actual experiment. The procedure was similar to the one described above, except that objects from the contact category were used in the practice trial,

and the investigator was allowed to interrupt and guide the participants whenever they erred. The same procedure was used for the practice and for the actual trials in both the Dholuo and English language contexts.

4.4 Data coding

Coding was done for spatial descriptions involving the location of a figure in relation to a ground. An assessment of the findings revealed a wide range of verbal spatial representations that extended beyond using spatial frames of reference. These included non-FoR descriptions such as topological relations and deixis, which were not used in the final analysis but were captured under the category labelled 'undefined'. In addition to the undefined category, coding was done according to the relative, intrinsic, and geomorphic FoRs as described in Section 2.1.1.

4.5 Data analysis

The results from both language contexts were recorded and compared to find out the possible effects of language context on the use of linguistic FoR. To achieve this, both descriptive and inferential approaches were used. A descriptive approach shows the distribution of the FoR across the language contexts, which is presented through a table and visually captured in a graph. The statistical analysis shows whether the difference in the use of linguistic FoR between the language contexts is significant enough to base conclusions on. Through the statistical analysis, variables contributing to the outcome of the data that could not be captured by descriptive statistics could be accounted for. The inferential analysis models selected are current and comprehensive enough to provide a complete assessment of the dataset, producing outputs that can be easily interpreted.

In the descriptive analysis, language was used as the independent variable, while the 'choice of FoR' was used as the response variable. The package ggplot2 (Wickham 2016) was used to plot the bar graph. The descriptive analysis revealed the distribution of the four levels (three FoRs and one undefined category) across the unfeatured-unfeatured, featured-unfeatured, and featured-featured categories. The distribution between the two languages was compared, and the results were noted.

For the statistical analysis, language was used as the x-axis and plotted against the choice of FoR (y-axis). The logit mixed-effects modelling used the lme4 package (Bates et al. 2015) to predict the likelihood that a speaker would use a particular FoR to describe the picture stimuli. The choice of FoR (dependent variable) was modelled as a function of the predictor language with two levels, Dholuo and English contexts, with a by-subject and by-item random effect. A by-subject and by-item intercept and a language slope for the by-item varying effects was deemed to be the most effective modelling approach. Treatment coding was used, since there was a need to directly compare the influence of Dholuo and English language contexts.

5 Results

5.1 Sample participant responses

(a) Unfeatured-unfeatured category

(6) Participant (DP023[8]): 20-year-old male DEK multilingual
Language context: Dholuo
Stimuli (BAFTFAF[9]):

Mpira	*ni*	*piny*	*mar*	*yien*	*ko-ng'iy-o*	*tok-i*	*gi*
ball	LOC	down	of	tree	CONJ-face-INF/IPFV	behind-GEN	to
mbele	*ko-ni*						
front	side-this						

'The ball is at the lower side of the tree while facing behind you from this front side.'

The participant in (6) interprets the ball (figure) as occupying a position on the lower side of the tree (ground). To identify a lower and possibly an upper side of the spatial array, the SAP used an environmental gradient (slope), which utilizes a geomorphic FoR.

(b) Featured-unfeatured category (FU)

(7) Participant (DP073[10]): 19-year-old female DEK multilingual
Language context: English
Stimuli (MRFAT[11]):
The man is in front of the tree, the man is facing the left side.

A description such as (7) was coded as having used a relative FoR, since it involved mapping the SAP's bodily coordinates onto the tree (ground), from which its front (from the perspective of the SAP) was identified, thereby locating the position of the man (figure).

(c) Featured-featured category

(8) Participant (DP035[12]): 25-year-old male DEK multilingual
Language context: Dholuo
Stimuli (COBHFABA[13]):

Dhiang'	*nie*	*tok*	*ot*
cow	LOC	back	house

'The cow is behind the house.'

[8] Participant number 23 acting as the director.
[9] An abbreviated unique code identifying a specific stimulus; it reads in full – Ball Front of Tree Facing Front.
[10] Participant number 73 acting as the director.
[11] An abbreviated unique code identifying a specific stimulus; it reads in full – Man Right Facing Tree.
[12] Participant number 35 acting as the director.
[13] An abbreviated unique code identifying a specific stimulus; it reads in full - Cow Behind House Facing Back.

Constructions such as the one in (8) were interpreted as falling into the intrinsic FoR since the SAP used a facet of the ground (back of the house) from which the position of the figure (cow) was located.

5.2 FoR distribution in terms of language contexts

A by-subject and by-item intercepts model output estimate predicted the log-likelihood of choosing any frame of reference, given the group language, significantly above chance: β0= 2.34121, *SE* = 0.39914, Wald *z* = 5.866, *p*<0.00001. This outcome aligns with the information in Table 2 and Figure 3, which shows that in both language contexts, instances where FoRs were used in the spatial descriptions were more frequent than instances where they were not used. The table and graph, however, do not clearly show a difference in FoR choice between the two language contexts, an observation that is echoed by the model estimate, which showed no statistically significant difference between the two language contexts: β1= -0.01384, *SE* = 0.40908, Wald *z* = -0.034, *p*=0.973.

Table 2: FoR type choices

	LOCATION		
	Unfeatured-Unfeatured (UU) %	Featured-unfeatured (FU) %	Featured-Featured (FF) %
DHOLUO			
Geomorphic	2.50	1.70	0
Intrinsic	9.20	12.50	78.30
Relative	78.30	57.50	11.70
Undefined	10.00	28.30	10.00
ENGLISH			
Geomorphic	0	0.80	0.80
Intrinsic	2.50	15.00	76.60
Relative	88.30	59.20	12.50
Undefined	9.10	25.00	10.80

5.3 The use of the left/right relations

The left/right relation was used by the participants in spatial descriptions across all the categories. It was used primarily with the relative FoR and, to some extent, the intrinsic system. It was observed that there were several inconsistencies in the use of these bodily-derived left/right relations. Several participants failed to differentiate between *acham* 'left' and *achich* 'right'. Instead, they resorted to their English equivalents, which they used easily and seemed to understand and interpret very well. At other times, if unguided, both participants carried on with the task while misrepresenting the left/right relations. The director sometimes got it right but the recreator did not, resulting in a wrongly recreated array. Worse still was when the director got it completely wrong, thereby misleading the recreator. There were cases where the participants hesitated before using the left/right terms, apparently attempting to remember which was which. When

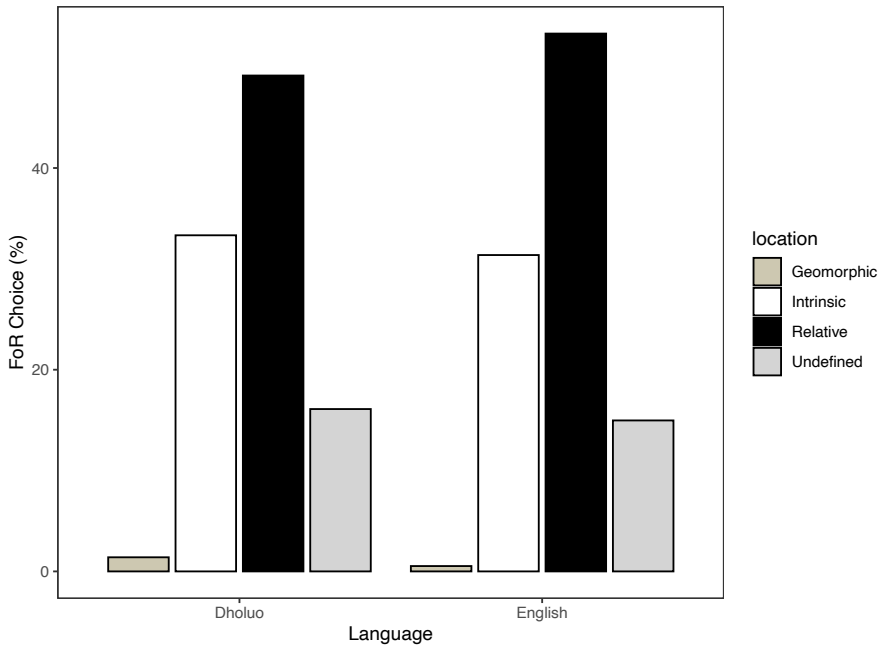

Figure 3: Spatial frames of reference representation across Dholuo and English contexts

the experimenter noticed these difficulties, he would correct the participant and allow the the task to be re-performed.

At other times, the participants themselves sought clarification from each other as to which side was left and which was right. One such instance, where the recreator sought help in interpreting what was meant by *acham* 'left', elicited an interesting response from the director. She rebuked the recreator (who was her friend) for being poor in interpreting the left/right relations because "her mother never taught her Dholuo well". Ironically, in correcting her, she (the director), too, gave a completely wrong interpretation of *acham*.

Crucial to the present discussions is that such misrepresentations of left/right relations were not experienced in the English context.

6 Discussions

6.1 Effects of language context

Following Bylund and Athanasopoulos' (2014, 973) assertion on the possible influence of language context on perceptual distinction, it was hypothesized that language context (in bilingual situations) could influence the choice of FoR. However, as indicated in the previous section, language context had no significant effect. It can be argued that the multilingual setting in which the DEK participants interacted and were educated could be a possible reason for the lack of effect of language context. It is common for Dholuo and English to be used together during a conversation through code-switching, code-mixing, or both, whether in school, home, or other social contexts. Such a shared context of usage may have significantly reduced the effects of language context, to the extent that the degree to which the languages of the multilingual are activated as a result of the bilingual mode (Grosjean 1998) becomes insignificant. For instance, during the task administration exercise, despite prior instructions on which language to use,

some of the participants occasionally drifted from Dholuo to English. The experimenter had to remind them to stick to the language in focus. If, while speaking Dholuo, they drifted seamlessly to English and back, it might indicate that the language context divide has thinned rather considerably.

Regarding the use of left/right relations, Dholuo speakers use *acham* 'left' and *achich* 'right' both to refer to sides of their bodies and in spatial descriptions. It is interesting, though, that using *acham/achich* gave several participants problems, particularly in their interpretations in the Dholuo context (see Section 5.3). The confusion surrounding the usage of left/right relations is not unique to Dholuo. Romero-Méndez (2011, 928) observes that amongst the AyMi speakers, the participants, while using Mixe language, could not tell which side was *akäˀäny* 'left hand' and *anäˀäjny* 'right hand' and therefore failed to make accurate locative and orientation descriptions. Like Dholuo speakers who used English to clarify their meaning, the AyMi participants used Spanish. Dholuo speakers did not exhibit similar confusion when speaking English.

The ease with which the participants used these relations in English and not Dholuo needs to be explained. It is important to note that the confusion is not in identifying which side of the body is right or left, but in the Dholuo terminology that refers to the side in question. It can be argued that the code-mixing characteristics of the Dholuo-English bilinguals mentioned above place these speakers in an environment where certain referents are best expressed in one language or the other. For instance, in the Kenyan context, the concept of left/right relations is introduced in Kenyan schools at the kindergarten level under the subject strand "environmental activities". The subject strands are primarily taught in English, so the strand involving left/right relations would be taught in English, too. Further, it is at the kindergarten stage (age 5–6 years) that children naturally become aware of left/right relations (Petty 2010). The awareness of the concept of left and right, reinforced with the teaching of the same, particularly in English, is bound to bias the children's understanding of these relations in English. It thus explains the ease with which the participant used these relations in English, as opposed to Dholuo.

6.2 Default spatial frames of reference

The results show that Dholuo uses more than one spatial frame of reference in expressing static angular descriptions. Such an outcome is not surprising given the large number of spatial cognition studies from a wide range of languages with similar findings. With the exception of a few languages, such as Guugu Yimithirr (Pama-Nyungan, Australian) and Mopan (Mayan, Belize), which almost exclusively use the absolute and the intrinsic frames of reference, respectively (Pederson et al. 1998; Levinson 2003), the majority of other languages use two or more FoRs for location descriptions. What is most relevant for the present discussion is why, of the two or more spatial frames of reference available in any particular language, there is mostly a primary system (see Section 2.1.2 for a review of studies showing default FoR systems). One underlying factor across the studies reviewed in Section 2.1.2 is that the researchers used the M&T referential communication task for data collection. However, other studies (e.g. O'Meara and Pérez Báez 2011) used the B&C referential communication task. O'Meara and Pérez Báez' study, which involved 13 Mesoamerican languages, reported a default FoR in 12 of the 13 languages investigated. Despite a difference in the referential communication tasks employed, most of the findings from the literature reviewed show the presence of a default system.

It would be expected, therefore, that despite using a different referential communication task in the form of the NMT, the findings from the present study would be comparable to those

of the previous studies. In fact, from Table 2 and Figure 3, it could be concluded that overall, the relative frame of reference is the default FoR.

However, such a conclusion would be premature at this stage. First, it has been observed from the studies reviewed that most of the researchers targeted monolingual participants. Moreover, even in instances where the participants were in a multilingual set-up (e.g. the Seri language) (O'Meara 2011), the multilingual nature of the participants was not overtly expressed or acknowledged. It can be argued that there is a relationship between monolingualism and a default FoR system; that is, the predominance of any one FoR can be explained in terms of its frequent use. If the participants in the present study were monolinguals, the predominance of the relative FoR could be attributed to their monolingual nature. However, as mentioned earlier, all the participants were multilingual, and as such, for the present study, the monolingualism factor fails to hold.

It is important to mention again that an earlier study (Ogelo 2017) involving near-monolingual Dholuo speakers revealed the predominance of the intrinsic FoR. The present study, however, reveals a preference for the relative system amongst DEK multilingual speakers. Could the difference in the FoR predominance between the two studies be a result of the difference in the monolingual/multilingual nature of the participants, or could it be that the relative and the intrinsic systems are equally available to Dholuo speakers and that the difference in predominance is context initiated?

Senft (2001, 545) responded to the latter question by asserting that "languages seem to prefer certain frames of reference in particular contexts that ask for different spatial tasks and that may require different means and ends". The "particular contexts", in reference to the present study, could be the unique nature of the feature categories (UU, FU, and FF), which called for the use of particular FoRs. That explains why the relative system was preferred for the unfeatured-unfeatured and the featured-unfeatured categories, while the intrinsic system was preferred for the featured-featured category across both language contexts (see Table 2).

It can be argued that both the "particular contexts" and the multilingual nature of the participants might have contributed to the overall predominance of the relative FoR. It is important to note that the multilingual nature of the speakers means that they use English,which is heavily relativistic, at almost the same frequency as Dholuo (see Table 1). Frequent and equal use of these languages makes the two FoRs – the relative and the intrinsic – readily available and salient in the speakers' minds. Ultimately, the DEK multilinguals have access to both FoRs at their disposal, which they use equally depending on context (the nature of the stimuli in our case). Therefore, the question of a default system becomes immaterial in the case of Dholuo multilinguals.

7 Conclusion

This study provides a unique perspective on the investigation of spatial frames of reference by foregrounding multilingualism, in contrast to most previous studies, which focus more on monolingual populations. The study reports that the preference for the relative FoR by the L1-Dholuo L2-English multilinguals was partly a result of their frequent usage of the heavily relativistic English language. This contrasts with the findings of an earlier study (Ogelo 2017) of Dholuo near-monolinguals, who showed a preference for the intrinsic FoR. Such an outcome shows that the learning and frequent usage of an additional language to the L1 can influence the choice of linguistic frames of reference.

Therefore, the findings of this study motivate the adoption of a multilingual approach to investigating linguistic spatial frames of reference in languages. In this way, when languages are classified in terms of their default linguistic frames of reference, care is taken to spell out the multilingual or monolingual perspective from which such a classification is made. Consequently, the categorization of linguistic frame of reference preferences that presently dominates the literature, which is based on other factors than the multilingual/monolingual nature of the target populations, may need to be revisited.

List of Abbreviations

1 = first person;2 = second person; 3 = third person; AyMi = Ayutla Mix; BU = Boro-Ukwala; B&C = Ball and chair; CONJ = Conjunction; DEK = Dholuo English Kiswahili; FoR = Frame of Reference; FF = Featured-featured; FU = Featured-unfeatured; GEN = Genitive; INF = infinitive; IPFV = Imperfective; KSN = Kisumu South Nyanza; L1 = First language; L2 = Second language; LOC = Locative; M&T = Man and tree; NMT = New man and tree; OBC = Object centred; SAP = speech act participant; SD = Standard deviation; SG = singular; SM = Subject marker; UU = Unfeatured-unfeatured

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Appendices

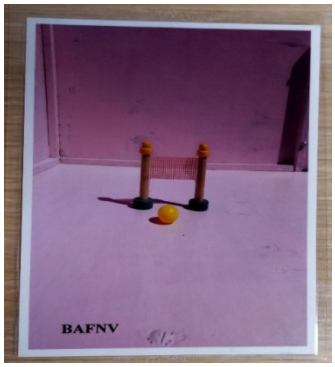
APPENDIX A: Summary of Photo-object Combination

Summary of object combinations

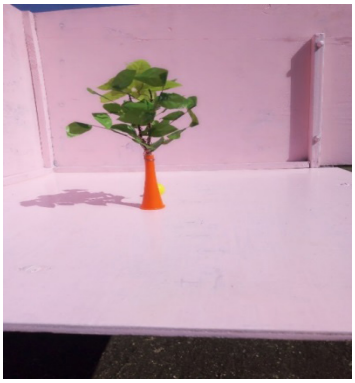
		PICTURE CODE	OBJECTS		EXPERIMENTER'S DESCRIPTION
Category 1		**Stimuli**	**Figure**	**Ground**	**Unfeatured-unfeatured (UU)**
	1	BAFNV	ball	net	Ball front of net, net placed transversely
	2	BABT	ball	tree	The ball is behind the tree
	3	BAFTFAF	ball	tree	Ball front of tree facing front
	4	NLTV	net	tree	Sagittally placed net left of tree
	5	PFNFAF	pole	tree	Pole in front of net placed transversely
	6	TFNFAF	tree	net	Tree front of net placed transversely
Category 2		**Stimuli**			**Featured-unfeatured (FU)**
	1	MFAFBT	man	tree	Man facing front behind tree
	2	MLTFAF	man	tree	Man left of tree facing front
	3	MFTFAR	man	tree	Man front of tree facing right
	4	MLTFAAFT	man	tree	Man front of tree facing away from tree
	5	MRFAT	man	tree	Man right facing tree
	6	MRTFABA	man	tree	Man right of tree facing back
Category 3		**Stimuli**			**Featured-featured (FF)**
	1	COBHFABA	cow	house	Cow behind house facing back
	2	BFAFRCFAR	boy	car	Boy facing front right of car facing right
	3	COFCFAC	cow	car	Cow front of car facing car
	4	LAFAFLCOFAF	lady	cow	Lady facing front left of cow facing front
	5	BFAFFCB	boy	car	Boy facing front, front of car facing boy
	6	COFALHFABA	cow	house	Cow facing left of house facing back
Contact category		**Stimuli**			**Featured-featured (FF)**
	1	BATTA	ball	table	Ball on top of the table
		BOTTA	bottle	table	Bottle on top of the table

Appendix B Photo-object Picture Stimuli

BAFNV



BABT



BAFTFAF

NLTV

PFTFAF

TFNFAF

MFAFBT

MLTFAF

MFTFAR

MLTFAAFT

MRFAT

MRTFABA

COBHFABA

BFAFRCFAR

COFCFAC

LAFAFLCOFAF

BFAFFCB

COFALHFABA

BATTA

BOTTA

Appendix C: Sample Language Background Questionnaire

Language Background Questionnaire

Age: _____
Gender: _____
(1) Please indicate which language(s) you speak and rate your proficiency in each one of them, using the following scale:
1 < - - - - - - 2 - - - - - -3 - - - - - - 4 - - - - - - > 5
Rudimentary Excellent
Language: _____ Self-rated proficiency (1–5): _____
Language: _____ Self-rated proficiency (1–5): _____

(2) Please indicate how often you use these languages in your everyday, oral communication, using the following scale:
1 < - - - - - - 2 - - - - - -3 - - - - - - 4 - - - - - - > 5
Seldom Almost all the time
Language: _____ Frequency of use (1–5): _____ Hours per week_____
Language: _____ Frequency of use (1–5): _____ Hours per week_____

(3) Which language(s) did you learn first, that is, as a baby? _____

(4) If you speak any other languages than the one(s) you learnt first, please indicate which ones, where you learnt them (e.g. school, playground etc.) and at what age you learnt them.
Language: _____ Where it was learnt: _____ Age of learning: _____
Language: _____ Where it was learnt: _____ Age of learning: _____

I hereby give my consent to the data, in anonymized form, being used for research purposes.
Date and signature:_____

Appendix D: Sample consent form

CONSENT TO PARTICIPATE IN RESEARCH

Dear Ms/Mr ……

My name is ……. I am ……..I am conducting a research study on …….. It is in this line that I would like to invite you to participate in this research project.
Please take some time to read the information presented here, which will explain the details of this project and contact me if you require further explanation or clarification of any aspect of the study. Also, your participation is **entirely voluntary,** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.
If you are willing to participate in this study, please sign the attached Declaration of Consent and hand it to the investigator

DECLARATION BY PARTICIPANT

By signing below, I ……..……. agree to take part in a research study entitled ……..and conducted by ……. (Name of Researcher)
I declare that:

- I have read the attached information leaflet and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurized to take part.
- I may choose to leave the study at any time and will not be penalized or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.
- All issues related to privacy and the confidentiality and use of the information I provide have been explained to my satisfaction.

Signed on (Date)……
Signed by (participant)…….
Phone.……

SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to…….. [*name of the participant]*
Signed on (Date)……
Signed by (investigator)……
Phone.……

Appendix E: Sample stimulus in the B&C photo series task

Figure 4: A picture of a ball (figure) and a chair (ground) used in the B&C elicitation task (Adapted from Bohnemeyer 2008