

Investigating Evidence of Linguistic Relativity in Dholuo

Awino Ogelo

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Supervisor: Prof Manne Bylund Spangberg

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Declaration

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Abstract

An age old question within the language sciences has been whether linguistic experience influences how people perceive reality. The possible linguistic influence on thought is what is known as linguistic relativity. Experimentally rigorous psycholinguistic approaches provide an understanding of this kind of relationship between language and thought. These empirical techniques have been adopted in this study to investigate evidence of linguistic relativity in Dholuo.

The study specifically explores relativity effects as evidenced in the behaviour of Dholuo-English-Kiswahili (DEK) multilingual individuals. The investigations were carried out under the linguistic domains of stasis (spatial frames) and kinesis (motion events), both wrapped within the spatial realm. Each of the domains was probed both at a linguistic and a non-linguistic level. A total of two hundred and thirty DEK multilingual speakers were engaged through the photo-object spatial reference frames task, the mirror image task, the verbal motion event construal task and the non-verbal motion event categorization task. Additionally, forty first language (L1) Kiswahili speakers were also engaged through the verbal motion event construal task and the non-verbal motion event categorization task. The latter group was included for comparison. These experiments were conducted under different language contexts; for the DEK group, the spatial reference tasks were carried out both in Dholuo and English; the motion event tasks were performed under Dholuo, English and Kiswahili contexts; while the L1-Kiswahili group performed under Kiswahili context.

The results of the investigations were analysed and interpreted through the theoretical lenses of the thinking-for-speaking hypothesis, the grammatical aspect approach, multicompetence theory as well as cognitive grammar. For the investigations on spatial reference frames, the findings revealed an unrestricted availability of multiple spatial reference frames in Dholuo – a state referred to as “referential promiscuity”. The multiplicity of the spatial reference frames was linked to but not directly attributed to the multicompetence of the DEK participants. The linguistic promiscuous state of Dholuo provides multiple options for Dholuo speakers to spatially encode phenomena in a way that is missing in other languages which have a single spatial frame. This is a case of linguistic relativity at the linguistic level.

In the motion event experiments, the findings revealed that Dholuo construes motion events by focussing on the ongoing phase of the events, a behaviour that is typical of languages that grammatically mark aspectual distinctions. The grammatical aspect hypothesis attributes the preference for the restricted viewpoint to the imperfective (progressive) aspect in these languages.

Dholuo thus aligns with grammatical aspect hypothesis as would be expected of aspect languages. The restricted viewpoint of motion event obligatorily imposed on the Dholuo speakers by the imperfective (progressive aspect) in the language is proof of linguistic relativity at the linguistic level. The L1-Kiswahili group's findings were similar to those of the DEK group.

The study however failed to show sufficient evidence of linguistic relativity at the non-linguistic level for both the spatial reference and the motion event investigations. Instead there was evidence of conceptual convergence due to possibly a shared grammatical category of Dholuo, English and Kiswahili at the non-linguistic level of the motion event tasks.

Samevatting

'n Eeue-oue vraagstuk binne die taalwetenskap is of linguistiese ervaring 'n invloed op mense se werklikheidspersepsie het. Hierdie invloed op die mens se denke staan as linguistiese relatiwiteit bekend. Streng gekontroleerde psigolinguistiese benaderings bied begrip van sodanige verband tussen taal en denke. So 'n genuanseerde empiriese benadering is in hierdie studie gevolg om bewyse van linguistiese relatiwiteit in Dholuo te ondersoek.

Die studie ondersoek spesifiek aspekte van relatiwiteit wat herkenbaar is in die gedrag van veeltalige Dholuo-Engels-kiSwahili (DEK) sprekers. Ondersoeke is onderneem binne die linguistiese domeine van *stasis* (ruimtelike raamwerke) and *kinesis* (gevalle van beweging), wat beide binne 'n ruimtelike omgewing gebeur. Elke domein is in diepte op beide 'n linguistiese en 'n nie-linguistiese vlak ondersoek. Altesaam tweehonderd en dertig veeltalige DEK sprekers is by die uitvoer van verskeie opdragte betrek: binne 'n ruimtelike foto-voorwerp verwysingsraamwerk, met 'n spieëlbeeldtaak, met verbale interpretasie van 'n geval van beweging, en met die kategorisering van 'n nieverbale beweging. Hierby is 'n bykomende veertigtal eerstetaal (L1) kiSwahili sprekers betrek by verbale interpretasie van 'n geval van beweging, en by die kategorisering van 'n nieverbale beweging. Laasgenoemdes is as kontrolegroep betrek. Hierdie ondersoeke is onder verskillende toetsomstandighede uitgevoer; vir die DEK group is die ruimtelike verwysingsraamwerktaak in beide Dholuo en Engels uitgevoer; die taak om 'n geval van beweging verbaal te interpreteer is binne Dholuo, Engels en kiSwahili kontekste uitgevoer; terwyl die L1-kiSwahiligroep slegs binne 'n kiSwahili konteks opgetree het.

Die bevindinge van hierdie ondersoek is ontleed en geïnterpreteer aan die hand van verskeie teorieë: die dink-om-te-praat hipotese, grammatiese aspekbeskouing, multivaardigheidsteorie, en kognitiewe grammatika. By die ondersoek van ruimtelike verwysingsraamwerke is gevind dat daar 'n onbeperkte veelvoud van ruimtelike verwysingsraamwerke in Dholuo beskikbaar is – 'n geval van sogenaamde “linguistiese promiskuiteit”. Hierdie onbeperkte veelvoud van ruimtelike verwysingsraamwerke hou verband met die multivaardighede van die DEK deelnemers, maar is nie die direkte gevolg daarvan nie. Die linguisties promisku staat van Dholuo bied 'n veelvoud van geleenthede aan Dholuo-sprekers om dinge in ruimtelike verband vas te pen, 'n aspek wat eenvoudig ontbreek in tale met slegs 'n enkele ruimtelike verwysingsraamwerk. Dit is dus 'n geval van linguistiese relativiteitswiteit op 'n taalvlak.

Met ondersoeke van bewegingsinterpretasies is bevind dat Dholuo gevalle van beweging interpreteer deur aandag te gee aan die onvoltooide aspek van sodanige beweging, gedrag wat eie is aan tale wat onderskeid in grammatiese aspek aantoon. Die grammatiese aspekbenadering skryf hierdie voorkeur vir 'n beperkte vertrekpunt toe aan die voorkoms van onvoltooide

werkwoordvorme binne hierdie tale. Dholuo pas dus in by die grammatiese aspekbenadering , soos te verwagte by tale waar werkwoordelik aspek die klem dra. Die beperkte interpretasie van enige bewegingsmoment wat noodwendig op Dholuo-sprekers deur die onvoltooide aspek van werkwoorde binne die taal afgedwing word, toon linguistiese relatiwiteit op taalvlak. Bevindinge by die L1-kiSwahili groep stem met dié van die DEK groep ooreen.

Die studie kon egter op die nieverbale vlak nie genoeg bewyse vir linguistiese relativiteit by ruimtelike verwysing of by bewegingkategorisering vind nie. Daar was eerder bewyse van denkooreenkomste, waarskynlik danksy 'n gedeelde grammatiese kategorie op nieverbale vlak by die bewegingsgeval ondersoek binne Dholuo, Engels en and kiSwahili.

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List of Abbreviations

H	-	Downstepped high tone
1	-	First person
2	-	Second person
3	-	Third person
ACC	-	Accusative
CNC	-	Concurrency marker
CONJ	-	Conjunction
EMP	-	Emphasis
H	-	High tone
IMP	-	Imperative
IND	-	Indicative
INF	-	Infinitive
IPFV	-	Imperfective
IPST	-	Immediate past
L	-	Low tone
LOC	-	Locative marker
NC1	-	Singular noun class marker
NC2	-	Plural noun class marker
NOM	-	Normative
NPROG	-	Non-progressive
OBJ	-	Object marker

PASS	-	Passive
PFV	-	Perfective
PL	-	Plural
POSS	-	Possessive
PRF	-	Perfect
PROG	-	Progressive
REL	-	Relative pronoun
RPST	-	Remote past
SG	-	Singular
SUBJ	-	Subject marker
VBC	-	Verbal crutch

CHAPTER 1

INTRODUCTION

1.1. Introduction

Section 1.2 introduces the background, rationale and problem statement of the study. The subsequent sections 1.3 and 1.4 enumerate the objectives and research questions of the study respectively. Following this is section 1.5 which briefly introduces the research design. Sections 1.6 and 1.7 provide a brief background on Dholuo and Kiswahili respectively. The final section, 1.8, delineates the organization of the dissertation.

1.2. Background, rationale and problem statement.

The idea that language shapes thought, known as linguistic relativity, has been a subject of empirical research and discussion in several academic fields that goes back centuries, as far as the writings of philosophers such as Wilhelm von Humboldt (1767-1835). This notion is closely associated with Edward Sapir and his student Benjamin Lee Whorf, who suggested that linguistic categories have a bearing on the construction of a speaker's perception of the world. The ebb and flow of the relativity debate over the years has brought with it staunch supporters, such as Hymes (1985), and fierce critics, such as Pinker (1994). Contemporary work on linguistic relativity adopts controlled experimental methodologies that focus on the potential influence of linguistic categories on specific aspects of cognition.

Whereas there has been a resurgence in linguistic relativity research, African languages have received minimal attention in this area. Henrich et al. (2012) lament over the tendency of most researchers to focus on the Western Educated Industrialized Rich Democratic (WEIRD) populations upon whom they make general conclusions regarding the world's languages. Such conclusions risk being biased since specific ecologies within each language are not considered. The need to change this narrative, albeit in my small way, has motivated my choice of Dholuo, a Western Nilotic language primarily spoken in Kenya, for this study.

Two interrelated goals are achieved by the study. Firstly, I seek to delve into the under-researched domain of multilingual cognition. More than eighty languages from over forty

ethnicities are spoken in Kenya (Eberhaud et al., 2021). Like most African countries that have adopted their colonialist's language as an official language (Oostendorp, 2012), Kenya has done so with English. In most cases, a child is exposed to their mother tongue, e.g. Dholuo, at home but learns English and Kiswahili in school. Students get exposed to other languages at higher levels of schooling since they may interact with peers from different linguistic backgrounds. Such a rich linguistic environment makes a compelling case for a domain-based study of motion and spatial frames in Dholuo-English-Swahili multilingualism. The second goal of the study is to explore relativity effects in Dholuo regarding the perceptual domains of motion and spatial frames, within this multilingual environment. The choice of these perceptual domains is moreover motivated by the fact that there is ample relativistic research on them, thus providing a solid base of comparison for the findings generated in the dissertation at hand.

The study's focus on proficient Dholuo-English-Kiswahili (DEK) multilinguals provides a very interesting prospect that defines the novelty of our investigation. On the one hand, previous studies on spatial frames have mostly focussed on bilinguals who speak languages that are predominantly extrinsic (L1-absolute spatial frame and L2-relative spatial frame and vice versa). The DEK individual, however, brings together three typologically distinct languages with mixed spatial frames manifestations. Dholuo and Kiswahili tend to oscillate between extrinsic and intrinsic categories while English is predominantly extrinsic. On the other hand, previous studies on the relationship between motion event construal and grammatical aspect have focused on bilinguals with a linguistic background comprised of languages with both aspectual and non-aspectual properties (L1-aspect language and L2 non-aspect language, and vice versa). However, in our case, Dholuo, English and Kiswahili are all languages with grammatical aspect even though the aspectual manifestation in each of the three languages varies. To the best of my knowledge, variations and combinations of this nature have not been explored before

1.3. Research objectives

The two previously mentioned goals of this research are addressed through the following two objectives:

- i) To investigate the influence of Dholuo grammatical and lexical categories on the cognitive processing of motion and spatial frames amongst Dholuo speakers comparing this to documented findings of the same categories from other languages.
- ii) To determine the extent to which the multilingualism of Dholuo speakers modulates such an influence.

1.4. Research Questions

The above mentioned objectives have been crystalized into four basic research questions:

- i) What is the relationship between Dholuo verb aspect and motion event categorization in DEK multilinguals?
- ii) To what extent does language context influence DEK multilinguals' choice of spatial frames of reference?
- iii) To what extent do features of multilingual experience such as proficiency and frequency of use influence patterns of construal and categorization?
- iv) Do the domains investigated in Dholuo within this study yield the same results documented for other languages with similar linguistic categories?

1.5. Study design and methods

This section briefly introduces the research design and main methods used in the study. Note that an exhaustive description of the study design and methods is presented in chapter four.

The study adopts a cross-sectional experimental research design that uses comparison groups (Alison & Gass, 2005, p. 146) for data elicitation and interpretation. The cross-sectional approach was important because the investigation focussed on a language related phenomenon which is specific to a particular group of people. The experimental design was preferred because it yields controlled data, with the risk of confounding variables significantly reduced. Additionally, the findings from the experiments should hold for other members of the population

with similar background characteristics such as other DEK multilingual speakers. Further, the use of standardised experimental procedures means that the findings from the study were comparable to other findings from similar investigations carried out in the past. This comparative angle aligns with research question four.

The quantitative approach was the primary method used in the study. It involved analysing the numerical data both through descriptive and inferential statistical techniques.

1.6 Brief background to the Dholuo language

Dholuo is a Western Nilotic language spoken in Kenya and Northern parts of Tanzania by the Luo people. The current number of the Luos in Kenya stand at slightly over five million (11% of the total population) (KNBS, 2019). Most of them are found in the Kisumu, Siaya, Homabay and Migori counties in Western Kenya. 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 grammar, vocabulary and phonology (Stafford, 1967). The KSN is considered the standard dialect since it is found in most of the Luo literature such as the bible and elementary school readers. It also has a wider geographical area of usage and is the preferred dialect for radio broadcast. The dissertation adopts the KSN dialect.

1.7. Brief background to the Kiswahili language

Kiswahili is a Bantu language of the Niger-Congo language phylum spoken in a number of countries in the Eastern, Central and Southern parts of Africa. In Kenya, it is a native language to the Swahili people from the Coastal region. It is a national and an official language. It is taught as a compulsory subject in both primary and high schools. It can be considered as an L1, L2 or L_n to almost every adult in Kenya.

1.8. Organization of the Dissertation

The dissertation is organized into eight chapters. Chapter two introduces the overriding hypothesis investigated in the study – linguistic relativity. Its genesis, growth over the years and present state are discussed. This exposition is done through a review of the previous studies done across several linguistic domains within the spatial realm. Particularly, previous studies

concerning the interaction between multilingualism and linguistic relativity are examined and the findings presented.

Chapter three introduces the theoretical frameworks upon which the findings of this dissertation are interpreted. Accounts such as the thinking-for-speaking hypothesis, the grammatical aspect approach, and multicompetence, along with the theoretical underpinnings of spatial frames, are explained in detail. Included in this chapter, under the section of aspect, is a brief description of aspectual oppositions in both Dholuo and Kiswahili.

Chapter four expounds on the cross-sectional experimental research design as used in the current study. Several aspects of the quantitative approach are mentioned and explained throughout the chapter. The various ways in which the classification, coding, analytic procedures etc., are applied in the analysis of the findings are clearly stipulated in the various sub-sections of the chapter.

Chapter five and six present the analysis of the findings from the data. The former specifically deals with all the analysis concerning the spatial frames while the latter is concerned with motion events categorization. These findings are analysed through both descriptive and inferential statistics. Relevant examples are drawn from the data to supplement the findings and enrich the analysis.

In chapter seven, the results of the analysis from chapters five and six are discussed. The theories earlier mentioned are used to interpret the results and draw conclusions tying them to the research questions.

Chapter eight provides the conclusion to the study. The goals of the study are revisited and the manner in which they have been achieved indicated. Recommendations for future studies are also mentioned at the conclusion.

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

This chapter introduces the concept of linguistic relativity which is foundational to the dissertation. The literature review offers a detailed account of the historical developments of research on linguistic relativity and multilingualism, foregrounding the previous empirical studies that have defined both fields. The chapter therefore shows a relationship between linguistic relativity and multilingualism encapsulated within the realm of spatial domain.

Section 2.2 traces the development of linguistic relativity from conception, underlining the crest and troughs that have riddled its path over time. The section that follows, 2.3, introduces research on multilingualism briefly mentioning its history within the Kenyan context and focalizing on the past empirical studies related to it. The subsequent section, 2.4, concerns a detailed review of the sub-domain of spatial reference frames. In section 2.5, a review of motion has been undertaken extensively. The last section, 2.6, concludes the chapter and introduces chapter three.

2.2. Development in the fields of linguistic relativity

2.2.1. Definition of the Sapir -Whorf hypothesis (SWH)

The Sapir-Whorf hypothesis (SWH) is a decades-old concept traceable to disciplines such as linguistics, anthropology, and psychology. It is commonly understood to refer to the idea that language influences thought processes. Most researchers associate the Sapir-Whorf hypothesis with the two personalities from whom it derives its name: Benjamin Lee Whorf and his mentor Edward Sapir. Interestingly, neither Sapir nor Whorf would have envisioned that their ideas would birth a proposition considered as a hypothesis (Everett, 2013; Hill & Mannheim, 1992; P. Lee, 1996). Some scholars, especially in anthropology, argue that SWH is an axiom immune to refutability (Hill & Mannheim, 1992) while those in linguistics regard it as ‘a fact discovered by linguistic analysis’ (Scholz, Barbara C., Pelletier, Francis Jeffry and Pullum, 2021). These two cross-discipline perspectives on SWH are a fraction of its existing viewpoints in the literature.

Sifting through the lot, I will present the current psycholinguistic position on SWH as advanced by most scholars in the field. The labels Sapir-Whorf hypothesis (SWH), linguistic relativity principle, linguistic relativity hypothesis and linguistic relativity are used herein interchangeably.

Penn (1972: 13) observes that Whorf's linguistic relativity principle is ambiguous and can mean one of two things depending on the interpretation it is given. Language can either determine (restrict or magnify) thought (strong SWH) or it can merely influence thought processes by slightly restructuring it (weak SWH). Whereas the former has been completely debunked (Gumperz & Levinson, 1996, p. 22), the latter has received criticism from some quarters for being banal rendering testability invalid (Pinker, 1994, p. 65). This dissertation however, is not necessarily aligned to any of the versions but follows on the premise of what Enfield (2015, p. 212) describes as areas within linguistic relativity that 'are methodologically more tractable, conceptually more coherent and empirically more promising.' First though is brief history of how SWH developed.

2.2.2. History of SWH

A number of studies cite the intergenerational trio of Franz Boas, Edward Sapir and Lee Whorf as the leading scholars credited for accentuating the concept of linguistic relativity. While that may be true, the metaphysical idea relating language to cognition transcends centuries.

Philosophical comments on thought and language by great classical thinkers such as Plato (428-348 BCE) have been unearthed (Everett, 2013, p. 9). Plato's tutee Aristotle (384-322 BCE) held that the aesthetic nature of poetry hidden behind ordinary language has the profound effect of creating a lasting impression on the minds of the listeners. He believed that political rhetoric could massively sway how the populace thought about particular social agendas (Neill, 2015, p. 1). These and a number of other philosophers contributed chiefly to the growing ideas surrounding the relationship between culture, language and thinking.

Other notable scholars whose works touched on language and thought interaction include Immanuel Kant (1724-1804), Johann Hamman (1730-1788), Johann Herder (1744-1803) and Wilhelm von Humboldt (1767-1835). The German polyhistor, von Humboldt, particularly stands out as an 18-19th C core contributor to the debate on the relationship between language and thought. He posits that an individual's grammar points to the person the aspects of the world

unnoticeable from the lens of a different language (Neill, 2015, p. 1). Specifically, he asserts that language and thought are not autonomous entities but a united inseparable whole (Joseph et al., 1988, p. 54). This assertion mirrors what later became the deterministic version of SWH.

In the sections that follow, the contributions of the aforementioned intergenerational trio will be briefly highlighted showing how their ideas are interconnected, eventually developing into what is presently called the SWH.

(a) Franz Boas (1858–1942)

While it is not certain that Humboldt's perspective on the relationship between cognition and thought had a direct impact on Boas's stance on language-thought interaction, it is possible that he interacted with Humboldt's writing. One of Boas's standout observations in relation to language centred on the classification of experience. He noted that through grammatical and lexical categories, language can group experience. This he explained was possible since languages have different grammatical compositions hence are likely to classify experience differently (Lucy, 1992: 12; Neill, 2015: 2)

Using his knowledge of Inuit and other languages, he generated a number of examples to demonstrate the role that language plays in carving up experience depending on their grammatical and lexical make ups. One such example was his famous claim that the Inuit have different names for snow depending on the situation compared to English where the same phenomenon would be represented by a single word (Neill, 2015, p. 3). Overall, Boas seems to suggest that although there is so much that is similar amongst individuals from varying cultural backgrounds, their respective languages mirror the mental reality (experience) lived by the speakers. Even though he did not explicitly equate language to thought or that language directly determines thought, his arguments concerning the role of language on experience (perception) was an important foundation for the idea of linguistic relativity.

(b) Edward Sapir (1884–1939)

Edward Sapir devised a more empirically sound approach in investigating and analysing not only linguistic data but other cultural materials that he encountered during his numerous fieldworks. Some of the important positions shared between Sapir and Boas are highlighted here. First, he

affirms Boas's position on the ability of language to classify experience. He further emphasizes that the connections of different language forms within a language system, point to the same interrelatedness of experience within a speaker which such forms represent. Second, he supports Boas' observation that different languages may express the same concept differently and that linguistic experience is automatic and unconscious. Third, Sapir like Boas before him believed that there is a connection between all humans that transcends any cultural boundary, a psychological commonality or as Boas referred to it *the psychic unity of mankind* (Everett, 2013, p. 11; Lucy, 1992b, p. 21). Last and most importantly, both polymaths shared perspectives concerning the relationship between culture, language and by extension experience (thought). They both noted the strong influence that culture has on the form that a language takes, that is 'cultural relativity' (Everett, 2013, p. 11).

Sapir emphasised on the need to study languages within their cultural and social contexts. He believed that language aids in the understanding of social reality within a particular cultural niche since it bears imprints of the culture in question. If we regard social reality as similar to perception (thought) then according to Sapir, 'the societal patterns called words' (Sapir, 1949, p. 62) seem to act as funnels that channel these thoughts. Unlike Boas who held that linguistic categories reflect perceptual experience, Sapir considered them as 'guides to objective understanding of the nature of experience'. This he called 'the relativity of the form of thought' (Sapir, 1949, p. 159). Sapir, like his teacher Boas, did not overtly consider language to be identical to thought. He however acknowledged the role of culture through language in shaping speakers' experience of social reality (Sapir, 1949, p. 162)

Viewed in context of his writings, most of Sapir's assertions concerning language and culture and their impact on perception fit within his overall paradigm of cultural relativism. The details of his works however reveal a close connection to what would later be branded the linguistic determinism. One of his most ardent admirers and student Lee Whorf, picking up the cue and using specific comparative linguistic data, presented what he (Lee) called the linguistic relativity principle.

(c) **Benjamin Lee Whorf (1897–1941)**

Whorf's unmatched passion for languages saw him make an indelible impression in the field of linguistics – an area that was never part of his professional career to begin with. A trained engineer, Whorf used his skills from the hard sciences to study languages, slicing them apart with precision and thoroughness only comparable to his mentor Edward Sapir. Prior to 1931, when he made formal contact and became a student of Edward Sapir at Yale, Whorf had worked on the Aztec (Nahuatl) and Maya languages untutored. He presented papers at several conferences, published scholarly articles, and even won a prestigious fellowship.

Whorf concluded much like Sapir before him that the grammar of a linguistic community is closely related to the culture of that particular community. For instance, the Hopi grammar bears a resemblance to the Hopi culture and so is the grammar of the European languages to the Western culture. He however puts a caveat that this relationship between language and culture is not that of 'correlation' but of 'a connection' (Whorf, 1956, p. 159). Whorf points out that those habitual notions such as time and matter depend on the linguistic categories from which they have been carved and would therefore signify different experiences depending on the speech community.

His most famous quote, which he later refined as;

We are thus introduced to a new principle of relativity which holds that all observers are not led by the same physical evidence to the same picture of the universe, unless their linguistic backgrounds are similar or in some way calibrated. (Whorf, 1956, p. 14)

has been at the centre of debate surrounding SWH. Whorf, unlike his predecessors, used linguistic data to draw conclusions thus presenting a more empirically improved position. Like most scholars have rightly noted, Whorf's position does not explicitly root for the deterministic view of languages which alludes to language variations being equal to differences in cognitive abilities (Everett, 2013, p. 18; Kay & Kempton, 1984, p. 76).

In summary, this background has attempted to piece together bits of suggestions, comments, suppositions, statements etc., made by multifarious commentators across the ages relating to language, thought and culture. This is in a bid to build a historical framework against which the

linguistic relativity principle has been deciphered. One can view Whorf as the final descrambler of the interwoven lingo-cognitive ideas that have accumulated across generations. His work represents a stage where all the loosely attached relativistic propositions floating all over the linguistic atmosphere over the years, have found ground, perched and metamorphosed into a well-grounded principle. Much current research on language and cognition have borrowed ideas from Whorf's postulations.

2.2.3. Criticism of SWH

The post Second World War period saw a general revival of research across various disciplines including psychology, anthropology, and linguistics. Whorf and Sapir's close associates brought both scholars' work to the limelight with the publication of Sapir's collection in 1949 and the reprinting of some of Whorf's writing in 1950 (Lucy, 1992b, p. 69). This and the emergence of the field of psycholinguistics as a discipline generated a lot of interest in linguistic relativity.

There was an urgent need to re-evaluate and reframe Whorf's proposition into a scientifically sound and testable hypothesis. Around mid-20th Century, a number of anthropology conferences were held where Whorf's work among others was discussed, leading to the coinage of the Sapir-Whorf hypothesis expression by Harry Hoijer in 1954. The SWH was further helped by Carroll's (1956) publication of a collection of selected writings of Whorf. The period that followed saw linguists, psychologists and anthropologists immerse themselves into empirical studies to investigate the relation between language and cognition

The rapid rise in interest in SWH did dissipate as the second half of the century progressed. Several factors contributed to this sudden inattention to SWH by majority of scholars interested in language, cognition, and culture. The factors culminated into numerous criticisms emanating both from the scientific community and the lay population.

First, according Lucy (1992b, p. 3), linguistic relativity principle suffered the injustice of being oversimplified. It was interpreted either as 'thought depends entirely on language' which was seen as too deterministic or that 'some structures of language may affect how one thinks' which was banal (Pinker, 1994, p. 65). A deterministic perspective of SWH implied that people from different ethnic backgrounds were cognitively different. Such a view at the heart of the Civil

Rights Movement in the US was regarded as containing racial undertones. The alternative perspective on the other hand was seen as too obvious with no empirical weight. Depending on how one interpreted the SWH, it simply appeared too unattractive to be embraced by most researchers.

Second, the racial sensitivity associated with the deterministic reading of SWH, among other variables, made the emerging Chomsky's (1965) linguistic universals more socially palatable. The theory proposed that fundamental units of grammar are available to every child at birth irrespective of their environment. This meant that linguistic variation only existed at the surface and that all humans had more or less similar underlying grammar. Contrary to the popular deterministic interpretation of SWH at the time, Chomsky's argument seemed to advocate for sameness across the racial divide which was a socio-politically sound view. Furthermore, as Everett (2013, p. 21) notes, most researchers' belief that grammars are essentially similar across languages seemed to have discouraged them from initiating detailed analysis of different languages. The chance to ascertain each language's unique property and their possible consequent impact on perception was therefore lost, dealing a blow to linguistic relativity.

Third, scholars found fault in some of Whorf's linguistic evidence. Clark & Clark (1977, p. 554) point out that most of Whorf's evidence supported superficial differences that were missing at close scrutiny. They further claimed that some of the examples that Whorf gave to back up his claims were either exaggerated, such as the case of the Inuit's seven labels of snow (Everett, 2013, p. 25; Pinker, 1994, p. 64; Pullum, 1991, p. 163), or inaccurate as the case of the Hopi time. After what he called 'a long and careful study and analysis' (Whorf, 1956, p. 57), Whorf had concluded that the Hopi language contained no grammatical or lexical structures that denoted time. He referred to Hopi as a timeless language (Whorf, 1956, p. 216). These apparent provocative findings aroused curiosity amongst researchers, but it was not until Malotki's (1983) work on the Hopi time that the claims were properly verified. After a four year ethnographic study of the Hopi temporal aspects, Malotki (1983, pp. 629–630) concluded that Whorf was widely off the mark. Assertions that the Hopi preferred ordinal to cardinal time labels (Whorf, 1956, p. 148), that there were no time metaphors in the Hopi language (Whorf, 1956, p. 146) and the general conclusion that Hopi language is timeless (Whorf, 1956, p. 216) were all false. Lee

(1996) however points out that Malotki's (1983) comments on Whorf's work on the Hopi language appeared to be based on misinterpretation of what Whorf actually said.

Fourth, a number of researchers interested in SWH raised valid objections to Whorf's methodology. Whereas he was applauded for having data to back up his arguments unlike some of his predecessors, he was criticised for depending on linguistic data to interpret non-linguistic phenomenon. The downside of such was ending up with a circular argument (Casasanto, 2008: 67; Enfield, 2000: 125; Everett, 2013: 23). Of course, linguistic data was important, and conclusions could be drawn from it but there ought to have been some non-linguistic evidence to back up the conclusions drawn on the basis of the verbal data. Lucy (1992b, p. 61) however argues that a systematic and thorough study of Whorf's work does reveal a great deal of non-linguistic evidence. Lucy (ibid) further points out that the potpourri of programmatic examples presented by Whorf may easily lose the reader, hence the popular belief that his arguments were circular. It can however be argued that, against Lucy's claim of programmatic examples, a closer examination of such examples reveal anecdotal data lacking controlled elicitation or thorough ethnographic analysis.

Lastly, since it was - and still is - difficult, impossible even, to separate culture from language, it would have been inaccurate to conclusively credit language alone with relativistic effects on thought. Culture has a profound effect on language and the converse is true to an extent. Both entities seem to be interdependent but still somewhat autonomous. The question therefore was, if language influenced perception, where did that leave culture? There still exists, as Everett (2013, p. 24) observes, a gaping methodological deficiency in as far as linguistic relativity investigations is strictly restricted to a language versus thought affair.

It is important to highlight these criticisms to understand the intellectual climate which helped refocus the conversation to a new direction birthing the current relativistic debate. Be that as it may, it was not all gloomy for the relativity principle as there were also proponents who advocated for it.

2.2.4. Support of SWH

Amid the opposition from some quarters, there was significant research on linguistic relativity from early proponents. One such work was conducted by Brown & Lenneberg (1954). They sought to investigate the idea that different lexical items indicated differences in cognition. They used the domain of colour and concluded that codability was related to one's ability to recognise colours. The study pioneered work on linguistic relativity in the domain of colour and was heralded as a milestone in exploring the relationship between language and thought. Clark & Clark (1977, p. 555), however, comment that Brown & Lenneberg's (1954) work on colour was based on the assumption that language divides and interprets colour arbitrarily, which according to them was faulty. Regier & Kay (2009) found that the division of colour space is in part conventions and in part biological. The convention divide concerns the relativistic and universal views already mentioned. The biological aspect concerns the impact of physiology of vision; for instance, the finding that language may affect colour perception primarily in the right visual field and less so in the left (Regier et al., 2010)

Lucy (1992: 70–82) explored the writings of three researchers who empirically investigated the linguistic relativity principle. These early proponents of linguistic relativity were Dorothy Lee (1944), Madeleine Mathiot (1962) and Harry Hoijer (1951).

Lee's (1944) work was more aligned towards cultural relativism than linguistic relativity though it is associated with the latter. She believed that the relationship between thought and culture was two-way, both influencing one another. She conducted a research on the Wintu language spoken in North Carolina, United States. She analysed in detail several aspects of the Wintu language leading to the conclusion that reality as perceived by the Wintu people was unique to the cultural orientation of the people. Language to her, mirrored a people's cultural perspective and that through language, the cultural worldview of a community could be perceived. Mathiot (1962: 341), on her part, hypothesized about the cultural function of linguistic categories. She emphasised the importance of perceptual criteria in classifying experience in Papago language and culture. As for Hoijer (1951), his work on the linguistic categories vis a vis the thought process of Navaho stood out as a particularly empirically sound investigation. From his research,

he concluded in part that language has a role in influencing habitual thought, mirroring Whorf's own conclusion.

Lucy (1992b, pp. 82–83) observed that these three scholars were key in publicizing the linguistic relativity principle. Crucially, however, he notes that they used what he calls the *lingua-centric* approach to the study of linguistic relativity. They did prioritize the use of verbal evidence and those who attempted to provide non-linguistic data fell short of the goal.

Berlin & Kay's (1969) *Basic Colour Term* work, which suggested a pattern of basic colour terminologies evidence across languages appeared to have been the death knell to the research in linguistic relativity. However, even with a two-decade apparent lull between 1970 and 1990 in the academic sphere, there were still a few important linguistic relativity studies which either directly or indirectly contributed to the current research on linguistic relativity. Such contributions included the works of Hymes (1966), Bowerman (1978), Silverstein (1979), Comrie (1981), Bloom [1981]), Kay and Kempton [1984], Givón (1984) and Bybee (1985). These works maintained a steady albeit low momentum that peaked at the turn of 1990's, signalling a shift in direction of empirical research on linguistic relativity.

2.2.5. Sapir-Whorf hypothesis - Post 1990s

Many significant publications in the early 1990s lay ground for current research on linguistic relativity. The publications were a result of empirical investigations across domains such as colour, space, time, motion, gender, and event construal. Some of the contributions included the works of Lucy (1992a, 1992b, 1996, 1997), Lee (1996) and Levinson (1996, 2004a, 2004b)

Lucy's (1992b, 1992a) work particularly stood out as largely influential. Lucy, (1992b) gives a comprehensive review of linguistic relativity tracing its development from Boas to Whorf. He analyses the subsequent attempts by researchers across disciplines to replicate Whorf's investigation, picking out their strengths and weaknesses. Further, he highlights the major methodological flaws realized in past empirical studies. Such flaws included the use of one language as a case study, basing the research on less significant language categories, and failure to treat aspects of language equally in comparative studies (Lucy, 1996, p. 36). He concludes by proposing a raft of measures necessary for a change in the approach to investigating the

linguistic relativity hypothesis. Such a reformulation was important as it narrowed the focus of the hypothesis and set the standard for acceptable evidence. In other words, it gave the hypothesis *a body and life* (Lucy, 1992a, p. 153).

Lucy (1992a) is a case study that employs an improved methodological approach as outlined in the Lucy (1992b) companion. He conducted a morphosyntactic analysis (of nominal number marking) involving Maya and American English and the corresponding cognitive assessment to identify the possible effects as a result of the linguistic differences of the two languages. Lucy's (1992a) ethnographic work aimed to achieve two objectives; to investigate the presence or lack of a connection between language patterns in Maya and English and the corresponding cognitive responses, and to operationalize the reformulated methodological framework proposed in Lucy (1992b). He seemed to have succeeded in both.

Lee (1996) extensively explored Whorf's work, revealing not just his unpublished writings but also some biographical information not captured by Carroll in Whorf (1956). Lee traced the development of Whorf's linguistic relativity principle highlighting a number of researches in the said field. She advanced the idea that Whorf's work was a meshwork of interrelated theoretical strands and not a mere hypothesis as had been perceived by many a researcher of linguistic relativity. Her clarion call was for the 'Neo-Whorfians' (Pavlenko, 2005, p. 435) to regard the linguistic relativity principle as 'the Whorf theory complex' (Lee, 1996, p. xiv) and treat it so. This way, she argued, as researchers progressively reformulated new and nuanced approaches to investigate linguistic relativity, they would do so minus losing the original position advanced by Whorf.

Lastly, a review of most of the neo-Whorfians' works reveals *inter alia*, that the traditional oversimplification of the linguistic relativity hypothesis to linguistic determinism versus linguistic relativity has been abandoned by the researchers (Oostendorp, 2012, p. 30; Pavlenko, 2005, p. 435). It has also been realized that the linguistic relativity research cuts across several disciplines - from linguistic anthropology, comparative psycholinguistics, anthropology to cognitive psychology. Such an interdisciplinary nature of research means different areas of interest and different subsequent interpretations of the various findings.

To sum, as Everett (2013, pp. 18–19) comments, most of the current relativistic research have traces of Whorf's ideas but the connection is most likely a disjointed one. As previously mentioned, Whorf's work is foundational and has provided a crucial background for the present empirical work on linguistic relativity.

2.3. Development in the field of bilingualism

This section presents a working definition of bilingualism, traces the history of the study of bilingualism and highlights notable empirical studies that have been undertaken in the field over the past years

2.3.1 Operationalizing bilingualism

The term multilingualism is used in some literature as an umbrella word for the concepts of bilingualism and trilingualism. It is not surprising therefore to find the labels multilingualism and bilingualism used interchangeably in most second language learning studies. However, it is important to note that there are efforts by scholars such as De Angelis (2007) to carve out an independent field of study solely for multilingualism. This group of scholars fault researchers in bilingualism for lumping both sets of phenomena together and treating them as one. They argue that any additional language learnt by an individual (e.g., L2, L3, L4) has a unique impact and should be considered independently.

While appreciating the concerns of De Angelis and others in their quest for a field distinction between the two, this dissertation's theoretical considerations and interpretation of findings is based on a synonymous relationship between bilingualism and multilingualism. Both will therefore be treated as similar.

There are variables that dictate the way bilingualism is perceived hence the difficulty in pinning it to any particular definition. These variables include such features as age of acquisition, social status of the language, among others. In most literature, the definition of bilingualism is based on two major parameters – proficiency and use.

2.3.2. Definition of bilingualism based on proficiency

One of the earliest proficiency based definitions of bilingualism was put forth by Bloomfield, (1933: 56) who regarded it as the ‘native-like control of two languages’. Bloomfield’s definition was based on the assumption that language nativeness equalled the highest possible degree of proficiency and competence. A successful bilingual therefore was one who exhibited this degree of proficiency in both languages.

A prevalent perception of bilingualism which is closely tied to Bloomfield’s definition is the fractional (monolingual) approach. According to this view, the bilingual is a composite of two separate monolinguals with equal competence of either language. Even though this approach does not emphasize on highest degree of proficiency as the previous one, it focusses on distinctness and complete separation of the two languages in the mind of the bilingual. The fractional approach has mostly had a negative connotation regarding bilingualism. First, with its insistence on equal proficiency, majority of less proficient users of more than two languages seem to have been locked out. Second, since each language of the bilingual is treated independently, there is always the temptation to investigate either language separately in psycholinguistic or sociolinguistic spheres. Such an approach stifles the focus on a possible interactive mechanism between the two languages.

Haugen, as cited in (Mackey, 1962) later broadened Bloomfield’s definition by referring to bilingualism as the phenomenon that enables an individual to be fluent in one language and be able to produce complete meaningful utterances in other languages. A closer look at both Haugen’s and Bloomfield’s definitions paints a picture of a continuum in a bilingualism spectrum. Bloomfield’s restrictive definition occupies one end of the continuum while Haugen’s open ended one occupies the other end.

2.3.3. Definition of bilingualism based on usage

A different way of defining Bilingualism is based on language usage. Weinreich (1953) defines bilingualism as the practice of alternately using two languages. He argued that both languages exist independently in the mind of the speaker, occupying distinct positions. Mackey (1962) considers bilingualism to refer to the alternate use of two or more languages by the same

individual. Grosjean (2008) on the other hand refers to it as the regular use of two or more dialects/languages. The use-based proponents argue that their approach is much more inclusive since using a language implicitly means having some level of proficiency in it.

It is generally agreed in the literature that both language proficiency and language use play a crucial role in defining a bilingual. In fact, it has been proven that there is a direct proportional relationship between frequency of use and increase in proficiency (Grosjean, 2008; 2013; Grosjean & Byers-Heinlein, 2018). Butler & Hakuta's (2004:120) assertion that an individual's bilingual status changes with time, losing elements of one language as they constantly use the second language more actively, fits well with the bilingual spectrum approach. A holistic definition should therefore infuse the bilingual continuum approach with both language proficiency and use. I therefore consider bilingualism in this study as *any degree of knowledge and meaningful use of two or more languages by an individual*. Language as used here means a language variety which one or a group uses as a code of communication.

2.3.4. Brief history of bilingualism in Kenya

This section seeks to highlight the bilingual state in Kenya as it has evolved over time. Outside Africa, the advent of colonisation and the demarcation of territorial boundaries was a catalyst to linguistic pluralism. Formerly monolingual communities found themselves in either side of the political boundaries. This together with emigration through slavery or by way of exploration bore linguistic minorities within the newly formed nation states. In the case of emigration through slavery, the minority groups were sometimes deemed unpatriotic to their adopted nations especially when they stuck to their languages and cultural orientation.

In Africa, the colonisers were the minorities though the missionaries before them did learn the local languages which they used to interact with the locals. In East Africa, which was part of the larger British Empire, the use of the local languages was emphasized both by the missionaries and the colonialists. The former believed that Christianity would best be understood in the locals' native languages and while the latter were reluctant to let the Africans learn the European languages so as to keep them in the lower cadre jobs as well as to discourage Europeanization (Kibui, 2014). The Kenyan language policy situation was dictated by educational commissions both during colonialism and post-independence. Some of the recommendations of these

commissions have had far-reaching effects, some of which are still felt in the Kenyan linguistic environment to date. For instance, after the Second World War, as colonies started agitating for independence, there was a raft of language policy decisions that were aimed at dividing the Africans so that they could not unite and speak in one voice (Bunyi & Schroeder, 2017; Kibui, 2014). As such, the learning and teaching of Kiswahili which was regarded as the African Lingua Franca then, was discouraged and instead the teaching of the native languages at the lower primary level and English at the upper levels of education was encouraged. The impression which the colonialist created with the learning of English during this period as a gateway to better life and its association with the elite was carried over post-independence (Kibui, 2014)

The post-independence Kenyan educational commissions re-emphasized the use of English as a medium of instruction, re-introduced Kiswahili as first, a non-examinable subject, and later both as an examinable subject and a medium of instruction for Kiswahili itself. The teaching of the native languages in lower primary was also encouraged. Other codes such as Sheng¹, which began as a cant was widely used by the youth especially those who lived in the informal settlements in the capital.

Today, Kenya prides itself as one amongst the many multilingual countries in Africa. Up to eighty languages are spoken in Kenya from a population of about 48 million (Eberhaud et al., 2021; KNBS, 2019). Furthermore, over forty ethnic communities are found in the country. Out of the eighty languages, Kiswahili is both the national and one of the official languages alongside English. As official languages both languages are used in government branches such as the Judiciary, Parliament and other public forums. They are also the official languages in schools though other European languages such as German and French are also taught in some schools.

Going by the definition of bilingualism used herein, it means that there is hardly any adult African (Kenyan) who does not speak at least two languages (Bunyi & Schroeder, 2017). Having said that, the Kenyan constitution allows for freedom of expression and one can express themselves in any language that they are comfortable in.

¹ Sheng' in 1970s drew its vocabulary mostly from English and Kiswahili plus a few native languages such as Kikuyu, Dholuo etc. It has evolved over the years and has less loan words and more own vocabulary. It is the preferred language (in its various forms) for use amongst the youth in Kenya today.

2.3.5. Place of bilingualism in linguistic relativity research over the years

This section briefly highlights the earlier perception of researchers on the interaction between bilingualism and linguistic relativity and how this perception changed over time.

Much as Whorf did not focus on the bi/multilingual subjects, he acknowledged the possible connection between linguistic relativity and bilingualism. Later on, however, bilingualism acted as the underbelly upon which much criticism of linguistic relativity was based. Stubbs (1998) notes that the majority of the critics argued that the popular linguistic relativity interpretation at the time could not fit in well with the bilingual speakers. If indeed languages shaped their speakers' perception of reality, then more languages in the mind of an individual meant more world views- a rather impossible feat, or was it?

Hoffman (1991), among other bilingual researchers having experienced the bilingual dilemma first hand, make the case for the possibility of switching between the experiential worlds of the languages that a bilingual speaker has. Patterson (1987) captures the testimony of one of the researchers as '...switching from one language to another and back, is like travelling back and forth through different worlds.' Such assertions went beyond mere testimonial narratives accounts and memoirs. Empirical investigations with bilinguals as the subjects were initiated within the linguistic relativity domain. Against the earlier perception that bilinguals were undesirable candidates for linguistic relativity research, new evidence emerged to the contrary. It revealed that the complex language situations of bilinguals were indeed an ideal environment for linguistic relativity research.

A once prevalent view that has since been dispelled was that there were two monolinguals within the bilingual. The shared view amongst most contemporary scholars interested in the relationship between bilingualism and cognition is that such an adoption of a monolingual lens on bilingual situations is restrictive. It deliberately bars the bi/multicultural context that comes with learning and speaking two or more languages from manifesting itself in the individual. Consequently, a lot of crucial extra linguistic resources that would aid in the accurate depiction of the individual's cognitive processes are locked out. It is important therefore to treat the bilingual subject as a distinct entity who is different from separate monolinguals from whom they share a language.

2.3.6. Relativity effects on the bilingual mind

This section highlights the interaction between bilingualism and linguistic relativity as revealed by a number of bilingualism and linguistic relativity research over the years. The impact of such an interaction to the speakers of the respective languages is also noted in the review.

(a) Number marking

Since Lucy's (1992b) work on substance and object categorization differences between Japanese and Yucatec, a number of research have been undertaken yielding insightful findings. Most of these studies however involved monolingual participants. Since the current dissertation concerns multilinguals, more previous studies involving bilinguals would be highlighted. For instance, Athanasopoulos (2006) compared the performance of different L2 English bilinguals in a picture matching task. The task involved identifying from five alternates, a picture that was similar to the original picture. The alternates contained a difference in number of an animal, implement or substances. Athanasopoulos (ibid) found that the intermediate L1 Japanese- L2 English learners treated the changes in the animals as most significant ignoring implements and substances similar to how monolingual Japanese would behave. L1 Japanese - L2 English advanced level learners treated changes in both animals and implements as the most significant as opposed to substances, similar to what an English monolingual would do.

The research concluded that the more advanced in proficiency the Japanese were in English, the less they behaved like Japanese monolinguals but more like English bilinguals. Generally, in grammatical number marking, the learning of an additional language is likely to restructure the conceptual disposition of an individual owing to the degree of proficiency that the bilingual has in the said L2. Even though the present study involves grammatical aspect and not grammatical number marking, we seek to investigate if a similar conceptual restructuring would be evident.

(b) Object Classification

There is further evidence from the domain of object classification preferences that support the re-shaping of a bilingual linguistic conceptual domain. Cook *et al* (2006) investigated object classification preferences among L1 Japanese- L2 English bilinguals. There were two sets; those who had stayed in English speaking environment (country) for between 6 months to 2 years, otherwise referred to as the short stay group and those who had stayed for between 3 to 8 years also called the long stay group. They found that both groups preferred to classify simple objects and substances using materials but not for complex objects. The long stay group preferred the shape categorisation for all the categories in comparison to the short stay group. The long stay group acted more like the English monolinguals while the short stay group's responses almost mirrored that the Japanese monolinguals. Overall, the findings imply that additional language learning especially over prolonged period has cognitive implication in the linguistically leaning conceptual domains.

Athanasopoulos (2007) carried out an investigation aligned with Lucy's (1992b) English and Yucatec object classification preference. The research involved L1 Japanese – L2 English learners. The behaviour of the bilinguals when considered wholesomely appears to be between the respective monolinguals. More specifically, the more L2 proficient the bilinguals were the more they classified the objects by shape like English monolinguals would. Other factors like length of stay and language of instruction played a less significant role in making changes to the cognitive representation of the bilingual.

Both studies, though dealing with object classification reveal the possible impact of learning an additional language to the cognitive operations of the speakers in a way that we hypothesize might be similar to the case of the DEK multilinguals.

(c) Motion events categorization

What happens in the mind of a bilingual while processing motion event at any particular point in time? Motion event encoding by speakers of languages whose aspectual distinctions are grammaticized versus the non-aspect languages has been widely documented. The general findings from these studies posit that speakers of aspect languages defocus the event endpoints while those of non-aspect languages tend to mention event endpoints. Of interest in the several investigations in the literature is what happens when a bilingual uses both an aspect and a non-aspect language.

A number of researchers have carried out investigations that seek to answer the aforementioned question. Bylund *et al.* (2013) investigated motion event encoding in Afrikaans – a non-aspect language. They further sought to find out if learning of English in addition to Afrikaans had any effect in the motion event encoding behaviour. In the non-linguistic experiment, the research showed that the more often the participants used English, the more they behaved like English speakers, that is, they selected more [-endpoint] alternates. The same English monolingual behaviour was not witnessed in the linguistic experiment though. Age of acquisition and proficiency were deemed insignificant to the resultant behaviour by the participants.

Bylund & Athanasopoulos' (2014b) study on motion event cognition in L1 speakers of isiXhosa living in a multilingual setting is the closest work to the work in this dissertation. The study examined the influence of linguistic background on motion categorization patterns. Even though the target group was L1 isiXhosa speakers, the fact that they grew up and went to school in a multilingual setting clearly explains the interest in the participants' linguistic background. The multilingual set up in this case comprises languages such as Afrikaans, English, isiXhosa, isiZulu, Sesotho, Setswana and siSwati.

Part of the dissertation, like (e.g., Athanasopoulos & Bylund, 2013; Bylund *et al.*, 2013) is hinged on the grammatical aspect theory developed by von Steutterheim *et al.* (2012). The theoretical framework posits that grammatical aspectual distinctions that denote the ongoing phase of an activity focus on the internal temporal constituency of events during the process of conceptualization. Languages with grammaticized aspect are likely to direct their speakers to the

ongoing phase of an event unlike speakers of non-aspect languages who are more likely to adopt a holistic view of motion events that includes the endpoints.

Overall, Bylund & Athanasopoulos' (2014b) study confirmed the previous study's (e.g Bylund *et al.*, 2013) finding that frequency of use of a language with grammatical aspect influences motion event categorization. IsiXhosa which is the focal point of this particular study is a non-aspect language. Knowledge and frequent use of aspect languages such as siSwati, Sesotho, Setswana, and English must have contributed to a change in the L1 isiXhosa's conceptual domain. As a result of the cognitive readjustment, the participants who would otherwise adopt a maximal temporal viewing frame tended to defocus the motion events end points. It is interesting to note that the cognitive restructuring effected by English did lead to the aforementioned English-like behaviour despite the period of immersion being more than a decade earlier (at age 6-12 in primary school) where it was used as a medium of instruction. However, the exposure at secondary school was less significant possibly due to the critical age effects as advanced by the critical period hypothesis.

The literature presented above gives a glimpse of the possible findings and theoretical implications that would be predicted for the investigation on motion events in this dissertation since this too involves bilinguals

(d) Colour

Relativity effects in the domain of colour amongst bilinguals was one of the earliest to be documented. As noted by Athanasopoulos (2009), the much publicised Berlin & Kay's (1969) work on basic colour categories actually had majority of the bilingual participants who lived in the US at the time. Such an important factor was however only superficially considered. The researchers admitted to a possible influence of English but further stated that the consistency of the foci placement in the various languages could not primarily be because of English. Subsequently, the data interpretations that followed were done on the premise of the participants' L1. Nevertheless, the exactness with which the supposedly eleven basic colour categories resembled the English colour categories could not escape scrutiny. It can indeed be argued that it was due to the respective conceptual domains of the L1 undergoing cognitive modification under

the L2 (English) influence. After all, the participants were immersed into the linguistic environment of the L2.

An extensive more empirically improved study conducted by Caskey-Sirmons & Hickerson, (1977) confirmed the L1 conceptual domain restructuring proposition. The study compared the colour categories of monolingual speakers of five languages; Mandarin, Korean, Hindi, Japanese and Cantonese with their respective native speakers who had become bilingual users of English. The results indicated that the categorization patterns of the bilingual differed significantly with their monolingual counterparts due to the influence of English. The outcome could possibly be associated with conceptual restructuring of the L1 by the L2 after considerable length of exposure.

A number of subsequent studies (e.g., Jameson & Alvarado, 2003; Winawer, Witthoft, Frank, Wu, Wade & Boroditsky, 2007; Zollinger, 1988) all found significant differences in colour categorization between monolingual speakers and their bilingual counterparts. These differences were majorly associated with L2 learning that must have interfered with the L1 conceptual organisation by way of restructuring. A few other studies (e.g., Laws, Davies & Andrews, 1995) found no difference in colour cognition between Russian and English speakers. Such a marked difference in outcome could be due to the methodological underpinnings among other things.

More recently, Athanasopoulos *et al.* (2011) and Athanasopoulos (2009) conducted a study with Japanese- English and Greek-English bilinguals, respectively. Both studies revealed differences in colour categorisation. The former reported frequency of L2 use as an important factor in the cognitive restructuring of bilinguals. The latter on the other hand found that the conceptual changes in the L1 involved both learning of new linguistic categories as well as the attrition of previously learnt original terminologies. Athanasopoulos' (2009) study further revealed that the semantic saliency and similarities in surface linguistic forms did have an influence on cognition as opposed to the less salient and dissimilar forms.

One theme that runs across the studies in this sub-section is the possible impact of additional language learning on colour categorization and as such fits within the realms of this study which involves DEK multilingual speakers.

(e) Time

The domain of time too has attracted a fair number of research on linguistic relativity amongst bilinguals. Studies investigating the use of spatial terms referring to distance and quantity used as time metaphors have documented cross-linguistic differences.

Boroditsky (2001) investigated the use of spatial metaphors in representing time amongst Mandarin and English monolingual and bilingual speakers. According to Boroditsky (*ibid*) both Mandarin and English speakers use horizontal spatial terms to talk about time though the Mandarin speakers also commonly use the vertical terms *sha`ng* and *xia`*. She sought to find out whether using spatial metaphors to talk about time can in the short and the long term have implications on how those particular people speak about time.

The results showed that spatial knowledge can be used in processing of the spatiotemporal metaphors in the mind of speakers. With reference to bilinguals, the study showed that Mandarin speakers who acquired English at an early age behaved more like L1 English speakers that is; they tended to represent time using more horizontal term. Those who acquired the L2 (English) later in life behaved more like the L1 Mandarin speakers using a lot more vertical (*sha`ng* and *xia`*.) terms.

Another study that uses the same starting point of vertical and horizontal dimensions as Boroditsky's (2001) work was conducted by Miles et al. (2011). They sought to find out whether being fluent in Mandarin and English would lead to the use of two different mental time lines, that is the vertical and the horizontal. The findings showed that depending on the sociolinguistic context, the Mandarin-English bilinguals mapped time to space according to the vertical time line (consistent with the Mandarin sociolinguistic context) and demonstrated the same with a horizontal time line when exposed to prompts in an English sociolinguistic context.

Lastly, Bylund & Athanasopoulos (2017) conducted a psychophysical task to investigate the effect of language on duration estimation in monolingual and bilingual speakers of Spanish and Swedish. Swedish speakers talk about time in terms of distance thereby using distance-based metaphors such as the English equivalent of *short time*. Spanish speakers on the other hand prefer use of quantity-based metaphors similar to the English *much time*. The results showed that

the presence of linguistic cues enhanced interference in time estimation in either language meaning, Spanish speakers were misled by stimulus quantity and Swedish speakers misled by stimulus distance. More importantly was the finding that the Swedish-Spanish bilingual speakers behaved differently depending on the language context. This showed a demonstration of shifting duration representation within an individual as a result of language context.

Similar to other domains such as colour, the research on time demonstrates the possible evidence of linguistic relativity amongst bilinguals and the same is predicted for the investigation carried out in the present study.

(f) Spatial frames of reference (FoR)

Spatial frame of reference can be defined as a unit of coordinate systems that express the relationships between objects in space i.e., the location of object A vis a vis object B. At the surface, research in linguistic relativity in the domain of spatial reference frames amongst bilinguals appears to be less extensive compared to other domains such as colour, motion events or object categorization. However, echoing Pavlenko (2014, p. 120), even though most studies involving linguistic spatial relationship and cognition have been conducted with bilinguals, the researchers instead prefer to base their analysis on a monolingual spectrum only acknowledging the participants' knowledge of an additional language in passing.

Two studies will be cited that portray this; Levinson (2003), in his investigation involving the Guugu Yimithirr, explains that to ensure the instructions had no directional cues, they were to be executed in English and the feedback from the respondents given in English too. This clearly demonstrates that the participants were bilinguals i.e., speaking Guugu Yimithirr and English. In the other study by Wassmann & Dasen (1998), the Balinese were found to use both the predominant geocentric system and the relative system. What is not emphasised is the use of the relative Indonesian language amongst the Bali especially in schools as a language of instruction. Apparently, this is what accounted for the usage of the less predominant relative spatial orientation system amongst the participants. While these revelations do not invalidate the studies' research findings, they are worth noting.

The few spatial cognition studies premised on bilingualism focus on a range of spatial relationships-from topological relations such as pre/post-positions to spatial frames of reference. Firstly is Ijaz's (1986) work on spatial preposition using semantic relatedness and cloze tests. She focused on the L1 Germans-L2 English, L1 Urdu-L2 English bilinguals, and English monolinguals. The findings revealed that the bilinguals' L1 conceptual framework influenced the learning and usage of the L2 linguistic concepts. Semantic similarities or differences between the L2 and the L1 target words facilitated the L1 based cognitive restructuring that took place between the two languages.

Secondly, as earlier pointed out, the participants whom Levinson engaged especially in Hopeville were all bilinguals (Levinson, 2003, p. 143). They had an L1 Guugu Yimithirr that encodes the absolute spatial frame and an L2 English that primarily utilizes a relative spatial frame. There were mixed results. They did not behave like English speakers and used less of the relative frames but at the same time did not typically behave like the L1 Guugu Yimithirr would. Pavlenko (2014) suggests that the findings portray a convergence of conceptual representation between L1 Guugu Yimithirr and English.

Similar results depicting L1 and L2 conceptual convergence were reported in a study that focused on the Arrernte speakers of Australia. These speakers preferred the absolute FoR. English speakers from the neighbouring Sydney preferred the relative FoR while another neighbouring English speakers from Alice Spring portrayed an in-between absolute and relative performance – a possible indicator of convergence (Levinson, 2003; Pavlenko, 2014, p. 122).

Lastly, it has been observed that the Hopevale Guugu Yimithirr language has undergone substitution under the influence of English. The present generation do not recognize the cardinal directions that was synonymous with Guugu Yimithirr (Haviland, 1993, 1998; Levinson, 1997, 2003; Pavlenko, 2014). It can be argued that such a process of substitution must have been as a result of aspects of the conceptual system shifting from the L1 to L2 (English). Such a shift eventually leads to attrition where the L1 conceptual representations are deleted and the new conceptual system built upon the L2 takes over.

The Dholuo investigation on spatial frame of reference conducted in this study is similar to the aforementioned studies by virtue of having bilingual speakers. It would be interesting to see if

the findings associated with speaking of an additional language would be reflected the present study even though the approaches adopted are slightly different.

2.4. Previous empirical research involving spatial frames of reference

Empirical research involving spatial reference frames abounds in the literature. It is therefore reasonable to highlight only the recent and most relevant work to this study. The strength of this review lies in its insightfulness in revealing possible evidence of linguistic relativity in the use of spatial reference frames.

2.4.1. The MesoSpace Project

The MesoSpace project, as reported in O'Meara & Báez (2011) is a collaborative work involving thirteen mostly unexplored Mesoamerican languages. The work focuses on spatial representation within language and cognition. The project highlights seven of the thirteen languages. Additionally, one language outside the MesoSpace, the Mopan (Mayan), and two control languages within the MesoSpace, Seri and Sumu, are also included in the report.

MesoSpace sought to investigate in part, whether the Mesoamerican languages prefer non-relative reference frames to the relative frames. Two tasks were employed, a linguistic and a non-linguistic task. For the linguistic task, a ball and a chair (B&C) photo series was used. This was an improvement of the man and tree (M&T) matching game designed by Levinson et al. (1992) of the Max Planck Institute for Psycholinguistics. This improvement was necessary because of the limitation of the M&T design. The objective of task two was to investigate the preferred linguistic FoR in non-linguistic cognition. The method that the MesoSpace group used to collect data was through the *new animals memory task*, a modified form of the *animal in a row task* developed by Levinson and Schmitt (O'Meara & Báez, 2011).

The results from the MesoSpace Project revealed that most of the Mesoamerican languages investigated largely preferred the use of non-relative frames of reference such as absolute, direct, landmark-based and the intrinsic system (Báez, 2011; Danziger, 2011; Romero-Méndez, 2011; Soto, 2011). The project further revealed that in some cases the primary linguistic reference frame used in any particular language is also preferred in conducting non-linguistic cognitive tasks (Báez, 2011; Danziger, 2011). The use of linguistic frames of reference in solving lower-

level cognitive assignments involving recall is one of the primary issues investigated under FoR in this dissertation.

2.4.2. Other spatial frames studies

In the following paragraphs, I review other spatial frames of reference studies and highlight how integral they are to the FoR investigations in the dissertation. Hoffmann (2019) investigated the use of the absolute spatial frames as realized in the Australian languages of Jaminjung, MalakMalak and Kriol. Specifically, she sought to find out the restrictions in usage of the various manifestations of the absolute system in the aforementioned languages. Among other findings, she notably reports that the use of the absolute system across the three languages was based on three contexts; the first two contexts relate to the locative descriptions where (a) the ground is mentioned but it is not the speech act participant (SAP) and (b) the ground is not mentioned but it can be a SAP. The third context involves an orientation description. These contexts, she opines, greatly dictate how the absolute system operates across the languages. Further, she identifies boundedness as another factor that restricts the use of the absolute system. A bounded system has the endpoint in the speaker's mind. It is mostly characterized by references to local landmarks. It is less restrictive. An unbounded system, which is depicted by the absolute FoR, extends beyond the edges of the map and the geographical orientation. It is more usage restricted. The idea of FoR usage restriction is key in the interpretation of the findings in this dissertation. Though the absolute system is minimally realized in Dholuo, context and boundedness mentioned here are relevant to the interpretation of other dominantly used spatial references in Dholuo such as the relative, object centred, direct etc.

Terrill & Burenhult (2008) sought to investigate spatial relationship of objects in space not by the traditional spatial frames approach but by focusing on the orientation properties of the objects in question. Using Jahai (Mon-Khmer, Malay Peninsula) and Lavukaleve (Papuan isolate, Solomon Islands) languages, they aimed at foregrounding the orientational strategy as an independent spatial descriptive principle not to be interpreted by FoR but considered alongside or in place of it. They adopted the *Man and Tree games task* from which the elicited linguistic data was analyzed. The results indicated that languages such as the aforementioned, the Mopan and the Kilivila which would otherwise be considered as unsystematic and un-placeable (in

terms of the preferred FoR) (see e.g., Pederson et al., 1998) find a home under the orientational approach. They claim that such languages would uniformly align with the interpretation of the proposed system. Of relevance to this dissertation is the in-depth focus and analysis which this study gives to objects' orientation which is missing in most of the literature. It should be mentioned though that there are other studies that do analyze both locative and orientation descriptions (see, e.g., Báez, 2011; Garza, 2011; Soto, 2011). This is important because our study focusses on both Ground and Figure orientation of objects under the categories of unfeatured-unfeatured (UU), unfeatured-featured (UF) and featured-featured (FF)

According to the Levinsonian definition, the absolute FoR refers to a system that involves fixed arbitrary bearings abstracted from the physical environment. Palmer's (2015) study reassessed this definition finding fault in Levinson's (2003) use of fixed, abstract, arbitrary and other concepts to define the absolute system. Using three languages as a case study, he rebuts the use of each of these terms explaining reasons why they are not correct. He proceeds to operationalize the absolute FoR as involving a ternary and not binary relationship as earlier proposed by Levinson and that the absolute system uses anchor points located in the external world. This definition widens the scope of absolute FoR and includes other sub-systems that were otherwise locked out of the Levinson's restrictive definition. Notably, Palmer (*ibid*) introduces the Topographic Correspondence Hypothesis (TCH) which asserts in part that the absolute system is not only anchored in the external world but motivated by it. This in essence would mean that the type of absolute encoding that a community predominantly uses is in a way influenced by their physical environment. Two significant points are to be emphasized from Palmer's study. First, the redefinition of the absolute system as portrayed in Palmer (*ibid*) can be consistently applied to other systems related to the absolute system such as the landmark-based and geomorphic FoRs, which are used in this dissertation. This is important since even though the absolute system is not dominant in Dholuo, the theoretical frameworks associated with it such as the TCH can by extension be used to interpret the findings involving the landmark-based and geomorphic systems. Second, Palmer (2015, p. 211) argues that the TCH can equally be used to account for the relative system in that it is mostly preferred in the urban regions as opposed to the absolute system which has more users in the rural set ups (Burenhult & Levinson, 2008; Majid et al., 2004; Pederson et al., 1998)

Ogelo (2017) conducted an empirical research on spatial relationships in Dholuo. Part of the aims of the research was to find out the types of spatial frames of reference in Dholuo and to establish whether the relationship between the linguistic FoR and the non-linguistic domains reveal linguistic relativity. The research employed a mixed design involving experiments, interviews, and questionnaires. To identify the types of reference frames available in Dholuo, *an animal in a row (AIAR) experiment*, the *Mirror image task* were conducted. The findings revealed that Dholuo uses both the allocentric and the egocentric reference frame (as defined in section 3.5). The Mirror Image task did not sufficiently provide enough proof to confirm the use of the intrinsic FoR in undertaking non-linguistic tasks.

2.5. Motion event categorization

Aside from Frames of reference, Motion events categorization is the other point of investigation focused on in this dissertation. Papafragou & Selimis (2010) describe events as situations that are ‘fleeting and impermanent’, carved out of human dynamic experience of the world. That events are impermanent means the viewing of it is possible from various angles at different levels. Talmy, (2000: 25) defines a motion event as a situation that contains a translational movement of an entity along a specified location. The ingredients of (motion) events are causality, presence of an object, space and time (Athanasopoulos & Bylund, 2013a; Casati & Varzi, 2008). Other concepts that characterize a motion event include the Figure (the object that moves), Ground (the reference object), Path (the course followed by the figure), Manner (the description of how the movement occurs), Cause (what initiates the movement) and Motion (the movement or lack of it, by the figure).

2.5.1. Previous empirical research on Path and Manner of motion events

Research in motion events has mostly looked at cross-linguistic differences in encoding path and manner of motion. Talmy’s (1991, 2000, 2007) dichotomous typology of languages based on their lexicalization patterns of path and manner has been the framework upon which many comparative linguistic studies have been based. According to Talmy (*ibid*), languages can either be classed as verb framed (V-language) or satellite framed (S-language). Verb framed languages e.g., Greek, Japanese, Hindi etc. encode path in the main clause of the sentences and express manner optionally through other linguistic elements such as adverbials. Satellite framed

languages e.g., English, German, Swedish etc., on the other hand express the path of motion in a particle while motion is conflated with manner in the main verb (Talmy, 2000). Slobin (2003, 2006; 2008) proposes a third category called the equipollent class which includes languages with almost equal path and manner of motion morphosyntactic weight.

As stated already, the foundation for most studies on path and manner verbs are based on differences in linguistic data, that is lexicalization patterns. There are studies that solely focus on the cross-linguistic differences at this level (e.g., Slobin 1996, 2000, 2005, 2006; 2008; 2009). Data used in these studies are majorly drawn from the famous elicitation task, *Frog, where you*, as well other secondary sources such as translations, novels etc. The general findings from these studies do confirm that path is encoded in both V and S-languages, the difference being that path is encoded in the main verb in the former making it more salient than manner, while manner is encoded in the main verb in the latter hence it is more salient than path.

Besides Slobin's (1996, 2000, 2005) cross-linguistic studies, another example of a verbal study of motion events is the pioneer Dholuo motion study by Ongong'a (2017). The research investigated motion verbs and their lexicalization patterns in Dholuo along Talmy's (*ibid*) framework of motion event semantic constituents of path, motion, figure, ground and cause. The results showed a preference for manner verbs in transitive, intransitive and deictic motions. She observes that Dholuo mostly conflates motion with manner and cause but rarely does so with path. She therefore concludes that Dholuo aligns with Talmy's (2000) satellite language categorization.

Ongong'a's study is important for being the first avenue that gives an insight to motion events in Dholuo through its focus on manner. However, her reliance on fifty-one selected manner verbs from a few story books as the basis for her categorization portray the research as tilted towards conforming to the satellite languages classification. Further, Schaefer & Gaines, (1997) categorize Dholuo, alongside other Nilo-Saharan languages as verb-framing that conflates motion and direction and expresses manner mostly through a separate distinct lexical item. It cannot therefore be concluded with certainty that Dholuo nicely fits within the S-languages class as Ongong'a claims. Instead, in agreement with her recommendation, this is an area that needs further research using either established elicitation tasks such as *Frog where are you*, or novel

methodologies that are all encompassing. For the sake of this dissertation though, I would at best consider Dholuo as a split system.

Kersten et al. (2010) is yet another study on the manner of motion. He sought to investigate the conceptualization of motion events in English and Spanish. First, the results confirmed that English speakers conceptualized manner of motion differently from Spanish speakers that is, they attended more to manner of motion compared to Spanish speakers. Second, there was an effect of language context and age of language acquisition. Spanish/English bilinguals tested in an English context attended more strongly to manner of motion than Spanish monolinguals. Early Spanish/English bilinguals behaved like monolingual English speakers. The research concluded that on the whole, between the two, manner of motion is greatly attended to in English than in Spanish and this is reflected in cognitive representation as well an indicator of linguistic relativity.

Montero-Melis & Bylund (2017) used similarity arrangement tasks to investigate the cross-linguistics differences in caused motion between Spanish and Swedish speakers. There was a mixed outcome with Swedish speakers predictably preferring to group together events that had similar manner of object motion (whether the object rolled or slid) though this preference disappeared under verbal interference. However, there was no difference in preference when it came to manner of cause (whether the objects were pulled or pushed). Further, their investigation confirmed that path was encoded in both S and V-languages but more intriguingly was the finding that the effects of path tended to disappear when at the encoding phase, language was not overtly used.

2.5.2. Previous empirical research on grammatical aspect in motion events

Earlier works investigating the effects of verb aspect on motion events have outlined the significance of a language's aspectual category. One such study conducted by Flecken et al. (2014) investigated language effects on attention to motion events in a linguistic and a non-verbal task. Comparing native speakers of German and Modern Standard Arabic (MSA), they sought to ascertain whether differences in grammatical aspectual distinctions in both languages affect the endpoint encoding of motion events. German is considered a non-aspect language while MSA is regarded as an aspect language. The non-verbal task was conducted using eye

tracking. The study reported that speakers of MSA pay less attention to potential endpoint in motion events more than the Germans. The eye tracking results indicated that when the video clips showed an ongoing activity with an object in the distance as a possible endpoint, German participants directed their attention more to the possible endpoints than their MSA counterparts.

Second, Athanasopoulos & Bylund (2013) conducted a cross-linguistic (English and Swedish) investigation on the relationship between grammatical aspect and motion events cognition. They sought to establish if the differences in grammatical aspect in the two languages may lead to differences in linguistic and memory-based cognition. In the verbal encoding tasks, the results revealed (as predicted) that the Swedish participants were prone to mentioning event end points more than their English colleagues, who in turn concentrated on the ongoing phase of the events. In the memory-based event cognition task, cross-linguistic differences emerged as a result of the differences in grammatical aspect encoding between the two languages. This was further confirmed when those differences disappeared after the same experiment was repeated under linguistic interference

Third, Bylund & Jarvis' (2011) study involved L1 Spanish-L2 Swedish bilinguals and investigated the relationship between grammatical aspect and endpoint encoding amongst bilinguals. Further they sought to find out whether factors such as age of onset of L2 acquisition, length of residence in the L2 environment and the overall L2 grammar knowledge had any bearing on how grammatical aspects would influence endpoint encoding. The study reported that the bilinguals mentioned endpoints to a higher degree than the monolingual Spanish L1 control group thus they behave more like Swedish speakers than the Spanish speakers. Additionally, it was observed that the speakers with low age of L2 acquisition and those who had stayed in Sweden (L2 environment) for a long time behaved more like the Swedish than the Spanish.

Another related study of grammatical aspect and motion events construal amongst bilinguals was conducted by Athanasopoulos et al. (2015). The study involved fluent German-English bilinguals and particularly focused on the possible effects of language conditions on grammatical aspectual constraints in motion categorization. The results showed that the bilinguals matched the target alternates with the [+endpoint] alternates more while using German and less so while using English thereby confirming the effects of language context. The study further reported that

these effects disappeared under verbal interference indicating the transient nature of the language effects.

Bylund, Athanasopoulos & Oostendorp (2013) and Bylund & Athanasopoulos (2014a) studies highlighted in section 2.3.6.3 are additional investigations on the relationship between verb aspect and motion events

The key finding in these studies is that they reveal differences in both linguistic and cognitive behavior between languages that are typologically different regarding grammatical aspect. They are consistent with von Stutterheim *et al's* (2012) grammatical aspect approach to motion. This theoretical framework states that speakers of a language may choose to focus on the event progression and ignore the endpoints or they may decide to describe the entire scene mentioning up to and including the endpoints. Such a preference (of immediate or holistic event description) may be as a result of the whether aspectual markings in the language are grammaticalized in the verb or not. Languages like English, Russian and Spanish prefer the immediate ongoing phase while other languages like German and Swedish are prone to focus on the entire event scene mentioning endpoints in their description

The review in this section is intended to highlight previous empirical investigations on motion events cognition involving path and manner verbs as well as grammatical category of aspect. Specifically, the aim of this survey is to identify evidence of linguistic relativity in motion event cognition. Data from verbal encoding confirm the crosslinguistic differences on motion event description. This though may not be enough proof for linguistic relativity unless supported by non-linguistic behavior.

2.6. Conclusion

To conclude, this literature review concerns investigations on linguistic relativity and its manifestation in multilingual individuals. Background information and previous empirical studies concerning both linguistic relativity hypothesis and multilingualism has been highlighted. Crucially, those specific studies whose investigations integrate both linguistic relativity and multilingualism have been spelt out. The domain of space has been used as the template for the interaction between linguistic relativity and multilingualism. Specifically, the key aspects of the sub-domains of spatial reference frames and motion have been clearly portrayed in the literature review..

Concerning evidence of linguistic relativity that is, whether cognitive processes are influenced by language or not, an assessment of the highlighted literature reveals that such a question is beside the point. Focus has shifted from the ‘language effects on cognition’ umbrella to the more specific ‘effects of a particular linguistic structure on a specific cognitive process under specific conditions and to a certain degree’.

The chapter that follows presents a detailed exposition of the theoretical frameworks upon which this dissertation is premised.

CHAPTER 3

THEORETICAL FRAMEWORK

3.1. Introduction

The chapter introduces the theories that have been used in this dissertation. Integrated within the sections that highlight the theories are brief mentions of the experiments undertaken and their interconnectedness to the theories. The sub-domains of spatial frames and motion also feature across the theoretical sections.

Section 3.2 introduces the *thinking for speaking hypothesis* (TFS) which is primarily concerned with the findings of the linguistic tasks across the two sub-domains. The subsequent section 3.3 ushers in the *linguistic relativity hypothesis*. Under this segment, the tenets of the theory are discussed in detail and ties to the potential findings from the non-linguistic experiments of both the sub-domains explained. Section 3.4 explains the principles governing the concept of *multicompetence* and how integral it is for situating the findings of the dissertation. The section that follows 3.5 sheds light on the conceptual backbone of *the frames of reference principle*, detailing its categorization and the implication of that to the final interpretation of the spatial frames' findings. Section 3.6 briefly highlights the conceptual principles behind the mirror image experiment. The penultimate section, 3.7, discusses the concept of aspect. Within this section are sub-sections focusing of the lexical/grammatical nature of aspect, theoretical underpinnings involving *grammatical aspect approach* and *cognitive grammar* as well as the manifestation of aspectual oppositions in Dholuo and Kiswahili. Lastly, section 3.8 concludes the chapter.

3.2. Thinking for speaking hypothesis

The thinking-for-speaking hypothesis (henceforth TFS) posits that thinking takes a particular form when engaged in the activity of speaking (Slobin, 1996, p. 76). The thought process referred to is activated primarily to aid in communication. The TFS framework explains that a speaker chooses characteristics of events and objects that (1) fit some conceptualization of events and (2) are readily encodable in the language (*ibid.*). In other words when a speaker is about to verbalize a situation that they are faced with, they have to decide from a number of choices presented to them on what, how and which order to express the experience. Slobin (1996) adds

that these choices are partly based on the typological characteristics of the language. Core to the TFS is the need to give more attention by way of scrutiny and analysis to the online mental processes that correspond to the phases of speech production.

The interpretation of the TFS theoretical framework is pegged on the phasal decomposition of the speech production process into distinct time frames (Athanasopoulos & Bylund, 2013; Slobin, 2003). Each time frame corresponds to potential effects of the TFS on events as experienced by language speakers. The time frames are briefly discussed as follows;

i) Experience time

It is the time frame for pre-linguistic or non-linguistic coding, when the speaker attends to events' dimensions that are relevant for linguistic encoding. The TFS effects that arise from here are called 'anticipatory effects'.

ii) Speaking time

In this time frame, the actual speaking takes place. The linguistically codable dimensions are accessed and verbalized by the speaker. It is also the stage where the comprehension of the speech by the hearer takes place.

iii) Time testing

This is the phase beyond speaking and comprehension. It focusses on recall, recognition and inference. The effects are called 'consequential effects'

A number of studies have revealed cross-linguistic differences from verbal tasks investigating , for instance, variations in lexical patterns across a range of semantic domains (see e.g., Benazzo et al., 2012; Cook and Bassetti, 2011; Han and Cadierno, 2010; Stromqvist and Verhoeven, 2004; Verhoeven and Stromqvist, 2001). The TFS theorist, Slobin, has extensively researched on what he refers to as his 'parade case', that is the domain of motion events (Slobin, 2003, p. 161). In some of his work on motion events he compares lexical and grammatical variations between verb-framed languages and satellite-framed languages (e.g., Slobin, 1996, 1997, 2000, 2003). Following Talmy (2000), Slobin analyses motion events in terms of path and manner. He concludes that the saliency of path and manner in the V-language and S-language respectively

depends on the habitual, online attention given to them (path and manner) by their respective languages due to obligatory grammatical markings (Slobin, 2003).

Applying TFS to the analysis, Slobin (*ibid.*) explains that if for instance an English speaker (S-language user) is confronted with a video clip depicting a scene of a dog running into a house, the anticipatory effects activated by the video clip would make ready a manner verb, say *dash* in preparation for the speaking phase. At the point of verbalization, the manner verb, *dash* would be accessed and used. After the speech event, when later exposed to a similar scene, the speaker would be able to recall the lexical unit that worked for them. Such a description would be different from a French speaker exposed to the same video clip. In this case, the preverbal experience would lead to the choice of a path verb, say, *enter* (i.e., *entrer* in French) in anticipation of the speaking proper. During speaking, the actual verb, *entrer*, would be used in the clip description. This information would eventually be stored for later use through recall. Slobin summarizes by stating that whereas more needs to be done to unpack the dynamics of the anticipatory and the consequential effects of the *experience time* and the *time testing* phases respectively, what is beyond doubt is the conceptualization that takes place during speech (*ibid.*). This is an illustration of a typical study focussed on the first language.

Similar studies working with additional languages reveal mixed results (see for example; Cook and Bassetti, 2011; Han and Cadierno, 2010; Jarvis and Pavlenko, 2008). Interpreted within the TFS framework, Benazzo et al. (2012) report that in most cases, there is an influence of the L1 on the L2 and in some cases a counter influence of the L2 on the L1 with reference to the speech production process. For instance, an L1-English/L2-French bilingual, when faced with the same clip of *a dog running into a house* would, at the speaking time phase, access the requisite verb either *dash* or *entrer* depending on the magnitude of the saliency with which either language has these choices ingrained in their mind. Such saliency or codability is in turn dependent on various other factors such as the frequency of language use, the proficiency of either language, language mode among others.

Athanasopoulos & Bylund (2013) have criticized the methodological approach that studies investigating the TFS framework have adopted. They argue that these studies do not show conclusively via data how thinking takes place during speech but instead rely on typologically

constrained lexical differences across languages that point more towards linguistic diversity than TFS. The crosslinguistic differences evidenced during speech are then considered to be corresponding to conceptualization. The critics further observe that using crosslinguistic differences based purely on linguistic data as indications of cognitive processes leads to circular reasoning. They particularly point out that speech production at best only addresses the online psychological activities activated during the speaking time, but does little to provide useful information for the anticipatory and consequential effects. Athanasopoulos & Bylund conclude by asserting that whereas the linguistic analyses from these studies are rich in linguistic components such as semantic and syntactic structures which aid in preparing, selecting and structuring content of speech (conceptualization), the verbal as opposed to the non-verbal data reveals very little about actual cognitive processes

So far, the theoretical tenets of TFS discussed have been largely investigated and explained via verbally elicited data. That this is so is a deliberate undertaking on my part even though there are studies (see the discussion in e.g., Benazzo et al., 2012) where results from both verbal and non-verbal tasks are interpreted under the TFS framework. The stand I wish to take which has already been demonstrated in the previous paragraphs is that part of the linguistic data from the experiments used in this dissertation will be discussed and interpreted under the theoretical premise of the TFS framework. As pointed out by among others Lucy (1992a), there is a difference in mental representation between a purely verbal level of representation and a non-verbal level. The former deals with experience which relates to speech preparation and verbalization as demonstrated by the TFS framework, while the latter is specific to the cognitive representation of concepts

The choice of the TFS for the interpretation and discussion of the linguistically elicited data for both FoR and the motion sub-domains is largely due to the objectives of the spatial reference frame and the motion verbal experiments. The linguistic FoR task for instance was intended to achieve two goals. First, to identify the nature (use or no use of FoR) of the spatial descriptions from the various stimuli. Second, to establish the degree of preference of any particular FoR or non-FoR by the different speakers. Both goals were to be pursued while considering language contexts. As for the linguistic motion categorization task, the objective was to establish the nature (immediate or maximal viewing frame) of the verbal descriptions arising from the video

clips. Considered collectively, both linguistic tasks were aimed at, (a) generating data that would explain the linguistic construal of reference frames and motion events (b) exposing the conceptualization process at the point of speech production and (c) acting as a template for which relativity effects realized at the linguistic level could be traced to the non-linguistic level. Data from the non-linguistic tasks will be discussed under the theoretical strands of linguistic relativity hypothesis

3.3. Linguistic relativity hypothesis

This section connects with section 2.2 of the previous chapter which detailed the background information regarding linguistic relativity hypothesis. Herein, however, two dimensions impacting on the theoretical underpinnings of the linguistic relativity hypothesis are given prominence and their utilization within this dissertation spelt out.

First, it has been documented that there are three possible points of language influence on thought; the semiotic, the structural and the functional levels (Lucy, 1996, 1997). At the semiotic level, natural language unique to humans is considered in relation to its possible effects on thought processes vis a vis other species. In other words, every human is mentally endowed with the capacity to think. The way one thinks is hugely influenced by their experience. The language that they speak contributes immensely to the nature of experience that they amass. The mere fact that one has a language that they subscribe to indirectly or directly contribute to their thought processes.

The structural level deals with the extent to which the specific characteristics of a given language impact on thoughts of the speakers of that language. A cross-linguistic comparison on the same language component then can be undertaken and conclusions drawn. For instance, a Guugu Yimithirr (Australian language) speaker when exposed to a spatial array of objects would likely conceptualize the scene using the absolute spatial reference system which the language predisposes them to leading to an absolute description. In contrast, a Mopan (Mayan language) speaker exposed to the same set of spatial array would likely conceptualize the scene using the intrinsic spatial system which the Mopan language compels them to use leading to an intrinsic-framed description. The structural differences between Guugu Yimithirr and Mopan in relation

to spatial construal thereby lead to differences in conceptualization (Levinson, 2003; Danziger, 2011)

The functional level on its part is concerned with how the use of language (in terms of context, training etc.) may affect thinking. Since contextual information is key in meaning interpretation, the way a language is used could directly impact on the thought processes of the hearer. For example, the Yucatec (Mayan language) have different spatial reference frames which are revealed only when the language is used in a certain way. For instance, description of objects within table top space would see the use of *localized spatial frames* such as the intrinsic reference frame as opposed to those involving environmental features which would make use of the absolute or landmark based systems (Bohnemeyer, 2011).

Lucy explains that these different levels of language-thought interaction do not operate independently but seamlessly combine to show relativity effects. Consider a feature of a language, call it A. The fact that language has the potential to affect thought provides ground for investigating how A, when the language bearing A is used in a certain way (functional level), might influence thought processes. When this effect of A on thought is viewed at the individual or speech community level, it is considered as a mere psychological mechanism (semiotic level). But when investigations on a similar A is made in a different language and comparisons made (structural level), the relativity effects can be said to have been observed or not.

Second, Lucy (1997, p. 296) proposed three methods which can be used to investigate linguistic relativity hypothesis namely; the structure-centred, domain-centred, and behaviour-centred approaches. The structure-centred approach begins by first identifying observed differences in structure between languages. It involves analysing a language's components, be it morphosyntactic, grammatical or lexical, with a view of identifying a pattern of meaning. A relationship between the meaning component and thought is then considered against the corresponding linguistic element and thought processes in another language. The difference in meaning interpretation and the subsequent effect on thought could be due to the different structures of the languages in question.

For example, Lucy (1992b) first identifies differences in number marking between Yucatec and English. English as opposed to Yucatec obligatorily marks for plural for a large number of

lexical nouns. Yucatec on the other hand optionally marks for the same. The other difference involves noun modification involving numerals. In English, single numerals directly follow the noun to be modified whereas Yucatec uses noun modifiers that are often a combination of a numeral and other modifiers. Lucy (*ibid*) uses the differences in structural patterns between these two languages as a base upon which a broad typological framework was developed. More languages were then later included for comparison. Lucy (*ibid*) states that this approach has the advantage of providing a platform for novel interpretation of reality since it makes minimal assumptions concerning the languages in question. The downside of this approach however lies with its specificity. Since it begins with an observed difference in the structural patterns of two languages, there are cases unlike the example above, where extending such a comparison to other languages may not be possible especially if the difference observed does not neatly conform to known typological classifications

A domain-centred approach focuses on a natural entity such as colour or space. The domain is subjected to different languages from which it is encoded, exposing differences in the construal of the same reality. This approach is precise and can be used to compare many languages. Lucy (*ibid*) points to a likelihood of a domain bias as its downside. That it is possible to focus on some easily identifiable domains as opposed to others with more empirical weight. Lucy (*ibid*) also claims that the domain-centred approach comes out as a captive to the Western Scientific European tradition where investigations are carried out relative to a fixed set of parameters. A typological perspective is key in identifying what domains or elements within the domain are worth comparing. Further, exploratory studies in un-researched languages based on creative empirically sound methodologies would help dissociate the domain approach from the Western oriented mentality. Examples of studies that have used this approach abound in the literature. Notable ones include colour categories; e.g., (Athanasopoulos et al., 2011; Berlin & Kay, 1969; Davidoff et al., 1999; Roberson et al., 2000), spatial orientation e.g., (Danziger, 1996; Levinson, 2003; Ogelo, 2017; Pederson et al., 1998) etc.

A behaviour-centred approach is adopted in instances where a researcher has identified a particular unique social behaviour and suspects that it originates from thought which is influenced by language. The behaviour is then traced experimentally to its source. The strength of the approach is that if against expectation language is not the cause of said behavioural

anomaly, then another explanation is sought. Its limitation is that what might appear as an obvious language element responsible for the behaviour, may be insignificant in the language. An immediate example would be the anecdotal case of Whorf's fires (Whorf, 1956)

Of the three approaches proposed by Lucy (1997, 2000), the domain-centred model has been employed in this dissertation. First, the motivation for the choice of the domain-centred approach stems from the fact the area of focus in the dissertation, space, is an established domain in psycholinguistics. As Lucy (1997, p. 301) notes, spatial orientation has achieved tremendous results within the linguistic relativity framework - more than any other domain-centred approaches. Second, one of the strengths of the domain-centred approach is that it provides a platform for cross-linguistic comparisons since the compared language properties are almost invariant and easily found in most languages. Both spatial reference and motion, particularly motion events, have been successfully studied across languages. Third, through the domain-centred approach under spatial reference frames, it was possible to exploit the leeway proposed by the creators of the experiments (Levinson et al., 1992) to venture into the unknown and creatively carve out exciting and authentic stimuli that slightly deviated from the norm. Such exploratory initiatives, when successfully conducted, provide a genuine template for future non-Eurocentric linguistic investigations. Other modifications such as choosing locally available replica objects for the experiments, were also made especially for the FoR verbal and non-verbal tasks. These modifications aligned with the immediate environment upon which these experiments were conducted. Lastly, there was a rich array of linguistic variables across both the FoR and the motion data that did not strictly fall within the confines of the dissertation's objectives but have been briefly reported on. This clearly shows how integral language was in the design and execution of the experiments, thereby dispelling the fears of it being used as a mere dependent variable. All these factors cumulatively considered, made the selection of the domain-centred approach the most suitable.

It is important to note that in his attempt to develop a theoretical account of linguistic relativity, Lucy (1997) does not place much prominence on the number of languages that a speaker knows. It can be speculated that the already outlined theoretical tenets have been expounded with a monolingual native speaker in mind. We therefore move a step further and consider the relativity hypothesis under a multilingual set up.

3.4. Theoretical foundations of multicompetence

The concept *multicompetence* owes its origin to a period in the SLA environment where the call to demystify the exalted position of *native speaker* gained traction. A native speaker is defined as a monolingual who speaks the language they learnt during childhood (Cook, 1999, 2003). The practice of comparing L2 users to native speakers, also known as *comparative fallacy*, was widespread at the time and received criticism from contemporary scholars (e.g., Cook, 1991; Grosjean, 1989). Grosjean (1989) argued that a view which considers an L2 user as having two distinct competencies was misguided in every sense. Such a stand, he claimed, opened up an avenue for misrepresentation of bilingualism in a number of ways, some of which include judging bilinguals from a monolingual lens, or regarding the interaction between the L1 and L2 as interference. Cook (2003) concurs with Grosjean by highlighting a set of characteristics that define the typical bilingual speaker. One feature that he mentioned, which is of importance to our discussion, is that *an L2 user has a mind that is differently organised from that of the monolingual of either language*.

Multicompetence, originally defined by Cook (1991, 1999) as ‘the compound state of a mind with two languages’, was coined as an improvement to another term that was already in use, *interlanguage* which referred to the knowledge of the L2 in the mind of an L2 user. The latter terminology was considered inadequate as it failed to include the knowledge of the L1 (Cook, 1999; Oostendorp, 2012). Multicompetence therefore became an ideal candidate for use in referring to a bilingual speaker since it occupied an unbiased stead in place of the apparently inadequate terminologies of *native speaker* and *interlanguage*.

According to Cook (2002, 2003), multicompetence can be manifested via a number of models forming what he terms an *integration continuum*. One such model proposes a perspective that considers the L1, L2...Ln as occurring separately in the mind of the speaker and that the speaker is capable of speaking any of the languages without any connection. This type of view is comparable to the early definition of coordinate bilinguals by Weinreich (1953). In this kind of arrangement, there is no possibility of either language influencing the other since they are distinctly stored in the mind of the speaker. Another model proposes that the L1, L2...Ln combine together to form *an integrated* whole with no distinctions amongst the two or more

languages. This model proposes that the lexicon, phonology and other language features from the different languages are stored together as a unit. However, the single super system does not deter the speaker from choosing to utilize any of the languages in speech or in carrying out other tasks (Cook, 2003). There is yet a third view referred to as the *interconnection model* which subdivides into two. The first sub-model suggests that there is *linkage* between the two separate languages in the same mind similar to the separation model. However, unlike the separation model, there is language influence and transfer between the two languages in either direction. The second sub-model talks of *partial integration* where there is a partial overlap between two languages in the same mind akin to the integrated model earlier discussed. Here, there is total integration of the areas that overlap but other areas are separate from either language though there is bidirectional influence.

In extending the discussion on multicompetence and the sub-components that define it, focus is on Pavlenko's (1999, 2005) proposal on conceptual representation. She defines concepts as mental constructs shared amongst members of a language and cultural community that facilitate identification, comprehension, inferencing and categorization along similar lines. She argues that within the mind of any individual are conceptual representation that enable in-group communication to be possible (Pavlenko, 1999, p. 211). What then happens in the mind of a bilingual? An additional language acquired presents a complex interrelationship between the L1 and L2 linguistic and non-linguistic conceptual frameworks. Pavlenko (*ibid*) suggests three possibilities under which such an interaction may exist; co-existence between the L1 and L2 conceptual representation, L1-based conceptual system and, conceptual change. Each of the three are discussed in the subsequent sections

3.4.1. Co-existence of L1 and L2 conceptual representation

Co-existence of L1 and L2 conceptual representation is a cognitive status where a bilingual draws upon distinct linguistic conceptual frameworks depending on the language context. Such a state is mostly experienced by bicultural bilinguals. Koven (1998) investigated how French-Portuguese bilinguals use their respective linguistic repertoires to assume different sociocultural identities depending on the language of context. He found out that different languages produce for the same speaker different concepts that projected different socially recognizable

personalities. Despite being primarily based on linguistic evidence, the study gives a picture of how a bicultural bilingual's conceptual representation is organised. Other studies that have documented co-existence of language specific patterns of preference include; shape (Barner et al., 2009), emotion (Jameson & Alvarado, 2003) and time (Bylund, 2011)

3.4.2. L1-based conceptual system.

L1 conceptual transfer occurs when a bilingual at the beginning or the intermediate level relies on their L1 to guide the L2 language learning and use (Pavlenko, 2005). For instance, Athanasopoulos & Kasai's (2008) study revealed that in an object categorization task, both English and Japanese speakers chose shape alternates though the former performed significantly higher. Importantly though was the finding that intermediate L2 English speakers behaved more like their L1 counterparts an indicator that they still relied on their L1 to guide their L2 conceptualization. Other studies that showed evidence of L1-based conceptual system include; objects and substances (Athanasopoulos, 2006); motion event construal (Stutterheim, 2003) and spatial frames (Levinson, 2003)

3.4.3. Conceptual change

Conceptual change occurs when in the process of learning an L2; the L1, the L2 or both undergo some form of modification. Conceptual change in the mind of a bilingual can take a number of forms some of which are mentioned below

i) Internalization of new concepts

This involves adoption of new underlying concepts from L2 to the L1 conceptual framework. Such cases as lexical borrowing occur mostly in instances of language contact.

ii) Shift from L1 to L2 conceptual domain

This occurs when aspects of the conceptual representation of the L1 are abandoned in favour of the newly acquired L2 conceptual systems. It is experienced in situations where the L2 learner is immersed into the linguistic community of the L2 gathering up and effecting changes not only on linguistic attributes but cultural ones as well in a conscious way

iii) Convergence

This process leads to the creation of a single conceptual domain different from both the L1 and the L2. Conceptual representation from both the L1 and the L2 contribute to the new pool that adopts a completely new identity separate from either language. Pavlenko (*ibid*) points out that convergence is un-static and depending on the degree of exposure amongst other factors, may change and result into other processes like shift or restructuring.

iv) Attrition

This refers to the complete loss of certain concepts particularly L1 concepts after a possible assimilation and acculturation due to long periods of immersion in the L2 context. The concepts lost may be replaced by newly acquired L2 concepts in a process called substitution

v) Restructuring of the conceptual domain

Under the influence of L2 learning, the L1 conceptual domain may undergo changes that may delete or add elements to it. The L2 may as well undergo modification, drawing elements from L1. These changes do not fully shift the conceptual domain from either language but partially reorganizes aspects of it.

The cognitive changes highlighted are believed to have been as a result a number of factors some of which are discussed in the section that follows:

3.4.4. Factors that lead to conceptual change

i) Language proficiency

Researchers have found that a bilingual's L2 proficiency might have an effect on the individual's cognitive make up. For instance, Flecken (2011) investigated event construal by early Dutch-German bilinguals and found that the bilinguals behaved differently from either monolinguals. This indicated that their proficiency in L2 might have resulted into the bilingual-specific behaviour. In another study of motion events categorization involving German-English bilinguals, Athanasopoulos et al. (2015) found that the bilinguals mentioned event endpoint more while operating in a German context and failed to do so in an English context as had been predicted. The same task under interference revealed that the participants behaved in a similar way to the undisrupted language further reinforcing the impact of L2 proficiency. Other studies

such as (Athanasopoulos, 2006, 2007; Kurinski & Sera, 2011) further show the effects of both the bilingual's L1 and L2

Promising as these previous investigations appear, there are however a number of other studies focusing on L2 proficiency that only partially replicated the findings. Cook et al (2006) report no proficiency effects on participants who had stayed in the L2 context for a short period (below 6 months) as opposed to those who had a longer length of exposure (3 years). Kurinski & Sera (2011) observed that the effect of L2 learning on categorization though present was limited. Limited in the sense that even native English speakers with advanced proficiencies, could not perform to the level of Spanish native speakers. Bylund & Athanasopoulos (2014a,b) explain that the varying results could be due to, among other reasons, the methodology that the different researchers employed in testing the participant's L2 proficiency level.

The methodology concern can be remedied by adopting the standardisation of the proficiency tests as suggested by Bylund & Athanasopoulos (2014a). Alternatively, researchers can cross-compare findings from studies that employed similar proficiency tests and draw conclusions based on the same.

ii) Language contact

Language contact refers to how often the bilingual uses their L1 or L2. This factor is important since it might impact either directly or indirectly on the cognitive processes of an individual. For instance, Bylund et al. (2013) investigated grammatical aspects in motion events in L1 IsiXhosa-L2 English speakers. IsiXhosa as opposed to English does not grammatically encode aspectual distinction. The findings indicate that the more frequently the L1 IsiXhosa-L2 English bilinguals used English, the more prone they were to be focusing on the ongoing phase of the motion event similar to how the English speakers would behave. Frequency of use of an L2 therefore is likely to restructure the cognitive function of a bilingual. Other empirical evidence supporting the above assertion arise from the works of (e.g., Athanasopoulos, Damjanovic, Krajciová & Sasaki, 2011; Bylund & Athanasopoulos, 2014b; Bylund, Athanasopoulos & Oostendorp, 2013)

The second, albeit indirect, influence that language contact has on the cognitive behaviour of a bilingual concerns its potential effect on language proficiency. Schmid (2011) discusses in detail the factors that lead to language attrition. She explains that infrequent usage of an L1 in place of

the L2 with time is likely to impede the retrieval of the L1 linguistic components. Instead, the frequency of use of L2 has the effect of influencing aspects of the L1 leading to such processes as convergence, restructuring, shift etc.

iii) Context of Acquisition

The environment in which a bilingual acquires an L2 can vary. Nonetheless, the effects of the L2 on the cognitive constitution of the said individual presumably remain the same. With every linguistic setting comes a plethora of socio-cultural attributes that can either facilitate or impede the L2 acquisition process. As Bylund & Athanasopoulos (2014b) note, a context where a bilingual is immersed into the L2 community would provide adequate extra linguistic resources that would not only enhance the L2 acquisition but also potentially contribute to the restructuring of their L1.

iv) Bilingual Language Mode

It has been argued that a bilingual's L1 or L2 can be activated to a degree in a speech environment depending on the language context. Kersten *et al*'s (2010) investigation on the categorization of objects on the basis of manner of motion produced results that back up the bilingual mode claim. The findings revealed that Spanish-English bilinguals attend more strongly to manner of motion when English is used as a language of instruction than when Spanish is used. The same bilinguals behaved similarly at classification of objects on the basis of path of motion under either language of instruction. Note that manner of motion is prominently marked in English as opposed to Spanish while path of motion is marked in both languages. It is on this premise that English as a language of instruction influenced the cognitive behaviour involving object sorting and categorization. The finding that language context possibly activate either of the languages also points towards evidence of co-existing conceptual representation of the two languages. Other studies (e.g., Athanasopoulos, 2007) showed less impact of the language of instruction compared to language proficiency. Though the highlighted findings on the bilingual language mode suggest its influence at cognitive restructuring in bilinguals, more evidence needs to be gathered for a conclusive determination to be made

v) Age of Acquisition

Age of acquisition refers to the age at which a bilingual began to learn the L2. Researchers e.g., Bylund & Athanasopoulos (2014b), tend to consider the age of acquisition as one of the factors that contribute to the change in linguistic cognitive behaviour of a bilingual. The literature abounds with such findings (e.g., Athanasopoulos & Kasai, 2008; Boroditsky, 2001; Kersten et al., 2010). Boroditsky (2001) for instance investigated among other aspects, the correlation between age of English acquisition by L1 Mandarin-L2 English speakers and how such bilinguals think about time. The findings showed that bilinguals who acquired English earlier on in life tended to think about time more horizontally as would English monolinguals. However, those Mandarin speakers who acquired English later on in life maintained the vertical time interpretation like a monolingual Mandarin would. The length or amount of exposure to L2 did not impact on the results. However, for this particular case, save for Boroditsky (2001), all the other research (e.g., Athanasopoulos, 2009) found no direct effect of age of acquisition. In the Athanasopoulos (2009) research, it was also not treated as a necessary variable but one that remotely operated in the background to facilitate factors such as language proficiency and bilingual language mode which would in turn impact on the linguistic cognitive behaviour of the bilinguals. Age of acquisition therefore appears to be a crucial ingredient that affects other factors which in turn effect changes on the linguistic cognitive behaviour of the bilingual

Since this dissertation primarily focusses on DEK multilinguals, multicompetence runs across all levels of experiments, analysis and theoretical interpretation. From the verbally elicited data under the TFS framework to the non-linguistic data under the linguistic relativity hypothesis, all encapsulated within the sub-domains of spatial reference frames and motion, multicompetence is considered. Specifically, the aforementioned Pavlenko's (1999, 2005) approach to understanding conceptualization alongside the factors that support the same will be a key factor in the interpretation of the experiments' outcomes from the two subdomains. These sub-domains that have featured frequently in the foregoing discussions will be highlighted in the next sections and their theoretical constructs discussed.

3.5. Theoretical foundations of frames of reference

The theoretical underpinnings of spatial frames of reference are discussed and the specific tenets relevant to the analysis of the final findings are expounded in this section. Spatial representations can be categorized into coordinate and categorical relations (Jager & Postma, 2003:504).

Coordinate relations use metric units that define the exact distance in which to locate objects within space. Categorical relations on the other hand employ a more general structure that divides the visual spatial scene into layouts that enable loose location of objects in relation to other objects around the ego. Specifically, the coordinate relations are crucial in facilitating precise actions such as grabbing a bottle from off the table or kicking a ball. Categorical relations on their part help with identifying where objects are located in the larger visual space.

Neuroanatomical research reveals that coordinate and categorical representations are processed in the right and left hemispheric regions of the brain respectively. It has been suggested that since the left hemisphere is also responsible for language processing in right handed people (Jager & Postma, 2003, p. 505; Kosslyn, 1987, p. 168), categorical representation is not only more interlinked with language but also appear as the most dominant between the two. The language and categorical relations interplay is key in advancing the tenets of linguistic relativity and as such a central component in our study.

Categorical spatial relations branches into two main sub domains: kinesis and stasis. Kinesis includes categorical spatial descriptions that involve motion or movement of objects in relation to other objects within space. Stasis in turn groups together those spatial descriptions of static objects. The sub domain of stasis further divides into angular and non-angular spatial descriptions. The former entails locating of an object (Figure) by use of non-metric coordinates along a defined search domain with respect to another object (Ground). Examples from this group are the spatial frames of reference. The latter includes all the locative descriptions that do not use defined angles in expressing object to object relations. Major examples within the non-angular system are topological relations and deixis. Below is a diagrammatic hierarchical depiction of spatial representations

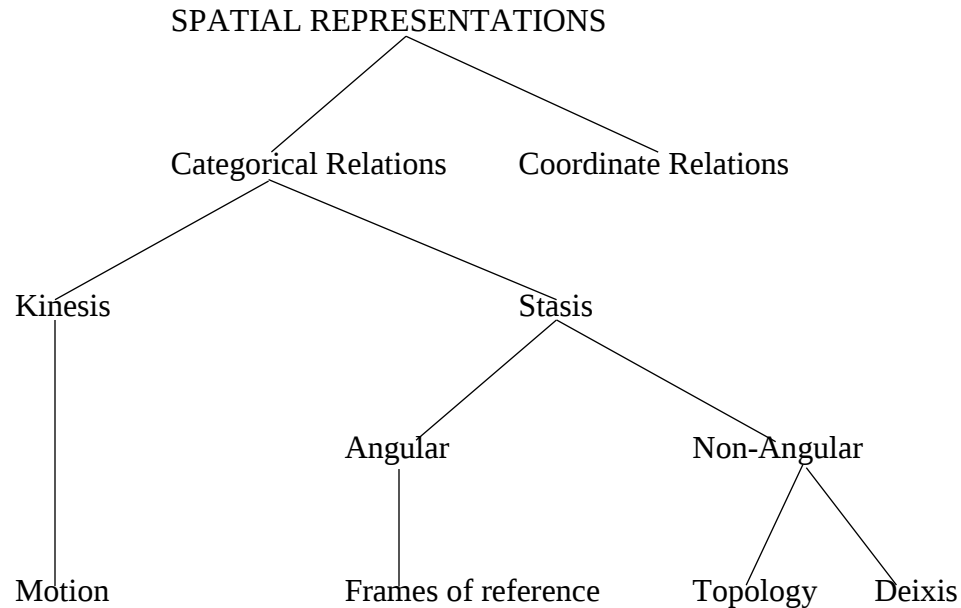


Figure 3.1 Hierarchical portrayal of spatial representation. (Model partly adapted from Levinson & Wilkins, 2006, p. 3)

Below is a brief highlight of the aspects associated with each of the four lowest cadre categories though focus will be on the frames of reference and motion which I will return to in later sections.

i) Frames of reference

The frame of reference sub-domain utilizes coordinates to locate or define the orientation of a Figure⁵ (object to be located/oriented) along a search domain against a Ground (object upon which the Figure's location is defined). Most FoR descriptions express either a ternary or binary relationship between objects (Levinson, 2004)

ii) Motion description

In this category, a Figure is displaced within space along a trajectory. The key aspects of motion description are thus a Figure (entity that is moving), the trajectory (the path along which the entity moves), the Ground (source / target of motion) and the Event (primarily depicted by the motion verbs).

⁵ Following Tamy (1991), the terms Figure, Ground, Motion, Event, Cause, Path etc., as used in motion event description have been capitalized throughout the dissertation to differentiate them from their non-motion usages.

iii) **Topological relations**

This class largely define locative relationships between objects that are in contact or contiguous with each other. It may also include encodings of non-projective elements that are in propinquity within a defined spatial scene. In such cases, the descriptions are imprecise, only mentioning the general configurations of the objects in question.(Levinson, 2003)

iv) **Deictic relations**

Descriptions of this nature focalize on the speaker. Any figure to be located is identified by use of demonstratives that express either a distal or proximal reference in relation to the addresser/ addressee. Unlike topological relations, deixis utilizes orthogonal properties in their descriptions though not as fine-grained as those of the FoR. A shared context between the interlocutors is important in deictic descriptions.

It should be noted that whereas these subdomains are autonomous and can define an utterance independently, there are cases where two, three or even all the four categories are realized in a single utterance complementing one another. In this dissertation, we focus on both spatial reference frames and motion events

3.5.1. Spatial frames of reference

Spatial frames of reference has been defined, classified, and used differently across disciplines. Most researchers however associate its origin to the Gestalt psychology movement. It is considered as one of the major perceptual phenomena that were central to the tenets of Gestalt theory of perception. According to Rock (1992, p. 404), the Gestaltist defined spatial frames of reference (also FoR or spatial reference frames) 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.

A simple way to understand the notion of spatial reference frames is to consider it as a platform that provides to a speaker options of pinpointing the locations of objects within a spatial set up (Danziger, 2010, p. 168). Logan (1996, p. 499) explains that FoR defines the perceptual space by aiding the viewer (the perspective from which the Figure is located in relation to the position of

the Ground) to identify the Figure and the Ground and maps this relationship unto the conceptual domain.

The shared view within the area of spatial cognition is that FoR is available in all languages. Additionally, research has revealed that due to cross-modal influence of language, there is evidence of the linguistic FoR permeating into non-linguistic domains. Levinson (2004) presents the cross-discipline classification of the FoR types as outlined in the sections that follow. First though is a look at the distinction between location and orientation description

(a) Location versus Orientation spatial descriptions

Most studies involving spatial reference frames focus on the locative descriptions of objects within space (see e.g., Bohnermeyer & Stolz, 2006; Levinson, 1997, 2003; Pederson, 2006; Pederson et al., 1998; Wilkins, 2006). Location descriptions involve a pairwise relationship between a Figure and a Ground occupying separate positions within a spatial scene. The relationship seeks to define the location of the Figure with reference to the Ground. The nature of the entities acting as Figure and Ground do differ that is, they can be objects with defined features (facets) such as a man, a chair, etc., or they can be unfeatured, that is lacking characteristics that can be defined as inherent parts of the objects e.g., front, back, sides etc. The unfeatured group include objects such as tree, ball etc. There are several ways in which a Figure can be located with reference to a Ground.

First, if the Ground is featured, a search domain extending from the anchor point (in this case a facet of the Ground e.g., front, back etc.) outwards unto the Figure would define the spatial relationship e.g., *the man is in front of the house*. Second, if the Ground is unfeatured, the bodily coordinates of the speaker (anchor point) would be mapped onto the Ground from which a search domain would originate and extend unto the Figure e.g., *the ball is left of the tree* (according to the viewer). Third, in case the origin of the anchor point is an abstract entity existing within the environment of the speaker e.g., cardinal directions, then the coordinates would be mapped from the environmental gradient or abstract entity onto the Ground from which a search domain would extend outwards, unto the Figure resulting into descriptions such as *the tree is north of the house*. It should be noted that every context in which a locative description is given leads to a different

FoR. Three have been mentioned here, but there are a number of others that will be discussed in the later sections.

Orientation descriptions refer to relationships between entities that focus on the positioning of the Figure vis a vis the anchor point. In other words, orientation descriptions mention where the Figure is facing. Orientation will be used in this dissertation in a similar way to Levinson (2006) and Pederson et al. (1998) but not in the strict sense in which Terrill & Burenhult (2008) have used it. It is important to note that like the locative descriptions, the interpretation of orientation descriptions rely on the anchorage system. For instance, an orientation description such as *the man is facing left* is permissible since the speaker maps the coordinates onto a space and marks it left thereby transferring the anchorage to this *left space*. However, in a situation where the anchor also doubles up as the Figure and the Ground, an orientation description would not be possible since it would give rise to such descriptions as *the man is facing the (same) man*. Remember the entity/space that is *faced* is also the anchor point.

The reason the distinction between the locative and the orientation description is important is because the approach we have taken in this dissertation is slightly different from that which is available in the literature. Previously, researchers have mostly focussed on elicitation tasks where a featured object is paired with an unfeatured object e.g., man and tree as in the *Man and tree game*, ball and chair as in the *Ball and Chair task* etc. Such tasks mostly limit the descriptions to locations and hardly consider the orientation descriptions. The few studies that have taken into account the orientations of the objects such as (Báez, 2011; Garza, 2011; Pederson et al., 1998; Soto, 2011; Terrill & Burenhult, 2008) have mainly considered the featured/unfeatured object pairing. This study differs not only because we employ a picture-object task as opposed to the picture-picture tasks, but because in addition to the featured/unfeatured category, we have the unfeatured/unfeatured (e.g., tree and ball) as well as the featured /featured category (e.g., man and car). This approach, considering the available literature, is unique to this study.

(b) General classification of spatial frames of reference

FoR classifications according to various disciplines as summarized by Levinson (2004) is briefly highlighted in this section. First, the brain sciences classify reference frames as either *egocentric* or *allocentric*. The basis for the difference lies in the origin of the coordinates that is, the coordinates can either be from the person/organism (egocentric) or from the environment (allocentric).

The next two classifications: the *viewer centred* versus the *object centred* and the *orientation bound* versus *orientation free* were proposed by the vision theorists from psychology. For the *viewer-centred/ object-centred* category, distinction is based on how the image literally appears on the retina of the viewer, otherwise called the 2D image (viewer centred) vis a vis perceiving an image in terms of its volumetric properties also known as the 3D image (object centred). The *orientation bound/ orientation free* category is based on whether objects can be identified with (orientation bound) or without (orientation free) considering other familiar related entities within their surroundings.

The linguists identify *deictic* versus *intrinsic* contrast. According to this classification, deictic FoR focusses on the speaker or any speech participant as opposed to the intrinsic FoR which does not.

Lastly, the psycholinguistic distinction proposes three strands of reference frames; *the viewer centred*, *object centred* and *environment centred*. The viewer centric frame depends on the person's body coordinates to give the observer's perspective. The object-centred frame is based on the object's intrinsic features. The environment centred frame on the other hand derives its coordinates from the physical features of the environment and abstract entities like gravity and cardinal orientation. Levinson (2004b, p. 32) concludes by stating that it is the psycholinguistics' viewer centred, object centred and environment centred categories that was renamed to the commonly known tripartite distinction of *relative*, *intrinsic*, and *absolute* spatial reference frames.

The limitations and merits of these frames of reference groupings as analysed in (Levinson, 2004, pp. 27–32) will not be mentioned here. Instead, in section 3.5.1(c), the spatial reference frame classification as used in this dissertation is explained.

(c) FoR classification as used in the dissertation

The dissertation largely adopts Danziger's (2011) frame of reference classification. To start with, any spatial description that involves the location or orientation of a Figure would be incomplete without the mention of a reference point. There may be one or two reference points for every spatial description but there cannot be none. The Ground forms the primary reference point for most descriptions but there is yet another point of reference which (Talmy, 2000, p. 203) calls the secondary reference object – the *anchor*. Danziger (2010, p. 106) defines the anchor as ‘the zero point from which the vector is calculated which narrows the search space from the Ground to the Figure’. Such a zero point would be fixed and immovable in relation to other elements of the spatial scene.

The relationship between the anchorage system and other aspects of the spatial array, such as the Ground and the speech act participant, is key in distinguishing the types of FoR in this study. A speech act participant (SAP) is the addressee or the addresser that is not part of the picture world (in our case) but involved directly in the description. The examples in 8-15 are used to interrogate further the nature of this relationship. The examples are based on Fig 3.2.



Fig 3.2 Picture of girl in front of house

To answer the question, *where is the girl*, based on Fig 3.2, the following possible responses are considered;

1.

- a. Absolute: The girl is west of the house
- b. Relative: The girl is to the left of the house (according to the perspective of the viewer)
- c. Intrinsic: The girl is in front of the house

The above responses are based on the Levinsonian tripartite distinction of the FoRs (Levinson, 2003). From 3.2, the girl is the Figure while the house is the Ground of the spatial array. Since the anchor dictates the origin of the coordinates, its location within the scene is important.

In absolute encoding, the anchor is not confounded with either the Ground or the speech act participant. In the relative description, the anchor is part of the SAP while in intrinsic descriptions, the anchor forms part of the Ground. In short, the anchor can either confound with the SAP, the Ground or neither of the two.

Using the Levinsonian classification as a base, a number of cross-category FoR groupings can be realized from the anchor-SAP-Ground interrelationship described above. There is need however to first redefine the intrinsic FoR (as reformulated by Danziger's (2011)) to the object-centred (OBC) FoR, to capture the narrow sense in which it has been used here. Further, an additional three more types of FoR, namely; the landmark-based, the direct, and the geomorphic FoRs have been added. The following are the definitions of the six types of FoR as used in this study

i) Absolute FoR

The Absolute FoR refers to the spatial relationship which involves an abstracted environmental bearing such as gravity and cardinal orientation. It involves the identification of a Figure in relation to a Ground based on fixed bearings (cardinal orientation). Important to note is that in absolute encodings, the anchor is neither part of the Ground nor part of the SAP. The example in 2 illustrate the same for both location and orientation.

2.

LOC⁶: *The girl is west of the house*

ORN: *The girl is facing West*

ii) Relative FoR

The relative FoR involves a ternary relationship involving the Figure, the Ground, and the viewer. These spatial descriptions are mostly realized with unfeatured objects or when speakers ignore these features and instead map their co-ordinates onto the Ground. As such, the projection of the SAP's coordinates onto the Ground means that the anchor is part of the SAP. A relative For description is exemplified in 3

3.

LOC: *The girl is left of the house (according to the perspective of the viewer)*

ORN: *The girl is facing left (according to the perspective of the viewer)*

iii) Object-centred FoR

The Object-centred FoR uses an inherent feature of the Ground as a reference point to identify and locate the position of a Figure that is within its search domain. The Ground in this case must not be the SAP but should be confounded with the anchor. The following is an illustration of this type of FoR.

4.

LOC: *The girl is in front of the house*

Note that in object-centred FoR, the Figure cannot be oriented against the anchor point, since that anchor point is also the ground. If that were to be the case, then we would have a description such as;

5.

ORN: **She is facing the house from the (same) house.*

This explains why the object-centred FoR lacks the orientation description.

⁶ LOC means location
ORN means orientation

iv) Direct FoR

The direct FoR involves a Ground which is in most cases the SAP and also the anchor, upon which the orientation or location of a Figure is identified. Unlike the relative FoR, this spatial description does not involve projection and mapping of spatial coordinates. The direct FoR is exemplified as follows:

6.

LOC: *The girl is in front of me/you*

ORN: *The girl is facing me/you*

v) Landmark-based FoR

The landmark-based FoR has been used to describe spatial relationships that make use of *ad hoc* landmarks or man-made or natural features/entities in the surrounding environment that the participants are familiar with. Examples of such *ad hoc* landmarks may include, a door, a table, a TV set or even a non-SAP human. The landmarks are used as the anchorage systems from which a figure is either oriented or located. Besides the figure and the landmark, there is a ground that mostly goes unmentioned in Landmark-based FoR descriptions. Below is the illustration of the same

7.

LOC: *The girl is toward the wall (from the chair)*

ORN: *The girl is facing the wall from the chair*

vi) Geomorphic FoR

The geomorphic FoR makes use of the environmental gradient emanating majorly from the surrounding landscape as a source of anchorage. The coordinates originate from the ground and extend outwards onto a figure whose location is defined by the environmental slope. The example in 8 illustrates the geomorphic FoR

8.

LOC: *The girl is downwards (from the chair)*

ORN: *The girl is facing downwards from the chair*

Having defined the FoRs, we can now turn to grouping them. At this point, it is evident that the role of the anchor in FoR categorization is integral. The criteria that Danziger (2011) proposes, which are adopted here, involve the anchor-SAP and the anchor-ground association.

An anchor-SAP combination gives rise to the dichotomous *allocentric* and *egocentric* classes. In the allocentric class, the anchor is not part of the SAP, while in the egocentric class the anchor forms part of the SAP. Within the anchor-SAP combination, the following types of FoR belong to the allocentric group; the absolute, landmark-based, the object-centred and the geomorphic FoRs. The following two examples are part of the egocentric class; the relative and direct FoRs. An anchor-ground mechanism on the other hand leads to an *extrinsic* class (the ground and the anchor are different entities) and an *intrinsic* group (the ground and anchor are the same). Within the anchor-ground combination, the following FoRs form part of the extrinsic class; the absolute, landmark-based, geomorphic and relative FoRs. Examples in the intrinsic group are the object-centred and direct FoRs.

The cross categorization of FoR classes and types as expounded in the previous paragraph is presented in Table 3.1

Table 3.1 The cross categorization of FoR classes and types.

	ALLOCENTRIC Anchor is not a SAP			EGOCENTRIC Anchor is a SAP
	Anchor based on angles abstracted from the environment	Anchor is a natural or man-made feature of the environment	Anchor based on environmentally derived gradient/slope	Anchor is a SAP
EXTRINSIC Anchor is not ground	Absolute LOC: <i>The girl is west of the house</i> ORN: <i>The girl is facing west</i>	Landmark-based LOC: <i>The girl is toward the wall (from the house)</i> ORN: <i>The girl is facing the wall</i>	Geomorphic LOC: <i>The girl is downwards of the house</i> ORN: <i>The girl is facing downwards</i>	Relative LOC: <i>The girl is left^{vd} of the house</i> ORN: <i>The girl is facing left^{vd}</i>
INTRINSIC Anchor is ground	Object-centred			Direct
	LOC: <i>The girl is in front^{vi} of the house</i>			LOC: <i>The girl is in front of me</i> ORN: <i>The girl is facing me</i>

LOC – Locative description

VD -Viewer dependent

ORN – Orientation description

VI- Viewer independent

3.5.2. Frame of Reference and Rotation Sensitivity

With the knowledge that the anchorage system lies with the SAP or the Ground, it would be informative to explore what would remain true of the FoR descriptions if certain features of the spatial array are rotated. For example, referring to Figure 3.2, would ‘*the girl is left of the house*’ hold true if the SAP is rotated, certainly not. The same cannot be said of ‘*the girl is in front of the house*’ when the observer is rotated since the anchor is not part of them (observer).

Beyond the test of whether a FoR description would remain felicitous if the anchor is rotated or not, sensitivity to rotation has a more profound bearing to the design, administration and interpretation of non-linguistic tasks that involve participant rotation (Danziger, 2010, p. 174; Levinson, 2003, p. 53). For instance, since the observer is not the same as the anchor, an absolute encoding would maintain its orientation in the *Animal in a row experiment* under a 180 degrees rotation of the speaker. A relative encoding, however, would force the speaker to realign the objects so as to maintain the original spatial array because as a speaker/anchor, participant rotation would interfere with the spatial ordering

In Table 3.2, a summary of the rotation sensitivities depicting the six types of FoR used in this study is illustrated.

Table 3.2 A summary of the rotation sensitivities depicting the six types of FoR

A: Examples of locative and orientation descriptions		B: Description still true under rotation of participant?	C. Description still true under rotation of ground?	D. Description still true under rotation of figure-ground array?	E: Frame of reference assignment
1	LOC: The girl is west of the house ORN: The girl is facing west	YES	YES	NO	Absolute (extrinsic; allocentric)
2	LOC: The girl is toward the wall (from the house) ORN: The girl is facing the wall (from the house)	YES	YES	NO	Landmark-based (extrinsic; allocentric)
3	LOC: The girl is downwards of the house ORN: The girl is facing downwards	YES	YES	NO	Geomorphic (extrinsic; allocentric)
4	LOC: The girl is left ^{vd} of the house ORN: The girl is facing left ^{vd}	NO	YES	NO	Relative (extrinsic; egocentric)
5	LOC: The girl is in front ^{vi} of the house	YES	NO	YES	Object-Centered (intrinsic; allocentric)
5	LOC: The girl is in front of me ORN: The girl is facing me	NO	NO	YES	Direct (intrinsic; egocentric)

vd -viewer dependent; vi- viewer independent

3.6. Conceptual principles behind the mirror image task

The mirror image (MI) experiment, also known as the Palmer's task, was designed primarily to test whether there exists a relationship between the habitual linguistic use of the intrinsic FoR and its use in non-verbal problem-solving tasks (Danziger, 2011). Here the terms intrinsic and extrinsic are used broadly to refer to FoR types where the anchor is either part of the ground or not part of the ground respectively (refer to Table 3.1). Akin to what the animal in a row (*AIAR*) experiments perform in extrinsic frames; the MI task was intended to investigate the use of the intrinsic FoR in non-linguistic situations.

The success that the AIAR enjoys in distinguishing the types of extrinsic FoRs used in table top spatial descriptions is heavily dependent on the rotational sensitivities of objects (Danziger, 2011, p. 4). Whereas this principle partially applies to the intrinsic frames too (in the case of direct FoR), when applied to intrinsic contexts it fails to yield conclusive results since the latter generally relies on the internal asymmetry of objects. A second and more significant contrast between the extrinsic and intrinsic frames with regards to their manifestations in non-linguistic situations is on enantiomorphs (an asymmetrical object that has an incongruent counterpart). It has been documented that heavy extrinsic users as opposed to their intrinsic counterparts can easily tell apart mirror images (Kant, 1991). It is along this premise that the MI experiment was designed.

Levinson & Brown (1994) report that according to Kant (1991) the distinction between the human's right and left side of the body is connected to their ability to differentiate between mirror images. In other words, if one is unable to make meaning of the sagittal axis that divides their world into left and right relations, there is a possibility that they may not understand incongruous entities like mirror images, clockwise and anti-clockwise relations etc. Levinson and Brown set out to investigate this assertion amongst the Tenejapans – a community in which left and right relations was almost non-existent, despite having terminologies for the left and right sides.

Their investigations proved that, indeed, compared to the heavy extrinsic Western population who predominantly used the left and right spatial referencing, the Tenejapans performed poorly in differentiating between pairs of mirror images. The FoR preferences by the Tenejapans, also called the Maya people, was not clearly defined. The findings of Levinson and Brown (1994), however, showed that there were elements that could be interpreted as absolute, geomorphic and intrinsic– depending on the classification criteria. The Mopan people are considered as heavy

intrinsic users (Danziger, 2011; Pederson et al., 1998). Danziger's (2011) used the mirror images task with the Mopan people which provided the base for extending the same to Dholuo speakers who are equally regarded as dominant intrinsic users Ogelo (2017).

It is noteworthy to observe that there are previous studies (e.g., Kolinsky et al., 2011; Pederson, 2003) that have reported a correlation between the inability to tell apart mirror images to illiteracy. It did however emerge from these studies that the stimuli used were 2D as opposed to 3D images. Effects of literacy were most prevalent from findings in studies that used 2D images. These were controlled for by using 3D images and choosing a homogenous literate group for our study.

The section on the Frames of reference has detailed on their nature, types and how they are grouped. Further, their manifestation when spatial arrays are rotated has also been highlighted. The conceptual ground with which the mirror image task was undertaken has also been explained.

There are two key theoretical points to note from the foregoing explication. The first concerns the verbal tasks especially with regards to the classification of the spatial frames into the six categories that is; relative, absolute, object-centred, landmark-based, direct and geomorphic FoRs. This fine-grained categorization is important since it captures every possible variation that may exist from the spatial descriptions produced by the participants. The spatial reference base is widely spread so that any spatial description that does not fall within it could be deemed with high certainty not to have involved the use of a spatial reference frame. The other broad-based categorizations are equally important since they provide an opportunity for cross-level analysis. For instance, in case there is need for comparison with any previous research that adopted a different, say Levinsonian classification system, it becomes easy to collapse the six types of FoR into the tripartite categories of absolute, intrinsic and relative FoRs. More importantly however, is the extrinsic/intrinsic distinction that forms the basis for the mirror image experiment

Secondly, sensitivity to rotation is a very integral theoretical ground upon which non-verbal FoR tasks are carried. Whereas it is greatly impactful with the *animal in a row experiment* which has not been used in this dissertation, as has been mentioned, it still is applicable in the interpretation of the FoRs (refer to Table 3.2). Another element of rotation that is relevant for the interpretation of the mirror image tasks involves the mental rotation employed by participants during the mirror image tasks in differentiating the enantiomorphs.

3.7. Aspect

In this section, the discussions will centre on aspectual notions of verbs. Rieger (2011) generally defines aspect as a language feature that describes the structure of a situation depending on the speaker's perspective of it or on the *aktionsart* of the verb. In her definition, Reiger (ibid) mentions two distinctive features which are; the speaker's perspective and *aktionsart*. These two features have been mostly associated with two types of aspects; grammatical aspect and lexical aspect respectively. As Sasse (2002) points out, the present situation in the field of aspect studies is such that for some researchers (e.g., Bertinetto, 1997; Smith, 1997), it is a must to differentiate between the grammatical and lexical aspect while for others (e.g., Bybee et al., 1994) such a distinction is not necessary. The latter group considers aspect as one linguistic category despite having both the semantic and grammatical components. Sasse (2002) adds that despite the insistence on the bi-dimensional distinction, the former group do not always agree on what linguistic components make up either of the aspect categories. Sasse (ibid) concludes by asserting that presently, lexical aspect is no longer regarded as dependent on morphological processes or exclusively confined to verb lexemes. Likewise, grammatical aspect no longer depends on overt marking where the difference between perfective and imperfective can be based on contextual grounds. Instead he points out that most recent researchers rely on the notion of *boundaries* to establish semantic distinctions between and within the bi-dimensional aspectual classes.

I will briefly touch on lexical aspect in the strict sense in which it appears in most of the literature (section 3.7.1.) and focus more on grammatical aspect (section 3.7.2) which is integral to the motion event cognition investigation undertaken in this dissertation. The theoretical foundations of grammatical aspect will be discussed in details in the aforementioned section. Generally speaking, the underlying semantic notions such as perfectivity, dynamicity, telicity etc., which are normally considered to be specific to either category, do interact at some level in the analysis of aspect. As Lindfors (2004) suggests, grammatical aspect adds a communicative perspective to the inherent (lexical) aspect. It means therefore that even though our focus going forward would be on grammatical aspect as elaborated in section 3.7.2, semantic notions that are traditionally regarded as belonging to lexical aspect are bound to appear in the discussions.

3.7.1. Lexical aspect

Lexical aspect refers to the semantic or inherent content of the verb. The term lexical aspect is used synonymously with *verb content* (Goedsche, 1940), *inherent aspect* (Lindfors, 2004), *aktionsart* (Binnick, 1991) etc. Sasse (2002) defines lexical aspects as comprising ‘any type of intrinsic temporal characteristic of situations’. Such intrinsic temporal components of situations can take the form of semantic binary distinctions such as dynamicity/stativity, durativity/punctuality, telicity/atelicity etc., (Sasse, 2002). Dynamic situations involve some change while stative situations do continue unchanged unless something happens to change them (Bybee et al., 1994). Durative situations last for a length of time while punctual ones are regarded as involving no duration (Radden & Dirven, 2007). Telic situations have an inherent or built in endpoint while atelic situations are indefinite as they lack a conclusive endpoint (Bybee et al., 1994; Radden & Dirven, 2007)

Radden & Dirven (2007) propose that telic/atelic situations further subdivide into accomplishments, activities, achievements and acts while at the same time they are subsumed under the durative/punctual situations as illustrated in Fig 3.3. Radden & Dirven (ibid) define the aforementioned terminologies as follows: accomplishments are telic events which require an energy source (e.g., a deliberate act by a human being) that propels it to completion after a certain duration; activities are durational and atelic events that is, they do not have any built in endpoint; achievements and acts are both punctual but the latter is atelic while the former is telic.

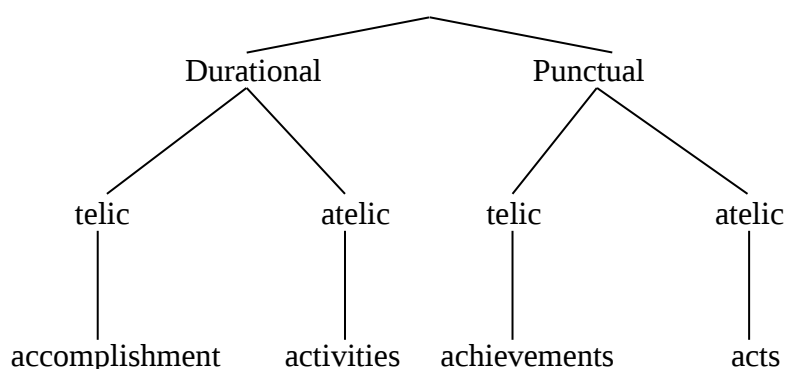


Fig 3.3 Sample inherent temporal composition of a situation depicting a lexical aspect (Adapted from Radden & Dirven, 2007)

3.7.2. Grammatical aspect

Grammatical aspect is discussed in this section first, as it contrasts with the lexical aspect and second, regarding the various aspectual oppositions that form part of it.

Grammatical aspect as a grammatical category is related to the different ways of viewing the temporal constituency of an event (whether it is complete, in progress, repetitive etc.). It is also referred to as *viewpoint aspect/ aspect proper* (Sasse, 2002), *morphological aspect* (Lindfors, 2004) etc. Grammatical aspect thus distinguishes the perfective/imperfective/habitual /perfect etc. Some of the common aspectual distinctions are explained below:

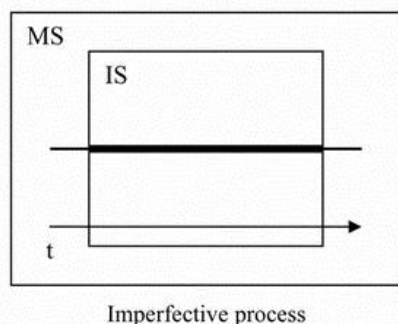
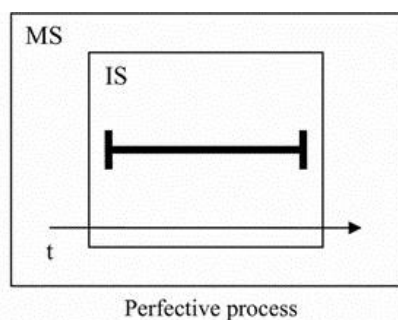
a) Perfective aspect

Perfective aspect presents an external view of a situation and in its entirety. It regards such a situation as bounded, wholesome, and complete (maximal scope). A speaker adopting the perfective aspect focuses on the boundaries of the situation, specifically its end (Comrie, 1976, p. 4; Radden & Dirven, 2007, p. 176). Even though the events in the perfective are typically situated in the past, it differs from the simple past in that it does not deictically relate the situation in question to the moment of speech but focusses on the viewpoint. It is also used for narration (Bybee et al., 1994).

b) Imperfective aspect

Imperfective aspect, on the other hand, views a situation with explicit references to its internal temporal structure, though it presupposes its overall boundaries. It zooms in on a situation's progression portraying a sense of immediacy (immediate scope) (Comrie, 1976, p. 4; Radden & Dirven, 2007, p. 176). Bybee et al. (1994) adds that an imperfective aspect presents a situation as in progress at a particular reference point be it past, present or future. In discourse, the imperfective is used to set up background situation but not used in narration unlike the perfective (Bybee et al., 1994).

Fig 3.4 shows a diagrammatic illustration of the perfective and imperfective



MS = maximal scope; IS = immediate scope; t = time

Fig 3.4 Maximal and Immediate scope

c) Perfect aspect

The perfect is regarded as an aspect even though it does not strictly present a situation's viewpoint as does other aspectual distinctions. It however signals a past action that has a present relevance (Comrie, 1976; Bybee et al., 1994; Dahl, 2000). Bybee et al. (1994) explains that the perfect aspect which she also refers to as *the anterior*, conveys a sense of past or perfective situation but adds 'a special flavour' of the situation having a present relevance. Bybee et al. (ibid) adds that unlike the perfective, the perfect can be used with the past, present or the future. These two distinctive features of the perfect are particularly important for this dissertation in as far as the difference between the perfect and the perfective is concerned in Dholuo and Kiswahili as expounded in sections 3.7.4 and 3.7.5 respectively.

d) Habitual aspect

Habituality is considered as an aspect in this dissertation though there are studies (eg., Givon, 2001) which classify it as a tense. In some languages, linguists classify habituality as part of imperfectivity while others regard it as an independent aspectual category equal in status to the perfective and the imperfective. According to (Comrie, 1976, pp. 27–28) habituality refers to an act that is repeated over a relatively long period of time that it becomes a characteristic feature of

that whole period. The habituality differs from the iterativity in that the former is defined by the extended period of time that characterizes its occurrence. Comrie (1976, pp.28) defines iterativity as the successive occurrence of many instances of a particular situation. Unlike habituality, iterativity is realized of a relatively short period of time.

e) Continuous aspect

The continuous aspect as contrasted with the habitual refers to a situation that carries on whether as a state or as an activity unlike the habitual which repeats itself over time. Comrie (ibid) subdivides the continuous aspect into the progressive and the non-progressive.

f) Progressive aspect

The progressive aspect views an action as ongoing at the time of reference. The progressive are typically realized in situation that involve actions that requires a constant input of energy to be sustained (Bybee et al., 1994)

g) Non-progressive

The non-progressive aspect is a continuous situation involving states. Such situations do not require overt/deliberate effort to be sustained.

Fig 3.5 presents an illustration of the aspectual oppositions according to Comrie (1976).

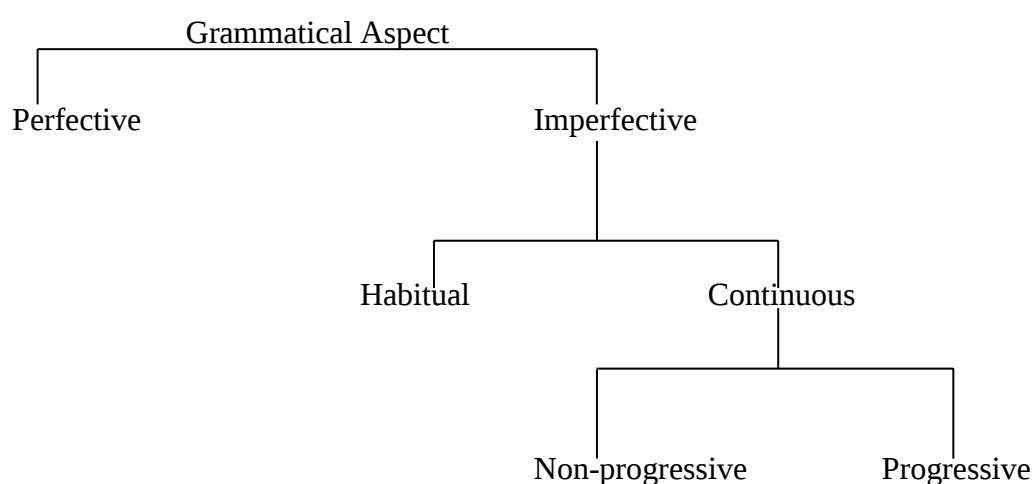


Fig 3.5 Aspectual opposition (Adapted from Comrie 1976)

(For details on grammatical aspect see Binnick, 1991; Comrie, 1976; Dahl, 2000)

While acknowledging the definitions involving the aspectual oppositions as elaborated in this section, it is important to state how some of these terms have been used in this dissertation. The imperfective aspect is regarded as a general term involving the progressive, habitual and non-progressive aspects as has been elaborated in the definitions. However, in the present study, whenever it will be used with reference to the obligatory aspectual markings in Dholuo and Kiswahili languages, the sense conveyed is that of the progressive aspect. For glossing of the actual descriptions in the analysis, each construction will be marked according to the specific aspectual opposition that it portrays. For instance, *seeing* will be glossed as non-progressive (NPROG) while *running* will be glossed as progressive (PROG). Neither of the two will be glossed using the general term, imperfective (IPFV).

3.7.3. Grammatical Aspect approach

This section introduces von Stutterheim et al's (2012) *grammatical aspect approach* as a framework that is used to investigate motion events construal across languages. Additionally, a complimentary approach, cognitive grammar (CG), that seeks to explain further the possible relationship between motion events and grammatical aspect has been highlighted. The grammatical aspect hypothesis states that speakers of a language may prefer an immediate or holistic event description depending on whether aspectual markings in the language are grammaticized in the verb or not. In other words, languages whose aspectual distinction are marked grammatically (aspect languages) are unbounded. As such, they tend to focus on the ongoing phase of the event while those that do not encode aspect grammatically (non-aspect languages) are bounded and tend to focus on events endpoint. Encoding aspect grammatically in the strict sense used here would mean that the language obligatorily marks for the imperfectivity (habitual/continuous). Speakers of these so called aspect languages would therefore frequently use the imperfective aspect in particular contexts involving motion events failure to which such a construction would be deemed ungrammatical. For instance in Dholuo a question such as *Otieno timo ang'o?* 'What is Otieno doing?' can only accommodate a response in the imperfective (progressive) aspect, such as *Otieno tedo/nindo/wuotho* 'Otieno is cooking/sleeping/walking'. Examples of the aspect languages are Algerian Arabic, Greek, Russian, Spanish etc. Non aspect languages on the other hand do not obligatorily mark for imperfectivity. Such languages include Swedish, Afrikaans, German etc.

von Stutterheim (2003) and her colleagues largely advanced the grammatical aspect approach following on the tenets of the thinking and speaking hypothesis which is confined within the larger cognitive semantics theory. Bylund and Jarvis (2011) suggest a complimentary route to

interpreting the theoretical attributes of the grammatical aspect approach via the cognitive grammar theory (CG). Drawing their arguments from (Langacker, 1987, 2000, 2008) and (Radden & Dirven, 2007), the duo begin by explaining the concept of scope as a tenet of CG and its relevance to the relationship between grammatical aspect and motion event construal. Scope refers to the perspective or viewing frame that a speaker uses to construe a situation (motion event in our case). As already stated, the viewing frame can either be a maximal scope that is, showing an event in its entirety or restricted (immediate scope) which focusses on the internal progression of events. According to Langacker (2008 pp. 63–64), an immediate scope is foregrounded when compared to the maximal scope. In the case of a motion event construal, the immediate scope would be the segment that the speaker is attending to through speech while at the same time there is a corresponding conceptualization taking place in the mind. The maximal scope would include all the related conceptual content running concurrently in the background with the verbalization process but which the speaker does not focus on. Under CG, aspect can be considered as the feature that contrasts the maximal and the immediate scope. When the aspectual marker is missing, the maximal/immediate scope differentiation may reduce leading to the construal of the entire event as a single bounded situation. Aspect's presence however, as in the example *he is molding a pot*, means the progressive construction would zoom in and impose an immediate scope that locks out the endpoints of the bounded event (Langacker, 2008:65).

There is a second important notion in CG that would best explain the relationship between grammatical aspect and motion event at the non-linguistic level. This notion concerns schema (s) which is defined by Langacker (1987:371) as 'an abstract characterization that is fully compatible with all the members of the category it defines.' Schematization therefore involves extracting of schemas to reinforce a commonality in categories-what he (Langacker) calls the *categorizing function* of schemas (Langacker, 2008, pp. 56–57). Regarding events construal, CG considers the viewing frames as having been schematized thereby becoming entrenched in the mind. Radden & Dirven (2007:176) call these entrenched viewing frames *time schemas*. Langacker (2008, pp. 49) points out that the activation of a time schema depends on the degree by which the schema has become part of the cognitive routine of the speaker. Tied to this, are the linguistic categories that correspond to these schema which too have been entrenched in the minds of the speakers as result of recurrent use. Bylund & Jarvis (2011) point out that, such linguistic categories as the grammaticalized imperfective aspectual markers would access the time schemas using restricted viewing frames.

To restate, speakers whose languages grammatically encode imperfectivity prefer to focus on the ongoing phase of events as opposed to speakers of languages that do not. The fact that the latter group's viewing frame is not restricted to the internal phase could easily be explained as arising from the absence of the imperfective aspect. The outlined underlying mechanism involving time schemas which explains how the imperfective aspect directs the speakers' attention to the ongoing phase of a motion event is pegged on the CG. A TFS leaning approach advanced by Stutterheim (2003) claims that the saliency of the imperfective aspect makes it readily available to the speakers who in turn use it for the construal of the ongoing motion event phase. Bylund & Jarvis (2011) affirm that the CG based framework agree with Stutterheim's position on saliency but adds that the emphasis should be on how a particular time schema is entrenched in the minds of the speakers in relation to a particular motion event. Such an entrenchment is mostly as a result of the frequent interpretation of events in a particular way and got little to do with the saliency of morphology

The grammatical aspect approach, though originally intended as a linguistic framework, has been extended to interpret the non-linguistic processes as well. At the non-linguistic level, the tendency for aspect languages to focus on the immediate viewing phase and the non-aspect languages to tend to encode events holistically is interpreted by way of a triads matching task. A consistent choice of a [+endpoint] alternate shows a tendency to holistically encode the motion event while a consistent choice of [-endpoint] seeks to show the preference for the ongoing phase.

It is important to note that the theoretical discussions based on the two approaches as expounded in the preceding paragraphs are integral in explaining the motion events findings from both Kiswahili and Dholuo. Both languages mark the imperfectivity obligatorily, a feature that forms the tenet of grammatical aspect approach and which can further be elaborated using the cognitive grammar approach. More so it would be interesting to observe how DEK multilinguals construe motion events owing to the fact that the three languages, Dholuo, English, and Kiswahili despite being aspect languages exhibit aspect distinctions differently (see section 7.5, for the theoretical implication of the two approaches in final analysis of the findings).

3.7.4. Aspect in Dholuo

The section discusses the various aspectual oppositions in Dholuo. Since such distinctions are tonally realized, it is prudent to briefly discuss the category of tone (section 3.7.4 (a)) after which grammatical aspect will be discussed in section 3.7.4. (b). (For a detailed insight into the grammar of Dholuo see Omondi 1982; Stafford 1967; and Tucker 1994).

a) Dholuo Tone

Even though Dholuo is a tonal language, tone is not represented in the language orthographically. The number of tones in Dholuo is not defined. Most researchers however suggest that there are two types of tone - high (H) and low (L). There is a proposal of a third tone, characterised as a downstepped high ($\downarrow$ H) (Okoth, 1982) or a mid tone (M) (Tucker, 1994). Omondi (1982), however, disagrees with the idea that Dholuo has three tones. She explains that there are two tones in Dholuo, namely the high (H) and the low (L), but clarifies that any other toneme such as rising (R), falling (F) or the downstepped ($\downarrow$ H), are variations of the two. The dissertation adopts Omondi's (1982) and Owino's (2003) position that there are two underlying tones in Dholuo.

In Dholuo, tone variations are used phonemically to convey lexical or grammatical distinctions. These tone variations are denoted by diacritics⁷. The examples in 9 illustrate the same;

9.

- | | |
|--------------------|---|
| a) [kìch] 'orphan' | L |
| b) [kích] 'bees' | H |

Instances such as in 9 pose no problems to native speakers in writing due to the presence of contextual information. The most important and most relevant (to the dissertation) role of tone in Dholuo is in the grammatical aspectual distinction between the imperfective and the perfective aspects. These are discussed in the section that follows. It is important to mention that tense in Dholuo is encoded lexically and that tone does not encode tense.

⁷ The diacritics denoting tone have only been used in contexts and with examples where they are relevant for the current purposes, that is, where the change in tone results in a change in word class or aspectual distinction.

b) Dholuo Aspect

This sub-section presents the aspectual oppositions in Dholuo as has been proposed by a number of Dholuo scholars but specifies the position adopted in this dissertation. The perfective and the imperfective aspects are regarded as the most prominent aspectual categories in Dholuo (Stafford, 1967; Okombo, 1997; Ochola, 2003; Oluoch, 2004; Suleh, 2013; Ochieng, 2017). In some of the studies (e.g., Omondi, 1982; Abudho, 2004) the terminologies completive and incompletive are used. The habitual aspect is considered as part of imperfective by most of the aforementioned scholars. The progressive aspect is in most cases used synonymously with the imperfective in Dholuo literature.

Despite the generally agreed upon tonal differentiation between perfective/completive and incompletive/imperfective Dholuo aspectual distinctions, there are conflicting proposals as to what comprises the former. There are scholars (e.g., Ochieng, 2017) who propose that the perfective aspect can equally be marked periphrastically with the perfect maker {-se} as in **10**

10.

à-sè lúók-ò lewni	LLHL
1SG-PFV-wash-INF. clothes	
‘I have washed clothes’	

Such a construction as **10** would ordinarily be regarded as expressing the perfect and not the perfective.ct

Other scholars (e.g., Oluoch, 2004; Suleh, 2013; Ochieng, 2017) regard the past tense lexical markers *nene* (remote past) and *nende* (immediate past) both of which contract to the pre-verbal morpheme {ne} as perfective particles which express the perfective aspect as in **11**

11.

<i>Otieno ne ò-wúóth-ò</i>	LHL
name-NOM PFV 3SG-walk-INF	
Otieno walked	

The examples in **11** would normally be regarded as the simple past and not the perfective

Most scholars however suggest that Dholuo perfective aspect is marked tonally as it contrasts with the imperfective (progressive) as illustrated in **12**

12.

a) *Akinyi ted-ò* H

name-NOM cook-INF/IPFV

‘Akinyi is cooking’

b) *Akinyi ò-ted-ò* LL

name-NOM 3SG-cook-INF/PFV

‘Mother has cooked’

It is important to note that going by Bybee et al's (1994) and Dahl's (1985) suggestion that the perfective aspect is marked on several verbs in succession when reporting a sequence of events in narrative but not used with the future tense, only **11** fits the bill but so does the simple past (for the relationship between the simple past and the perfective see Bybee et al., 1994, p. 83). The perfective as exemplified in **12** (b) can be used both for narrations and to express situations in the future while **10** can be used to express a future occurrence but not with narrations. Additionally, despite both **10** and **12** (b) expressing an event as bounded and complete akin to perfective aspects, they exhibit a feature that is primarily associated with the perfect aspect that is, expressing a past situation with a present relevance. From the explanations arising from **10-12**, it can be concluded that there is no single standpoint on what makes up Dholuo perfective aspect and how it differs with the perfect aspect. For this dissertation however, I will follow the perfective/imperfective (progressive) opposition as exemplified in **12** since this is the position taken by most Dholuo researchers. I will use the terminologies perfective and imperfective (progressive) but not completive and incompletive to avoid the strict sense in which the latter are defined by Bybee et al. (1994).

Dholuo uses high tone⁸ when referring to events in the imperfective aspect (both progressive and habitual). In a monosyllabic word, the single syllable takes the high tone. In disyllabic words, the first syllable takes a low tone while the second syllable takes the high tone. The examples in **13** illustrate the same.

⁸ In this dissertation, tone will be differentiated using the terms high (H) and low (L), and not other variations such as downstepped High etc.

13.

a) Monosyllabic word

Mama dhí H

NOM go-INF/PROG

‘Mother is going’

b) Disyllabic word

ò-dhí LH

3SG-go-INF/PROG

‘He /she is going’

c) Disyllabic word

ò-dhì LL

3SG-go-INF/PFV

‘He /she has gone’

In example 13(a), the verb *dhi* (go) has been used in progressive aspect. The single syllable in **13(a)** has a high tone thereby showing progression. Notice that unlike in example **13(a)** the verb in **13(b)** has the pronominal prefix *o-*. When a nominal is used in a sentence, the pronominal prefix *o-* is dropped in the progressive. However, in the absence of the noun, the pronominal is used as in the case of **13(b)**. The high tone (H) in the second syllable is maintained in **13(b)** to further show progression. In **13(c)** there is a low (L) tone in the second syllable of the disyllabic word indicating the perfective aspect. Notice that in the cases of the disyllabic words, the first syllable maintains its low (L) tone. Perfectivity is denoted by a change in tone in the syllable. If it is a monosyllabic word, the single syllable takes a high (H) tone in the imperfective aspect and a low (L) tone in the perfective aspect. If it is a disyllabic word, the second syllable takes the high (H) tone and the first remains unchanged

The continuous aspect brings together both the non-progressive and progressive forms as illustrated in **14**

14.a) *Mama* *nìnd-ó* LH

NOM sleep-INF/NPROG

‘Mother is sleeping’

b) <i>Mama</i>	<i>ring-ó</i>	LH
NOM	run-INF/PROG	
‘Mother is running’		

In **14(a)**, *sleeping* is a continuous stative (non-progressive) situation depicting a non-progressive aspect while in **14(b)**, *running* is a continuous progressive situation depicting a progressive aspect.

Habitual aspect is characterised by repeated situations on different occasions normally over an extended period of time (Bybee et al., 1994; Comrie, 1976). Examples in 15 illustrate instances of the habitual aspect in Dholuo.

15.

(a)	
ò-wúóth-ó-gà	LHHL

3SG-walk-INF/PROG-HAB

‘He/she is always walking’

or

‘He/she always walks’

(b)	
ò-jà-wúóth-ó	LLHH

3SG-HAB-walk-INF/PROG

‘He/she is always walking’

or

‘He/she always walks’

(c)	
ò-jà-wúóth-ó-gà	LLHHL

3SG-HAB-walk-INF/PROG-HAB

‘He/she is always walking’

or

‘He/she always walks’

The suffix {-ga} in **15(a)** and the prefix {-ja-} in **15(b)** can be considered as allomorphs of the habitual morpheme. The former occurs at word final position while the latter occurs at word initial position. As in **15(c)**, both can be used at the same time and the meaning of the sentence remains unchanged.

3.7.5. Aspect in Kiswahili

One of the salient features of Kiswahili like other Bantu languages is the noun class system, though we will not focus on it. Instead, the focus will be on its aspectual oppositions. The number of aspectual oppositions in Kiswahili is not definite, as scholars differ in their classifications. However, the following categories are the most commonly cited in the literature; perfect, imperfective (progressive and habitual) and persistive (Beaudoin, 1999; Matei, 2008; Nurse, 2008).

Kiswahili grammatically encodes aspect through inflections and compound constructions (Nurse, 2008). When formed through inflectional morphemes, aspect occupies position four (4) in Kiswahili verbal constructions through the aspectual formatives {-me-}, {-na-}, {-hu-}, and {-ki-}, (Beaudoin, 1999; Lindfors, 2004). The use of these aspectual formatives are briefly described in the preceding sub-sections

(a) The formative {-me-}

The morpheme {-me-} occurs only in affirmative sentences. It shows that an action that was completed not long ago in the past still has a lingering relevance in the present. The example in **16** shows the use of the formative {-me-} to show the perfect aspect

16.

<i>Mjumbe</i>	<i>a-me-kuj-a</i>
Messenger	3SG-PRF-come-IND
‘The messenger has come’	

(b) The formative {-na-}

As in the case of the {-me-}, the {-na-} morpheme occurs only in affirmative constructions. It is mostly used to show the progressive aspect, though scholars do not normally agree on this, as some suggest that it portrays the deictic temporal properties when used in the simple present. It is safe to say that the {-na-} formative shows both tense and aspect. Consider the examples in **17**

17.

Musa a-na-tembe-a

Moses 3SG-IPFV-walk-IND

‘Moses is walking’

In 17, the {-na-} morpheme shows both the progressive and the present tense. It is also used in verb compounds as shown in 20.

(c) The formative {hu-}

The *hu-* morpheme marks the habitual aspect in affirmative sentences. The habitual aspect describes an action that occurs repeatedly over time. A habitual construction in Kiswahili is exemplified in 18

18.

Mtoto hu-chez-a na waya

NOM HAB-play-IND CONJ wire-ACC

The child usually plays with a wire

The habitual aspect does not occur with the past tense (Ashton, 1993) as shown in the ungrammatical construction below

19.

**A-li-kuwa hu-imb-a*

3SG-PST-be HAB-sing-IND

*She /he was usually sings

(d) The formative {-ki-} and the verbal compound

The morpheme {-ki-} is the most controversial of all the formatives in as far as its aspectual and non-aspectual usage is concerned. For the different researchers' perspectives see Beaudoin (1999), Ashton (1993), Contini-Morava (1989), Moshi (1988), Mukama (1985) and Schadeberg (1992). The formative {-ki-} among other usages, is used to express simultaneity especially in constructions that have two verbs (verb compounds). Consider the following:

20.

Mtoto a-na-tembe-a a-ki-end-a

NOM 3SG-PROG-walk-IND 3SG-PROG-go-IND

‘The child is walking while going’

The example in **20** shows a verb compound construction that has both the *-na-* and the *{-ki-}* morphemes. The formative *{-ki-}* denotes both a progressive and concurrent activity.

3.8. Conclusion

The chapter highlights a number of theoretical underpinnings that form a background upon which the experiments, analyses and discussions in this dissertation have been premised. An interconnection between the theories has been demonstrated all throughout the chapter that has culminated in the infusion with the spatial domains creating a base for the interpretation and discussion of the findings from the various experiments. The chapter has also briefly touched on Dholuo and Kiswahili Grammar, particularly their aspectual distinctions. The next chapter ushers in the methodology.

CHAPTER 4

METHODOLOGY

4.1. Introduction

The present chapter aims to describe the research design and methodology used in the study. It further seeks to explain the reasons for the choice of the design and methods used. The section that follows, 4.2, explains the type of research design used in the study and justifies its selection. Section 4.3 introduces the research methods. Within this section are sub-sections that outline the general approaches that have been used across the entire study. The details captured in these sub-sections apply to all the experimental tasks. Section 4.4 describes in depth, the specific methodology used in the linguistic frame of reference experiments. The section that follows, 4.5, highlights in detail the methodology used in conducting the mirror image (non-linguistic) frame of reference experimental task. The next section, 4.6, describes the linguistic motion event experiments and the methodology associated with it. The subsequent section, 4.7, captures all that relates to the non-linguistic motion event categorization experiments. The last section, 4.8, gives a summary of what the chapter entails.

4.2 Research Design

The research design used in the dissertation and the reasons for its choice are elaborated in this section.. The study is a cross-sectional experimental research that largely uses the comparison group design (Alison & Gass, 2005, p. 146) for data elicitation and interpretation. In a comparison group design, participants are randomly assigned to different groups with the independent variable different between the groups. The research adopted a cross-sectional approach because the condition investigated was a language related phenomena that affects a particular group of people. A one-time study would therefore meet the intended goal without requiring time intervals, pre- and post-tests etc.

Shadish et al. (2002) point out that experimental research is localized and specific, occurring within a defined range of settings with a restricted target sample but with an outcome that is usually generalizable to the entire population. What defines an experiment though is the use of treatments and comparative groups. In assessing cognitive processes in the multilingual mind, a research design that allows for variations in language contexts (treatments) and encourage comparison would be the best fit for our research study. Further, experimental designs provide a platform for inference, prediction and subsequent generalization of outcomes.

Since the comparison group design within the experimental research paradigm accommodates all our research questions, it is therefore the ideal choice.

It is important to point out that the focal point of this linguistic investigation is the L1-Dholuo speaker. However, it should be noted that the final analysis and interpretation of the outcomes from the several experimental tasks in this study have been made within the realms of multilingualism. This explains why the language context has not been confined to Dholuo but extended to include both Kiswahili and English. It further explains why, in some aspects of the study, L1-Kiswahili participants were involved. Not only was there need to find out how the L1 Dholuo speakers would behave in other languages' (English and Kiswahili) contexts, but also to observe how these languages would behave independently with their respective L1s. This would lay ground for a comparison across the three languages.

4.3. Research Method

This section highlights the research methods employed at the various levels of data collection. The reasons for the choice of the methods are also stated. Owing to the variegated nature of the experimental design used in the study, this section will be devoted to the general research attributes applicable across the entire work. However, the specific methods associated with the individual experimental tasks are provided in sections of those respective experiments.

The data collected were largely numerical and required statistical descriptive and inferential techniques to analyse. It means therefore that quantitative research approach is central to the dissertation. The sub-sections that follow affirm to the quantitative nature of the research.

4.3.1. Participants

A total of two hundred and seventy-two individuals participated in the study. They were either L1 Dholuo or L1 Swahili college students between the ages of 18 and 30. All the participants were multilingual speakers. The L1 Dholuo participants were also L2 and L3 speakers of Kiswahili and English respectively, though the languages were not necessarily acquired in that order for all the participants. A number of other participants had an L4 and but rarely an L5. Most L1 Swahili speakers had an additional L3 besides their L2 English. The proficiency level of the participants in these languages varied. Almost all of them exhibited high levels of proficiency in their L1 which they spoke often (see tables 4.2 and 4.3 for details)

The DEK multilinguals were majorly residents of the Nyanza region of Kenya. It is in this region that most Dholuo speakers are found. All the two hundred and thirty-two DEK multilinguals were students in any of the following colleges/universities; Rachuonyo KMTC, Kisumu National Polytechnic, Kisii University and Rongo University. The L1 Kiswahili participants were mostly residents of the Coastal region of Kenya. It is at the Coastal region that majority of L1 Kiswahili speakers hail from. All the forty L1 Kiswahili participants were students at Eldoret University in the Rift Valley region of Kenya.

The choice of college students as the representative sample for the study was informed by our desire to investigate the impact of multilingualism on language-cognition interaction. The DEK multilingual group who were easily accessible and would provide the requisite data were the college students. Additionally, to compare the results from the study to other similar research would require that the participants' socio-educational background be similar.

Convenient cum partial purposive sampling technique was used to recruit the participants. These sampling procedures involve choosing members of the target population if they meet a particular threshold set by the investigator. Besides, the participants can only be chosen if they are available at a particular time, can be easily reached and are eager to be engaged (Dörnyei, 2007, p. 97). The participation of the respondents in the respective experimental tasks is highlighted in Table 4.1

Based on previous studies that used some of the experimental tasks that have employed in this study (Athanasopoulos et al., 2015; Athanasopoulos & Bylund, 2013a; Bylund & Athanasopoulos, 2014b), the use of twenty participants per experiment was considered to have enough statistical power.

Table 4.1 Number of participants for each experiment under the various language contexts

Experiment	L1	Language Context	No. of participants
Photo-object matching task	Dholuo	Dholuo	40*a
Photo-object matching task	Dholuo	English	40
Mirror image task	Dholuo	Dholuo	20*c
Mirror image task	Dholuo	English	20*b
Motion verbal description task	Dholuo	Dholuo	20
Motion verbal description task	Dholuo	Kiswahili	20
Motion verbal description task	Dholuo	English	20
Motion verbal description task	Kiswahili	Kiswahili	20
Motion non-verbal description task	Dholuo	Dholuo	20*a
Motion non-verbal description task	Dholuo	Kiswahili	20*c
Motion non-verbal description task	Dholuo	English	20*b
Motion non-verbal description task	Kiswahili	Kiswahili	20
Photo-object matching task (piloting)	Dholuo	Dholuo	10*d
Motion verbal description task (piloting)	Dholuo	Dholuo	5*d
Motion non-verbal description task (piloting)	Dholuo	Dholuo	6

*a = 4 participants performed both tasks, *b = 13 participants performed both tasks, *c = 15 participants performed both tasks, *d=5 participants performed both tasks.

4.3.2. Language questionnaire background

A language questionnaire was presented to the participants to capture details of their linguistic background. Table 4.2 and 4.3 summarize the information on languages spoken by the all the participants involved in the study

Table 4.2 L1-Dholuo participants' mean linguistic background (SD in parenthesis)

L1-DHOLUO				
Language	Spoken by % of participants	Proficiency (1-5)	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)
Kiluhya	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 4.3 L1-Kiswahili participants' linguistic background (SD in parenthesis)

L1-KISWAHILI				
Language	Spoken by % of participants	Proficiency (1-5)	Age of Acquisition	Frequency of Use (1-5)
Kiswahili	100	4.8(0.5)	from birth	4.9(0.4)
English	100	3.6(0.7)	6.4(3)	3.2(1.1)
Girama	55	4.3(1.4)	from birth	3.9(1.4)
Chonyi	15	3.6(0.5)	7.5(5)	2(0.9)
Digo	5	4.2(0.8)	5.8(6.1)	3(1.7)
Duruma	2.5	5	From birth	3.5(2.1)
Ribe	2.5	3	12	1
Rabai	2.5	5	10	3
Mbeere	2.5	2	18	2
Taita	2.5	1	23	1
Dholuo	7.5	2(1)	10.3(1.5)	1.7(1.2)
Kikamba	2.5	5	8	3
Ekegusi	2.5	3	12	1
Kikuyu	5	2.5(0.7)	13(9.9)	1
French	2.5	2	9	1

4.3.3. Research sites

This research study took place in the Nyanza and Rift Valley regions of Western Kenya. The field sites were spread across the counties of Migori, Kisii, Kisumu and Uasin Gishu covering institutions such as Rachuonyo KMTC, Kisumu National Polytechnic, Kisii University, and Rongo University.

The choice of the Nyanza region as the area of the research was because of two reasons. First, since I am a resident of the same region, it was cost effective to source for respondents from within the vicinity. Less money was spent on transport and accommodation. Secondly, being that the target sample were DEK multilinguals, it was only sensible to look for them in institutions located in areas where the majority of them were residents.

4.3.4. Timeline of the data collection process

The research study was conducted in three stages though the original plan was to have an initial pilot period extending into the actual data collection phase. Three factors led to the creation of the additional stage. First, piloting revealed that there was need to source for more funds for the research to be carried out to completion. Sourcing for more funds meant halting the research process. Second, there were restrictions of movements and closure of educational institutions due to the COVID-19 pandemic. Third, after assessing the initial data collected, it emerged that more data was needed.

Phase one took place between September-November 2019. In the first month of this period, piloting was done to test the effectiveness of the experimental tasks and improve on other areas of the data collection mechanisms. In the remainder of the period, a sizeable amount of linguistic FoR data and motion event categorization data were collected. The second phase took place between February and March 2020 where a significant amount of additional data on the aforementioned experimental tasks were collected. The third and final phase took place in the months of March and April 2021. This final phase took place after the previously collected data had been assessed and gaps identified. Additional data was gathered using all the experimental tasks to fill the gaps and replace a few data points that had been discarded due to technical problems from the previous data collection exercises. It was at this stage that the L1 Kiswahili respondents were engaged. The total time taken in the field for data collection was a combined seven months.

4.3.5. Data analysis

The datasets across all the experimental tasks were analysed through both descriptive and inferential statistical approaches. Descriptive analysis was crucial in highlighting the general observable outcomes of the experimental tasks. The most employed techniques were the use of proportions and percentages. The mean occurrences of variables were also calculated in some instances. Analyses at this level formed a baseline upon which the significance of the observed outcomes could be tested through inferential statistics. Moreover, through inferential analyses, other subtle variables that contribute to the outcome of the data that could not be captured by descriptive statistics could be accounted for. Subsequently, the final interpretation carries more weight and offers a valid framework for drawing conclusions.

(a) The R environment

All the inferential-statistical analyses were conducted in the R-foundation for Statistical computing (R version 4.1.0, R Core Team, 2021). Presently, the R software is considered the de facto programming language in the social sciences (Winter, 2020, p. xiv). It has a free license compared to other statistical software and is therefore easily accessible. It also provides a platform both for data cleaning and statistical analysis. For these reasons and more, I decided to use it for my statistical analysis.

(b) Modelling techniques

The statistical models used in this study were carefully selected to match those used currently in psycholinguistics studies. These criteria are not only current, but comprehensive enough to provide a complete assessment of the dataset and produce outputs that can be easily interpreted and discussed.

The R-package that has been used throughout the dissertation for analysis is the lme4 library (Version 1.1-7; Bates, Maechler, Bolker, & Walker, 2014).

Overall, the generalized linear mixed modelling (GLMM) family was the main method used for data analysis across board. The mixed model approaches are preferred over other traditional analysis criteria primarily because by design, they capture a lot of study parameters at ago. Such parameters include the random and fixed effects, both the continuous and categorical independent variables, more than one fixed effect *inter alia*. Specifically, even though all the participants were college students of a similar age group, there still existed individual differences amongst them. The same is true for the various objects/items used across the different experimental tasks. To account for these by-subject and by-item differences, we needed to run an

analysis that would capture these random variations. Ultimately, the researcher would be able to generalize the results to implicit variables within the data (Nalborczy et al., 2019). For a detailed outline of the advantages of mixed model methods see Bergh and Quene (2008) and Cunnings (2012). The logit mixed models was specifically appropriate because the dependent variables across all the experimental tasks were categorical and thus required non-linear regression (Winter, 2020, p. 198)

4.4. Photo-object matching task (FoR linguistics task)

The experiment was a linguistic FoR data elicitation task. It involved a pair of participants, one acting as a director who described a set of photos and the other acting as a matcher who recreated the scene described in the photo using objects. The dyads' descriptions were analysed and the types of FoR used identified. The goal of the task was to investigate any differences in FoR choices with change in language contexts.

4.4.1. Materials

The photographs were pictures of toy animals, car, tree, humans, house, ball, net and table. Each toy had a unique attribute upon which the design of the picture-object orientations heavily depended. For instance, the cow and the elephant were featured while the ball and the tree were unfeatured. Feature as used here means the physically observable attributes that an object has such as the front, back, sides etc. When an object lacks such attributes, it is deemed unfeatured.

The objects were combined along these features or lack of them, to form pairs that depicted the desired locative differences on the traverse plane. Photos of these pairings were taken, processed then printed for the task experiments. The actual objects were safely kept awaiting use during the experimental task.

These pairings fall into the following sets;

(a) The Unfeatured-Unfeatured (UU) category.

Two objects with no noticeable inherent parts were paired with each object occupying contrasting positions some distance apart. Such an arrangement was made deliberately to elicit spatial description along the horizontal plane. For instance, a net (which is considered unfeatured) was placed either in a sagittal or transverse manner and a ball at some removed distance from it. Other UU category included tree-ball and tree-net pairings

(b) Unfeatured-featured (UF) category

A pair of featured and unfeatured objects were placed strategically so as evoke the desired spatial descriptions along the horizontal plane. The pairings in this category were man and tree

(c) The Featured-Featured (FF) category

Two featured objects were placed against each other in different contrasting positions to elicit different spatial encodings along the horizontal plane. The combinations included; car-girl, cow-girl, house-cow, car-boy etc.

(d) Contact Category

This category was meant for the practice trials. It contained both featured and unfeatured objects. These objects were placed in such a way that there was contact between them e.g., a bottle or a ball on top of a table etc.

It should be noted that amongst these combinations were those that were novel and others that were similar to those used in previous experimental tasks. Either way, care was taken to develop a task that conformed to the guidelines presented in Levinson et al. (1992). See appendix A(i) for a summary of these objects' combinations.

4.4.2. Data elicitation games

The elicitation games which were used for the data collection were developed by a team from the Max Planck Institute for Psycholinguistics departments (MPI). The tasks were modified and put into use by among others Levinson (2004b), Pederson (2006), Gunter (1994), Danziger (1996), Wilkins (2006), Lourdes (1994) and Brown (2006). This team have conducted extensive research on languages using various modified forms of the space games thus contributing immensely to the growth of knowledge on spatial cognition.

The space games have an edge over the traditional grammatical categories' description since unlike the latter, they involve interactive language use within a particular linguistic community (Pederson et al., 1998, p. 560). Such a naturalistic discourse context not only presents the researcher with an array of intriguing linguistic details besides the focal aspect being investigated, but also foregrounds the functional attributes of language thus contributing to meaning construction. It can be argued that much as such a context provides a natural feel, it is in a strict sense particularised, only comparable to similar contexts and not as flexible as the larger discourse world. However, as Pederson et al. (1998, p. 561) note, the general consensus is that on the whole, the table-top discourse environment is more of a miniature speech community.

Following Levinson et al's. (1992) field manual for space games, the elicitation tasks can be categorised into two broad parameters. The first parameter is the classification according to the nature of the research. Is the research exploratory or comparative? An exploratory field investigation is an initial research conducted by an inexperienced field researcher on an 'un-entered' language. The purpose is to find out and record the general spatial encodings of the language. A comparative research is an intensive study of specific spatial domains within a language using a set of standardised procedures. The objective of the comparative study is to compare the results with other studies conducted elsewhere using the same tasks and procedures.

The second parameter is classification according to the nature of the materials used for the data collection. At one level the objects could be classified as natural or manufactured, at another level they could be categorized according to the type of materials preferred, that is whether it is photos or objects.

Below is a table summarizing the classification criteria mentioned above;

Table 4.4 Classification of space games

SUPERSET	NATURE	RESEARCH TYPE
Photo-photo space games, e.g., men and tree game, ball and chair games etc.	Director describes a photo and the matcher picks a similar one	Exploratory /comparative
Photo-object space games, e.g., wooden man game, farm animals, man and tree game, tinker toy game etc.	The director describes a photo and the matcher recreates the scene using objects	Exploratory /comparative
Object-object space games, e.g., tinker toy games, farm animals, wooden man etc	The director describes the orientation of actual objects and the matcher recreates using similar objects	Exploratory /comparative
De León's space game, e.g., farm animals (natural objects) etc.	Can be photo-photo, photo-object or object-object. Mostly uses natural materials	Exploratory
Men and tree game, e.g., Man and Tree game	Strictly conforms to standard procedures as laid out in the space games manual.	Comparative
Researcher's novel creation, e.g., any of the forms described above	Researcher has the leeway to slightly deviate from the standard procedures and experiment extensively with novel materials whether natural or manufactured	Exploratory

It is evident from table 4.4, that there are numerous cases of overlap between the supersets. The major difference lies on whether the research is a replication of a previous research or whether it is a new study area. In case of the former, exact procedures and similar objects are expected to be used. In case of the latter, the researcher is allowed the leeway to be creative and flexible.

4.4.3. Rationale for choosing the Photo-object matching game

The linguistic experiment was considered to be exploratory. In essence, the general design of the experimental task used in this dissertation for spatial reference frame investigation took the form of a photo-object matching game. Specifically, the referential communication task employed was an improvement of the original *Man and Tree* (M&T) game (Levinson et al., 1992) otherwise herein referred to as the *New Man and Tree task* (NMT). Notice that there have been other improvements to the M&T matching game, one notable one being the *Ball & Chair* (B&C) game (Bohnenmeyer 2008). Bohnemeyer (2008), highlight a few weaknesses of the M&T task that informed its modification to the B&C task. First, they indicate that people and trees are not the best candidates to be used as a Figure and a Ground respectively since a tree lacks a cononical ability to orient itself. Second, the fact that the toy man was featured as opposed to the tree yet it was the tree that was intended to be the Ground confused most participants. Third, they add that the toys as opposed to real objects impacted on the performance of the participants since most of them would perceive the toys as unreal and less authentic. Lastly, they believed that overall, the M&T task disfavoured intrinsic inferences. It is on these grounds that they developed the B&C task which they believed improved on the weaknesses of the M&T task

The B&C task on its part has its own weakness. Even though it uses real objects which the participants can easily identify with, the configuration of those objects such as *a ball hanging in the air*, or *a chair on its back with a ball over it* appears unreal. Further, over half of the B&C picture configurations appeals to topological arrangements which do not require spatial frames for encoding.

In the design of the NMT task, both the weakness of the M&T and those of the B&C were considered. Though the NMT does not conclusively address all these weakness, we believe that the task as designed resonated with the participants that were to be tested and adequately addressed the areas to be investigated. For instance, the need to pre-define the Figure or the Ground as in the case of the B&C and the M&T tasks has been a challenge. This mostly happens because the participants sometimes fail to conform to these predefined configurations. In the current work, the UF category was set up in pretty much the same way as the B&C and the M&T

tasks majorly for comparison purposes. With the UU and FF categories, the need to confine oneself to one object as a Figure and another as a Ground was not needed. Instead, the participants had the leeway to choose which of the two between the pair would best fit their description.

Within the NMT referential communication task, manufactured materials depicting natural objects such as trees, humans, animals etc. were used. It was important to select materials which the sample population could easily identify with. The photo-object as opposed to the photo-photo matching game was chosen because it was more open-ended, more naturalistic, less competitive and overall easier to play (Levinson et al., 1992, p. 11). Since the target population were college students and the field sites were the institutions, an open ended easy to perform task with a natural feel was considered as the most appropriate. And indeed, the task did evoke a great deal of curiosity, excitement and enthusiasm amongst the students.

It is evident that the superset bearing *the researcher's novel creation category* was the best fit for the study since it gave room for innovation and exploration. An array of combinations exploiting the spatial relationships between objects; and between objects and the viewer, within the horizontal planes were created. As stated, these arrangements, which were printed as photographs, were capable of eliciting unconstrained spatial descriptions that would best capture the linguistically rich table-top discourse space. Sets of unfeatured-unfeatured (UU), featured-featured (FF) and unfeatured-featured (UF) of six photographs each were developed. Figures 4.1-4.3 are picture samples of the stimuli used in the UU, UF and FF categories.

The task design was similar to the one proposed by the MPI team save for the fact that in this study, the participants were only allowed to interact via speech throughout the game. Physical contact where either party could see each other's constructions was only allowed at the end of the game. In the MPI suggested instructions, the director and matcher could, in the course of the game, compare the picture and the recreated array and make corrections before moving to the next picture. Investigator involvement was reduced to the bare minimum in our study as opposed to the MPI procedure where kibitzing was allowed. The decision to minimize interruptions was to allow the participants to enact and sustain their conversation in as natural a way as possible. Additionally, the lack of interruptions reduced the amount of time spent on the three sets of photographs per dyad since twenty as opposed to MPI's suggested minimum of three dyads were used in the research

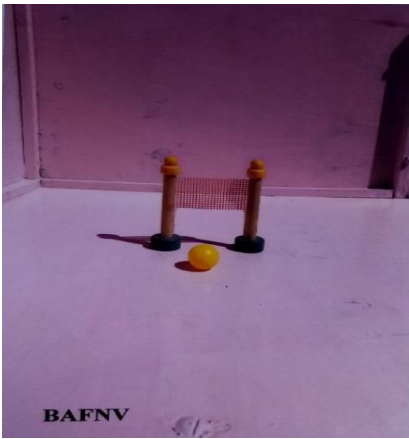


Figure 4.1 sample stimulus for the UU category



Figure 4.2 sample stimulus for the UF category



Fig 4.3 sample stimulus for the FF category

4.4.4. Task procedure

The task was performed in dyads. Eight dyads were used during the pilot phase and a further forty dyads (twenty each for Dholuo and English contexts) involved in the actual experiments. Each pair was involved one at a time. A member of the pair took the role of the director and the other automatically assumed the role of the recreator. Choosing of the director and recreator was done randomly. The two participants were seated side by side and screened off by an opaque board that permanently partitioned the presentation table into two equal halves. In both Dholuo and English data elicitation contexts, and the earlier pilot phase, the participants were seated facing west. This happened by chance.

For the practice trials, two sets of photographs that depicted objects in a contiguous relationship were handed to the director. The corresponding actual objects were then given to the recreator. The director was instructed in the hearing of the recreator that the photos depicted an arrangement of two objects. They were then informed that their task was to describe as accurately as possible the locative relationships of the objects in the pictures. The recreator on their part was presented with the actual objects that were used to generate the pictures. Their role was to select a pair of objects as was described by the director. They were expected to arrange the objects to depict the arrangement that was in the picture (which they were not allowed see).

During the course of the description, the investigator interrupted the director whenever necessary, encouraging them that every aspect of the picture was important and no details could be left out. The recreator too was encouraged to engage the director as much as possible so that the resultant recreated scene would be close enough to the original one in the picture. Even as the investigator chipped in, care was taken not to let the participants in on what was being investigated. Once the recreator was satisfied that they matched the director's description, both of them were allowed to stand and peek at each other's picture and recreated objects. At this point they were able to tell if either of them made mistakes in their description and the matching, and took the opportunity to correct the mistakes if any.

The same procedure was repeated with the second set of trial picture. If the investigator was convinced after the second trial that both participants understood the rules of the game, they then proceeded to the actual trials. Note that there was no difficulty experienced after the second practice trials amongst all the participants engaged. This was majorly because unlike the actual trials, the practice trials involved objects that were in contact with one another such a ball placed on top of a table. Such an arrangement was easy to describe and match. Pictures akin to those in

the actual trials were not used during the practice trial phase because it risked cuing the participants.

In the actual experimental task, the director was given 18 photographs placed before them on the presentation table. Each of the photographs was part of the UU, UF or FF categories. The photographs were arranged in no particular order. The director picked each photograph at a time and described only moving to the next once they received a signal from the recreator to do so. The recreator on their part were handed all the actual objects from which they would select the appropriate pair as per the director's instructions. These objects were placed on a separate table close to the recreator. Once the matching was complete and the picture of the recreated array taken, the objects were removed from the presentation table onto the side table awaiting the next picture description.

4.4.5. Data coding

The data was primarily coded for spatial location and orientation. The experimental task employed was designed to capture information on the static spatial relations within table-top space. The specific underlying system investigated through the elicitation task was the spatial FoRs used by L1 Dholuo speakers under different language modes. Preliminary assessment of the elicited data however revealed that there was a wide range of space encodings extending beyond the FoRs, cutting across the categorical spatial relations framework. Further, the data showed that in some cases, each picture produced an utterance that was hinged on more than one FoR supported by a variety of other categorical spatial classes. Coding was therefore expanded to accommodate these other sub domains, such as the motion descriptions, topological relations, and deixis. These other classes however were not used in the final analysis but were simply collapsed under the 'undefined' category. There were also cases where there was neither a FoR used nor non-FoR categories. These too were coded as 'undefined'.

In most descriptions, identifying the FoR used was straightforward and could be easily coded for since it was only one. In other cases, however, there was more than one type of FoR used. It therefore presented a challenge on which, out of the two or three FoRs present was the primary one. Example in **21** shows how a primary FoR was identified and coded. Example in **22** on the other hand shows a description that had more than one FoR and explains how a defining FoR was selected between the two. The Leipzig glossing rules was used (Committee of Editors of Linguistics Journals, 2015)

21

Dyad 1 (Dholuo)

DIR: (DP019)-Twenty-three-year-old male DEK multilingual

REC: (RP020) - Twenty-three-year-old male DEK multilingual

Stimuli: BAFNV (The net is placed transversely. The ball is a little distance from the net, in between the SAP and the net.)

Category: UU

Mpira nitie-re mbele net

NOM LOC-EMP front net

‘The ball is in front of the net’

A net, similar to a ball and a tree is regarded as unfeatured in this study. The director identifies a part of the net and assigns it a feature called ‘front’. He then interprets the position of the ball as being at a removed distance from the part of the net that he labelled ‘front’. The ball therefore is in front of the net. When a net is placed at a transverse position (see picture of BAFNV in figure 4.1), there is a part of it that is aligned with the front part of the SAP. To assign this part a label front, the SAP who doubles up as the anchor, has transferred his bodily coordinates unto the part of the net facing his front, under a process called reflection. The net consequently adopts the feature front against which the location of the ball is identified from the SAP’s viewpoint. The system responsible for mapping of bodily coordinates unto a Ground object is the relative FoR. We can therefore conclude that the underlying system from the locative description in Example 21 is the relative FoR.

22.

Dyad 5 (English)

DIR: (DP053) - Twenty-two-year-old male DEK multilingual

REC: (RP054) - Twenty-one-year-old male DEK multilingual

Stimuli: BABT (The tree is between the ball and the SAP)

Category: UU

DP053: There is a tree in front of you then in front of the tree there is a ball. Just next to you there, there is a ball:

RP054: Now the tree is between me and the ball?

DP053: I am saying the tree is just in front of you there, then in front of that tree again there is a ball.

The director starts by identifying the location of the tree using the addressee as a reference point. The addressee (SAP) becomes the anchor and the tree is in front of him. According to the director, the ball's position is in front of the tree, and closer to the addressee. It is evident that the director has employed the *direct frame of reference* in explaining the location of the tree and to an extent, the ball. He has also utilized the *relative FoR* by describing the ball's position to be in front of the tree. The recreator in response has placed himself in the recreation scene thereby also using a direct reference frame. The final response from the director reinforces his first instruction and follows the same direct- relative FoR format.

To choose either of the FoRs as the default, it was important to find out which of the two would impede the reconstruction of the spatial scene if omitted. Consider below;

a) *...in front of the tree there is a ball.*

b) *There is a tree in front of you ...just next to you there, there is a ball*

The description in (a) identifies the Ground (tree), as well as the Figure (ball). The description further expresses the locative relationship between the two without involving the SAP directly. In (b), the description focuses on the positional relationship between the SAP and the Ground, as well as the SAP and the Figure. Considered separately, both descriptions would lead to the creation of a spatial array, but it is likely that (a) would present a recreated scene that closely resembles the picture. Description (a) as opposed (b), assumes the automatic presence of the SAP and focuses only on the locative relations between the objects, information that suffices on its own. It is on these grounds that the relative FoR was considered as the defining FoR and the direct frame as a supporting reference frame for this particular description

4.4.6. Data analysis

This sub-section presents the approaches adopted in analysing the findings from the photo-object matching task. The nature of the data set, the descriptive and inferential analytic techniques and the inclusion of the item category as a variable have all been explained.

From the research question, it is evident that language context (Dholuo and English) would be the independent variable, while the *choice of FoR* would be the response variable.

(a) Nature of the data set

There were forty dyads across the two language contexts and six picture-stimuli each under the UU, UF and FF categories totalling to eighteen pictures. All the eighteen pictures were described by each participant once, giving rise to a total of 720 observations for the entire dataset. The descriptions were coded according to six different FoR categories and one non-FoR category. Observations included under the non-FoR category were deictic expressions, general descriptions and other undefined descriptive elements.

(b) Descriptive analysis

First, a proportion analysis was conducted on the FoR and the non-FoR levels. The analysis revealed the distribution of these levels within the UU, UF and FF categories as well as across the Location, Figure orientation and Ground orientation spatial platforms. The analysis was done both at a macro and a micro level. The distribution between the two languages was compared and the results noted. For a visual representation of the dataset, the package ggplot2 was used to plot bar graphs.

(c) Inferential testing

Similar to the descriptive analysis, the research question for the inferential testing was interpreted both at a macro and a micro level. At the macro level all the six types of FoR identified were collapsed into a single category labelled FoR, while all the other types of descriptions that did not involve the use of a FoR were labelled the non-FoR. The question addressed at the macro analysis level was whether using a FoR depended on the language used. At the micro level, the types of FoRs were considered not as a group but independently. The question addressed at this level was whether language influenced the participants into using a particular type of FoR as opposed to any other for any given category.

Language as the x-axis was plotted against the types of FoR for each of the spatial platforms. The logit mixed models were then used to predict the likelihood in log-odds space that a speaker would use a FoR to describe the picture stimuli. For every spatial platform, the choice of FoR (dependent variable) was modelled as a function of the predictor variable language context with the two levels, Dholuo and English. Additionally, since every participant produced multiple observations, it is possible that there were interdependencies amongst the observations. The same can be said of the pictures, which even though were described by different participants, still

elicited somewhat similar responses. To account for these, by-subject and by-item random effects were added.

Following Barr et al. (2013), there is need to run a model by fitting all the possible combinations of variables, that is ‘keeping it maximal’. However, as Winter (2020) points out, the idea of keeping it maximal must not be done indiscriminately. It should be a well thought out modelling scheme having factored in all the parameters of the dataset in question. To effectively ‘keep it maximal’, considering the data we had, we opted for a by subject and by-item intercept together with a language slope for the by-item varying effect. Treatment coding was used since the intention was to directly compare the influence of both levels of predictor variable.

(d) Item category as a predictor variable

A decision was made to find out if, besides language context, the variable item category would have any effect in the choice of FoR both at the micro and macro level. Additionally, there was need to compare the ‘language as a predictor’ model to the ‘item category as a predictor’ model to find out which between the two would best present the relationships between the variables in question. As already hinted at, the item category was used as an independent variable. The choice of FoR was therefore modelled against the predictor variable item category. Note that unlike language context which had two levels, the predictor item category had three levels; UU, UF and FF. First though was an attempt to model for both language and item category as predictors together with the random intercepts in a single model, testing for an interaction too. These modelling largely failed to converge hence was abandoned.

A mixed effect logit model with item category as predictor variable of three levels (UU, UF and FF) was run in R. Since the inclusion for the random slopes led to over-fitted models and models that did not converge, only random intercepts were used. For easier comparison, the language predictor models were re-run alongside the item category predictor models. Sum coding for both item category and language variables was done. The interpretation of the outputs was therefore based on the grand mean estimates of the various models. This was necessary since the intention was not to compare the effect of the different levels of item category variable on the response variable, but the effect of each level independently. A likelihood ratio test was done between the language predictor models and the item category models and a Chi-square statistic showing the model with the best fit was given

4.5. Mirror image task (non-linguistic spatial frame task)

The mirror image experiment is a non-verbal task that exploits the fact that frequent intrinsic FoR users find it hard to differentiate between pairs of enantiomorphs (Danziger, 2011; Levinson & Brown, 1994). Dholuo speakers, are regarded as frequent intrinsic FoR users (Ogelo, 2017). In this task, these speakers were exposed to pairs of congruent images and were expected to categorize them either as similar or different. The goal of the experiment was to ascertain whether the predilection to classify mirror images as identical would be maintained or lost across language contexts.

The experiment took the form of an interactive exercise where the participants were presented with pairs of 3D LEGO® objects manipulated to form various shapes. Some of these shapes were completely different, others were identical yet others were mirror images of each other. The participants were expected to tell whether the pairs of objects were similar or different.

4.5.1. Materials

3D LEGO® toy plastic building bricks with protuberances that can be snapped together to form objects of desired shapes were used. The specifications for the materials are captured in appendix B(i). 3D LEGO® toy plastic building bricks are of various colours. The protuberances have a standard diameter of 4.8mm. The blocks differ in sizes depending on the number of protuberances on each block. The number ranges from a single protuberance per block to a 4x2 block (see fig. 4.5).

4.5.2. Object design

The LEGO® blocks were manipulated to form objects of different shapes. The design of the objects and shape manipulations followed Danziger (2011). Since LEGO® blocks are way smaller than the DUPLO® blocks used in earlier experiment *ibid*, it was necessary to improvise to obtain the desired specification. It also means that in some of the cases, we did not strictly follow the object manipulation as in *ibid* but creatively developed our own following similar patterns. The description of the exact combination of these blocks to form the objects that were used in the study is attached in the appendix B(i).

Below are sample DUPLO® and LEGO® building blocks

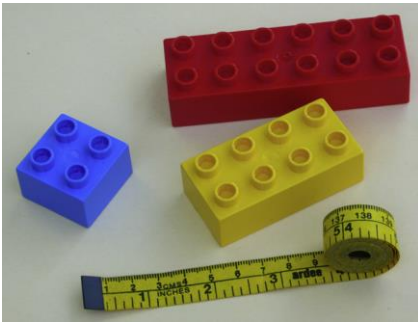


Fig 4.4 Sample DUPLO® building blocks (Adapted from Danziger 2011).



Fig 4.5 Sample LEGO® building blocks

There were three categories of objects; identical, bad match and mirror image. The identical objects were six pairs, the mis-matched pairs were three, there were also five pairs of mirror images totalling to thirteen. Additionally, there were two pairs of identical and bad match objects used for the practice trial. The mirror images were the critical items while both the identical and bad matches were used as fillers. No mirror image was used in the practice trial phase.

4.5.3. Procedure

The experiments took place in a quiet area within the college. Each participant was tested individually. Both the English and Dholuo tasks were only audio recorded since the camera malfunctioned. On top of the audio-recording, a template was used for physically noting the responses of the participants as per the object pairings. This template is attached in appendix B(iii). The investigator introduced the exercise by informing the participants that the activity they were about to undertake involved objects that were either similar or different. The participants were further informed that all they needed to do once they had exhaustively assessed the objects was to respond by a ‘these objects are similar’ or ‘these objects are different’ response. If they so wished, they were allowed to give reasons for their responses.

(a) Practice Trials

First, the investigator built, in the presence of the participants, a pair of bad match objects. He then picked each of the objects and explained to the participant why they were different. Below is a sample explanation from the investigator concerning a bad match object

23.

<i>I-neno</i>	<i>gik moko</i>	<i>ariyo-gi,</i>	<i>gi-pogore</i>	<i>nikech</i>
2SG-see	things some	two-DEM.PL,	OBJ.PL-different	because
<i>e ma</i>	<i>ma-malo-ni</i>	<i>ng'i-yo</i>	<i>ko-ni</i>	<i>to</i>
in this	DEM-top-this	face-INF/PROG	side-this,	but
<i>e machielo-ni,</i>	<i>ma-malo-ni</i>	<i>ng'i-yo</i>	<i>ko-cha,</i>	<i>donge?</i>
in other-this	DEM-top-this	face-INF/PROG	side-that,	VBC?

‘Do you see these two objects, they are different because in this one, the top part is facing this side and in this other one, this top is facing that other side, right?’

For the identical objects, the investigator had the following to say:

24.

<i>To</i>	<i>magi</i>	<i>to</i>	<i>koro</i>	<i>chalre</i>	<i>nikech</i>
But	these	but	now	similar	because
<i>gi-tee</i>	<i>gi-ng'i-yo</i>		<i>ko-ni,</i>	<i>donge?</i>	
OBJ.PL-all	OBJ.PL-face-INF/PROG		side-this,	VBC?	

‘But these ones are now similar because they are all facing this side, right?’

The investigator then proceeded to the third and the fourth practice sessions allowing the participants to hold the object and rotate them assessing them as much as they could. They then gave a response exemplified by the utterance below to a set of identical objects.

25.

<i>Ee,</i>	<i>ma-gi</i>	<i>chalre,</i>	<i>e</i>	<i>gi-tee,</i>
Yes,	DEM-things	similar	in	OBJ.PL-all
<i>wi-ye</i>	<i>ma-malo-ni</i>	<i>o-nind-o</i>		<i>ka-mae</i>
head-3SG.POSS	DEM-top-this	3SG-sleep-INF/NPROG		DEM-way

‘Yes, these are similar. In both of them, this top part is aligned this way’

(b) Actual trials

The pairs of the bad match, the identical and the mirror image objects were presented one after another to the participants. Similar to the practice trials, they were encouraged to hold the objects and rotate them. Once their response was noted on the template, the objects were deconstructed and new ones created. All these happened in the presence of the participants. A total of 14 pairs of objects were administered per participant. Both the order of task administration as spelt out under *actual trials* in appendix B(i) and on the template outline in appendix B(iii) were used. Whichever order the investigator decided to use, care was taken not to administer pairs of mirror image objects consecutively or the same original object twice. The overall goal was to note how the participants responded to the five pairs of mirror image objects.

4.5.4. Data coding

The first step involved counter-checking of the responses in the mirror image templates for any missing responses or double entry. The audio clips were transcribed and the responses compared to their corresponding templates. This was important since any possible inaccuracies captured in the hard copy templates could be corrected from the responses in the actual audio clips.

The second step involved data cleaning. The responses of the mirror image objects were isolated and captured alongside the participant details and the corresponding language context. This was done for both languages. The first stage of data analysis was conducted at this level. Further, the data was transformed to codable units in preparation for analysis in the R studio platform using mixed logit regressions. The ‘similar’ responses were coded as ‘1’ while the ‘different’ responses were coded as ‘0’.

4.5.5. Data Analysis

The analysis of this task was aimed at responding to the overall research question on FoR as posed in chapter 5. Breaking down the research question into subsets, two questions arose. One responded directly to Whorfian prediction that is; is there evidence of spatial reference frames in non-verbal tasks? The second question was about the language contexts, that is; how do DEK multilinguals categorize mirror images across different language contexts? These questions were addressed both through the descriptive and the inferential analysis. The dependent variable was the mirror image categorization (similar or different) while the independent variable was the language context

(a) Descriptive Analysis

The proportion of pairs of MI objects identified as identical was calculated and summarised in a table. A visual representation of the same was also produced through the gg2plot package in R. Comparisons between the two languages were made and the differences noted.

(b) Inferential Analysis

A generalized linear mixed effects model (GLMM) run in the R Studio platform was used. First, the significance of the observed differences in the participants' responses between both languages was tested. Second, being that the participants were multilinguals, there was need to assess the effects, if any, of the rich linguistic background of the participants on their classification of the mirror images. A mixed effects logistic regression was used for the same.

The following were identified as the components of the mixed effects logistic regression;

- Categorization of MI objects as either 'similar' or 'different' coded as 1s and 0s respectively as the dependent variable
- The language contexts as the independent variable. Dholuo and English being the two levels.
- The participants and the items as the random effects
- The language proficiencies, age of language acquisitions and frequency of language use as the language background variables

To test the significance of the differences in responses across both language contexts, a mixed logit model with language as the predictor variable and MI similarity as the dependent variable was used. Random intercepts of subject and items were included. The random slopes were not included in the models since they led to issues of overfitting. The model output were analysed and recorded.

The second step of analysis involved testing whether the language background of the participants had any effect on their MI classification. Since the language proficiency and frequency of use were highly correlated, the average between the two was calculated under the category called *language entrenchment*. The dependent variable (MI similarity) was modelled as a function of the predictor variables, language entrenchment and age of acquisition (for English). This was done across the two language contexts. The model output were interpreted and recorded.

The language only model was then compared to the model with the linguistic background using likelihood ratio tests to check if including the language background increased the model fit. The outcome was recorded.

4.6. Motion event experiments: Verbal endpoint construal task.

This task relates to the linguistic behaviour of DEK multilinguals in motion event construal. It uses video clips depicting moving entities such as a person walking, a rider etc., a long a trajectory with a potential endpoint in sight. It requires the participants to describe what is happening in the clips. The intention of the task is twofold; to investigate the use of grammatical aspect and to check for the mention of the unreached endpoints from the participants' descriptions.

This task had been successfully performed in English, German, Swedish, Afrikaans and isiXhosa by Athanasopoulos and Bylund (2013a), Bylund and Athanasopoulos (2013; 2014a), Bylund and Jarvis (2011), Schmiedtová, von Stutterheim and Carroll (2011). The materials, procedure, data coding and analysis highlighted here apply to all the motion verbal tasks performed both by the DEK multilinguals and the L1 Swahili speakers.

4.6.1. Materials

Twelve video clips showing goal-directed motion events were used in this investigation. The same clips had been previously used by Athanasopoulos & Bylund (2013a), Bylund & Athanasopoulos (2013; 2014a), Bylund and Jarvis (2011), Schmiedtová, von Stutterheim and Carroll (2011). They were prepared and compiled by the research team of C. von Stutterheim, M. Carroll and B. Schmiedtová at the University of Heidelberg, Germany

The clips show people engaged in ordinary activities such as walking singly, in pairs or in trios. Other clips picture people cycling or cars moving. These actions are shown to be happening outdoors that is, on the road, in the parking lot, in the playground, food market, parks etc. The scenes in the clips are hinged on a background that would easily pass as familiar to most people with buildings, trees and the skyline making up majority of them. Similar to the actors, the settings and the background, the goals upon which the motions are directed are everyday objects and entities such as benches, buildings, cars *inter alia*. These potential endpoints, however, were not reached (intermediate degree of goal orientation). Whereas the same concept of goal-directed motion was revealed across all the clips, the videos had been tactfully manipulated to depict various settings and scenes. The overall assessment of the video clips showed a design that portrayed events which most participants had either experienced or could identify with, thereby

reinforcing an element of immediacy of the stimuli on the participants. Six other clips containing scenes depicting simple actions that do not involve movement along a path (e.g., a person writing) were used as fillers. All videos were six seconds long

4.6.2. Procedure

Testing was done per individual in a quiet room at the university. The participants were informed that they would watch a series of video clips depicting everyday activities on a computer screen. Once they recognized what was happening in the scenes, they were then asked in Dholuo; *En ang'o matimore e vidio ni?* (What is happening in this video?). The clips were presented one by one in semi-randomised order, through PowerPoint. After each scene, an interlude of about eight seconds appeared on the screen in a purple background followed by a star appearing at the centre of the screen to indicate that a new event was about to start. Each of the participant's description was audio recorded.

4.6.3. Data coding

First, data cleaning was done. The responses for the twelve target clips were isolated from the fillers and transcribed. For both Dholuo and Kiswahili language modes, the transcribed data was translated. The second step involved coding for aspect and endpoint preference. For every response per item per participant, use of the progressive aspect was coded as '1'. Absence of the progressive attracted a '0' code. Similarly, reference to an endpoint was coded as '1' and its absence coded as '0'. This applied to both Dholuo and L1- Kiswahili. Examples in 26 provide an illustration of the same

26.

(a) Participant P123: A twenty-three-year-old female DEK multilingual

Language context : Dholuo

Stimuli LwtC: A lady is walking on a road; there is a parked car a head of her

<i>Miyo-ni</i>	<i>wuoth-ó</i>	<i>ka</i>	<i>dhí</i>
NOM-woman-DEM	walk-INF/PROG	while	go-INF/PROG
<i>ir</i>	<i>mtoka</i>		
to	car		
'This woman is walking while going to the car'			

(b) Participant P185: A twenty-one-year-old male DEK multilingual

Language context: Kiswahili

Stimuli tLwpB: Two ladies are walking on a pavement in a park. In front of them are benches.

<i>Wanawake wawili</i>	<i>wa-me-pita</i>
NOM-women two	3PL.NC2-PFR-pass

‘Two women have passed’

In **26(a)**, the participant uses the progressive aspect *wuothó* (is walking) which is coded as 1 for aspect. She also mentions an endpoint *ir mtoka* (to the car) coded as 1 for endpoint. In **26(b)**, the participant describes the action as having been completed in the recent past *wamepita* (have passed). This gets coded as 0 for absence of the progressive aspect. He further does not mention any endpoint thus attracting a 0 under the endpoint preference column

4.6.4. Data analysis

For every language mode in the DEK group, the frequency with which the respondents mentioned endpoints was noted. The same goes for the L1Kiswahili group. The mean frequency, the standard deviation and standard errors of endpoints preference were calculated per language context for the DEK multilinguals as well as for the L1 Kiswahili participants.

A frequency distribution table was created bearing the following columns; language, percentage mean, and standard error (SE). The table summarised the distribution of the mean endpoint preferences across both the DEK language contexts and the L1 Kiswahili language context.

Bar plots with standard errors were developed using the ggplot2 package in R to compare both endpoint preference and progressive aspect usage across the DEK language contexts. Another graph comparing both endpoint preferences and aspect usage for L1 Kiswahili and L1 Dholuo was also developed. For the latter case, a deliberate choice was made not to collapse the outcomes of the DEK contexts but to compare results from the L1 Dholuo participants under Dholuo context to those from L1 Kiswahili participants who had been engaged in a Kiswahili context. This ensured that uniformity was preserved. The comparison was further extended to the already available endpoint preference results from L1 English speakers.

For statistical testing, the data was arranged in a table format with the following columns; ‘subject Id’, ‘item no.’, ‘+/-endpoint’, ‘+/- aspect’ and the corresponding ‘language’ contexts. There was one table for DEK multilinguals and a separate table for both L1 Dholuo and L1 Kiswahili.

Sum coding for the DEK language contexts and language background predictor variables as well as for the L1 Kiswahili language background predictor variables was done. The interpretation of the model outputs was therefore based on the grand mean estimates of both the DEK and the L1 Kiswahili groups. It was important to do so since the effects of the language contexts and language background were to be interpreted independently. The same predictor coding scheme was not extended to the L1 Dholuo and L1 Kiswahili group comparisons since there was need to compare the difference in endpoint encodings between the two.

The variables of the model were as follows:

- Endpoint preference as a binary response variable for endpoint preference models
- Aspect usage as a binary response variable for the aspect usage models
- The group language with the levels Dholuo, English and Kiswahili as a predictors
- L1 Kiswahili and L1 Dholuo as the second set of predictor variables
- Subjects and items as random effects

Besides the use of language context group as fixed effects, the analysis was extended to other variables under the linguistic background group. Since the observed differences in endpoint encodings across the three language contexts were not statistically significant, it was necessary to further the analysis by exploring the role that linguistic background might play in endpoint preference. There was a compelling need to statistically match the variations in language proficiencies, age of acquisition as well frequency of use amongst the DEK group to the differences realized from the endpoint mentions. As such, the binary response variable endpoint preference was modelled as a function of the linguistic background (language proficiency, frequency of use and age of L2 acquisition) across the three language contexts. Modelling was done both for the DEK group and L1 Kiswahili group.

4.6.5. Methodological consideration on the interpretation of progressive aspect

A few important methodological considerations need to be explained with reference to section 6.3.1 of this dissertation. This observation concerns the progressive aspect usage by both the DEK and the L1 Kiswahili participants. First, in the event that a motion verb was missing from the description, the sentence was considered as not being in the progressive (see example 44). The same applied to descriptions that only had non-action verbs irrespective of whether the non-action verbs were in the progressive or not (see example 45). The reason for this was that since the aim of the investigation was to identify and describe what was happening in the scene, this could not be achieved when a motion verb was missing. The absence of a motion verb therefore

meant an absence of the progressive aspect. Further, non-action verbs fail to depict the action in the motion events hence their omission.

Second, in cases where there were two or more motion verbs used in the description and one of the verbs was in the present perfect and the other in the progressive aspect, the decision to consider the sentence as having been expressed in the present perfect or the progressive aspect depended on the structure of the sentence. For instance, consider example in **48** hereby repeated as example in **27**;

27.

Stimuli (CgtGS): A car is moving on a road, ahead in sight is a petrol station

Gari *moja* *li-me-pit-a*

Car one SUBJ.NC1-PRF-pass-IND

li-ki-end-eshwa

SUBJ.NC1-while-drive-PASS/PROG

‘A certain car has passed while being driven’

This description has two verbs; *limepita* (has passed) and *likiendeshwa* (while being driven). Between the two verbs, the former was considered as the defining part of the predicate, that is, it bore the meaning component of the sentence-*the car has passed*. In contrast, the second part containing the passive voice *likiendeshwa* was regarded as an adjectival phrase bearing additional manner information, which was not core to the meaning interpretation of the sentence. The description was therefore deemed to have been expressed in the perfective aspect and not the progressive aspect.

4.6.6. L1 English data

It should be noted that all the data referred to herein and analysed in the subsequent corresponding chapters were produced by the two experiments as conducted by me. However, there are comparative analyses involving results from other research conducted from previous studies. Specifically, results from both verbal and non-verbal categorization tasks involving L1 English speakers were sourced from Athanasopoulos & Bylund (2013) and Bylund et al. (2013). To restate, the information on L1 English findings apply to the analysis of findings from both the linguistic motion event tasks and the non-linguistic motion event tasks

4.7. Motion events experiment: Non -verbal categorization task

This task relates to the non-linguistic behaviour of DEK multilinguals in motion event construal. Similar to the linguistic task, the non-verbal version of the motion categorization task makes use of video clips which in this case are organized into triads. The materials, procedure, data coding and analysis described here apply to all the motion non-verbal similarity tasks performed both by the DEK multilinguals and the L1 Kiswahili speakers

4.7.1. Material

The non-verbal motion task used clips from the stimulus pool of video clips compiled by the research team of C. von Stutterheim, M. Carroll and B. Schmiedtová at the University of Heidelberg, Germany (e.g., von Stutterheim et al., 2012). A similar experiment had been conducted by Athanasopoulos & Bylund (2013a), Bylund & Athanasopoulos (2013; 2014a) and Athanasopoulos et al. (2015).

From the stimulus pool of video clips, nineteen triads were created that consisted of two alternates and a target. The triads were set up in such a way that motion events in a low (A), an intermediate (X) and a high (B) degree of goal orientation were combined and presented to the participants to choose which between A and B was more similar to X.

A low degree of goal orientation depicts the entity e.g., of a person walking along a street with no definite goal in sight. An intermediate degree of goal orientation shows an entity and a possible goal at some distance. There is a half chance that the entity would end up at the goal. The high degree of goal orientation depicts an entity going towards the goal. The final phase of this orientation sees the entity enter the goal.

The task's intention was achieved when the participant consistently chose either a plus [+] or a minus [-] endpoint alternate as the more similar to the intermediate alternate and by so doing denoting their preferred viewing perspective.

The target clip contained an activity with an intermediate degree of goal orientation (e.g., a person cycling towards a building but does not reach the building). One of the alternates had a low degree of goal orientation [-endpoint] (e.g., a person walking on a path but there is no destination in sight). The second alternate had a high degree of goal orientation [+endpoint] (e.g., a car driving into a parking lot). See appendix C(ii) for the still pictures of the low, high and intermediate orientation alternates.

The clips that created the triads had been edited to control for manner and direction of motion as well as the gender of the agent. Further, to avoid situations where participant would fail to notice similarities between the target and any of the alternates, the video clips were normed for visual similarity so that both the two alternates and the target were visually similar. Both Athanasopoulos & Bylund, (2013) and Athanasopoulos et al., (2015) performed tasks whose results showed that in all the triads, both the target and their alternates were relatively similar. All the clips were six seconds long.

4.7.2. Procedure

The testing was done on a one-on-one basis in a quiet place within the university. The clips were shown on a computer screen. The participants were informed that they would see a series of three video clips; A, B and X play one after the other. They were further informed that they needed to watch all the clips run to completion before telling the investigator whether they thought the last clip (X) was more similar to clip A or clip B. Thirty-eight triads with clips in an ABX format were presented in random orders. The presentation was counter-balanced, such that half of the time the [-endpoint] alternate appeared first as clip A, and half of the time it appeared second as clip B. The same was true for the [+endpoint] alternate. The clips were presented in a semi randomized order. The inter-trial interval was dictated by the participant's response. Once they answered, the experimenter clicked the computer mouse and moved to the next triad. The responses were both audio recorded as well as captured by hand on a hard copy template that had been prepared. The template is attached in appendix C(i).

4.7.3. Data coding

The responses recorded in the hard copy template were verified using the audio recorded responses. Choice of endpoint preference was used as the dependent variable. Pairing of the target clip with a [+endpoint] clip was coded as 1, and a [-endpoint] with the target clip coded as 0. Language with the levels Dholuo, Kiswahili and English was used as a predictor variable for the DEK group. Similarly, the L1 Kiswahili group had choice of endpoint preference as the dependent variable and language as the predictor variable. The coding of the dependent variable for the L1 Kiswahili participants followed the pattern used in the DEK group.

4.7.4. Data analysis

The number of times the participants chose the [+endpoint] alternate (response variable) was modelled as a function of language for the DEK participants. The average endpoint preferences for each DEK context were calculated alongside the standard error. A graphical comparison (bar plots) of the mean percentage endpoint preference across the DEK contexts was created in R. Another graph comparing the L1-Dholuo to L1-Kiswahili and L1-English mean percentage endpoint preference was developed.

Statistical testing was conducted using the logit mixed model. First, a combined dataset of the endpoint preferences from all the three DEK language contexts was used. A model with the predictor variable DEK language group and response variable endpoint preference was run. The model output was noted and results interpreted.

Second, another dataset containing both L1 Kiswahili and L1 Dholuo (Dholuo context) was used. The reason for including data from L1 Dholuo instead of running a model solely based on the L1 Kiswahili data was because logit mixed models with one predictor variable of a single level does fail to run. The choice of Dholuo context was for uniformity with the L1 Kiswahili group who performed the task in Kiswahili language mode. For this category therefore, the response variable, endpoint preference was modelled as a function of the L1 Dholuo and L1 Kiswahili as predictors.

The analyses sought to predict the likelihood in log-odds space that the speaker would match the [+endpoint] alternate to the target clip. Further statistical tests were run taking into account the participants' linguistic background. These tests took the form of the combined DEK dataset and the L1 Kiswahili and L1 Dholuo dataset as highlighted in the previous paragraph. For instance, in the case of the DEK dataset, first the model for the language group predictor was run and the model output noted. Following that, another test involving endpoint preference as a response variable and the predictors; language frequency, language proficiency and age of language acquisition of participants in the Dholuo context, was run. Thereafter, a third model with the same response variable was modelled as a function of the linguistic background information of participants who used the Kiswahili context. The same was true for the participants in the English context. The reason for modelling the participants' linguistic information according to their language context was because a single model that could include all the nine predictor variables plus the random effects would likely fail to converge, given the magnitude of independent data points in the combined dataset.

The L1 Kiswahili group had only one context of speech and therefore prompted the use of a single model encompassing the language frequency of use and language proficiency as the two-predictor variable. The age of language acquisition was not used as a predictor for this group because it had the same value of one (1) for all the participants involved. The same was true for Dholuo age of acquisition.

Prior to the modelling, a Pearson correlation test was conducted between language proficiency and language frequency of use to test for the level of correlation between the two variables.

4.8. Conclusion

The chapter has highlighted the research design used in the study. The design employed in the dissertation is a cross-sectional experimental research strategy. Further the comparison group design has been largely utilized as part of the data elicitation and analysis. Additionally, detailed methods used across the various experimental procedures have been presented. Under the methods section, there are sub-sections that define aspects cutting across the entire dissertation such as participants details, research sites etc. Alongside study design and methodology, there are four major sections (4.4-4.7) with an underlying theme of spatial frame of reference (4.4&4.5) and motion events categorization (4.6&4.7). Within these sections are detailed procedures, data coding and data analysis criteria that are specific to the various experiments undertaken as part of the experiment design.

Subsequent chapters utilize the methodology outlined in this chapter to interpret and analyse the findings from the study.

CHAPTER 5

SPATIAL FRAMES OF REFERENCE

5.1. Introduction

This chapter seeks to answer the research question: To what extent does language context influence DEK multilinguals choice of spatial frame of reference? All the analyses reported herein address the aforementioned question. The chapter is divided into four sections. The section that follows, 5.2, presents the findings of the linguistic frames of reference task (photo-object matching task) at the macro level. The subsequent section, 5.3, presents the findings of the linguistic frames of reference task (photo-object matching task) at the micro level. Section 5.4 presents the findings of the non-linguistic frames of reference tasks (mirror image task). The final section, 5.5, summarizes the key information presented in the chapter.

5.2. Photo-object matching task-analysis at the macro level

The findings of the linguistic FoR task were analysed using both descriptive and inferential statistics. The question we sought to answer using this level of analysis was whether the decision to use or not to use a FoR in spatial picture description depended on either the language context or the item category.

5.2.1. Descriptive analysis under the location spatial platform

Table 5.1 Distribution in percentages of FoR types under the location platform in Dholuo and English

LOCATION			
DHOLUO	Unfeatured-Unfeatured (UU) %	Unfeatured-Featured (UF) %	Featured-Featured (FF) %
Relative	78.30% (<i>SD</i> = 1.53)	57.50% (<i>SD</i> = 1.79)	11.70% (<i>SD</i> = 0.57)
Object Centred	7.50% (<i>SD</i> = 0.69)	9.20% (<i>SD</i> = 0.83)	75.00% (<i>SD</i> = 0.95)
Direct	1.70% (<i>SD</i> = 0.37)	3.30% (<i>SD</i> = 0.37)	3.30% (<i>SD</i> = 0.55)
Landmark		0.80% (<i>SD</i> = 0.22)	
Geomorphic	2.50% (<i>SD</i> = 2.04)	1.70% (<i>SD</i> = 0.45)	
Undefined	10.00% (<i>SD</i> = 1.18)	27.50% (<i>SD</i> = 1.73)	10.00% (<i>SD</i> = 0.76)
ENGLISH			
Relative	88.30% (<i>SD</i> = 1.16)	59.20% (<i>SD</i> = 1.54)	12.50% (<i>SD</i> = 0.55)
Object centred	2.50% (<i>SD</i> = 1.53)	13.30% (<i>SD</i> = 1.79)	75.80% (<i>SD</i> = 0.57)
Direct		1.70% (<i>SD</i> = 0.45)	0.80% (<i>SD</i> = 0.22)
Landmark			0.80% (<i>SD</i> = 0.22)
Geomorphic		0.80% (<i>SD</i> = 0.22)	0.80% (<i>SD</i> = 0.22)
Undefined	9.10% (<i>SD</i> = 0.89)	25.00% (<i>SD</i> = 1.43)	10.00% (<i>SD</i> = 0.75)

(a) Unfeatured-unfeatured (UU)

There was a 90% preference for the use of spatial reference frames in this category. The relative reference frame was the most preferred for verbal description in this category, both by participants who used Dholuo and those who used English in their description. The following examples explain part of the statistics highlighted in Table 5.1 under UU category

28.

Participant (DP0264): Twenty-two-year-old female DEK multilingual

Language context: Dholuo

Stimuli (BAFNV): A net is placed transversely. A ball is aligned directly to the middle of the net on the side that is closer to the SAP; the arrangement thus is, SAP-ball-net.

<i>Ket</i>	<i>net</i>	<i>gi</i>	<i>mpira</i>	<i>e</i>	<i>mbele-ne</i>
Put.IMP	net	with	ball	in	front-3SG.POSS

‘Put the net and then the ball in its front.’

In example **28**, the net is regarded as having a front, *mbele* (its front). The ball is to be placed at a removed distance from the supposed front of the net. When a net that otherwise has no defined facet (front) is assigned one by the SAP, the SAP has used a relative spatial reference frame. Such relative FoR constructions as in example **28** predominated at 78% of the total descriptions in Dholuo context. Compare this to example in **29**

29.

Participant (DP248): Twenty-three-year-old male DEK multilingual

Participant (RP249): Twenty-year-old male DEK multilingual

Language context: Dholuo

Stimuli (TFNFAF): The arrangement is such that from the SAP, there is the tree, and then the net (placed transversely)

Director (DP248)a:

<i>Yien</i>	<i>o-chung</i>	<i>e</i>	<i>dier</i>	<i>net</i>
Tree	SUBJ-stand/NPROG	in	middle	net

Recreator (RP249):

<i>Yien</i>	<i>o-chung</i>	<i>e</i>	<i>dier</i>	<i>net?</i>
Tree	SUBJ-stand-NPROG	in	middle	net?

Director (DP248)b:

<i>I-ket-e</i>	<i>mbele; yaani</i>	<i>i-ket-e</i>	<i>diere</i>
SUBJ.2SG-put-OBJ	front; EMP	SUBJ.2SG-put-OBJ	middle
<i>i-ket-e</i>	<i>kaka</i>	<i>ni</i>	<i>ket-o</i>
SUBJ.2SG-put-OBJ	like	SUBJ.2SG.IPST	PUT-INF/OBJ
			<i>mpira</i>
			ball
<i>cha</i>			
that			

(DP248)a: The tree is standing in the middle of the net

(RP249): The tree is standing in the middle of the net? (*Possibly surprised at how such an arrangement is possible*)

(DP248)b: You put it in front, that is, you put in in the middle. You put it like you did with the ball (referring to a previous description)

It should be noted that even though the nature of the UU stimuli disfavoured the use of the OBC FoR, there were instances where it was still employed as example in **29** shows. The data reveals that in all these cases, part of the pairs of objects making up the stimulus was *a net*. A net was used as a non-featured object in the tasks primarily because it is impossible to tell which of its horizontal surface is *front* or *back* (see Fig 5.1(a)).

(A)



(B)



Fig 5.1(a) Picture of a net which was used as an object in some of the UU category stimulus; (b) A sample stimulus under the UU category containing a net

Some of the participants did correctly identify the mid-section of the net (see Fig 5.1(b)) from which they described the location of the Figure as in example **29**. Despite its featurelessness, the participant still identified an intrinsic part of it (the net) from which the tree's location was described. He employed the use of an OBC FoR

(a) Unfeatured-featured (UF)

Similar to the UU category, there was preference for the use of spatial reference frame at 74% in this category. The nature of the UF category is a bit complex compared to the UU and the FF categories and as such need to be explained. This category had the objects *tree* (unfeatured) and *man* (featured), see appendix A for details. The configuration of the stimuli was such that the *man* being smaller would easily be deemed as the Figure and the more pronounced *tree* would easily be considered as the Ground (see Fig 5.2). According to O'Meara (2011), such a deliberate skewing of the stimuli configuration is consistent with the original intended design of the *Man and Tree game*. In 95% of the total descriptions, the *man* was marked as the Figure and the tree as the Ground. The *tree* was interpreted as a Figure and the *man* as a Ground in 3% of the total descriptions. The remaining 2% was taken up by double interpretation which used the tree as a Figure and the man as a Ground in one part of the description and reversed the order in the second part of the same descriptions. Let us consider these sets of examples



Fig 5.2 Sample UF man and tree stimulus

30.

(a) Participant (DP073): Nineteen-year-old female DEK multilingual

Language context: English

Stimuli (MRFAT): A man is on the right of the SAP and the tree is on the left of the SAP (from the perspective of the SAP). The man is facing the tree.

The man is in front of the tree, the man is facing the left side

(b) Participant (DP033): Twenty-year-old female DEK multilingual

Language context: Dholuo

Stimuli (MLTFAAFT): The man is on the left of the SAP farther away from the tree which is on the right of the SAP. The man is facing left of SAP.

<i>Yien</i>	<i>o-bed-e</i>	<i>tok</i>	<i>dichuo,</i>	<i>dichuo</i>	<i>ngi'-yo</i>
Tree	SUBJ-be-in	behind	man	man	face-INF/NPROG
<i>lwet-i</i>		<i>ma</i>	<i>kor</i>	<i>acham</i>	<i>to</i>
hand-2 SG. POSS		DEM	side	left	but
<i>yien nitie-re</i>		<i>e</i>	<i>tok</i>	<i>dichuo</i>	<i>lwet-i</i>
tree LOC-EMP/NPROG		at	behind	man	hand-2 SG. POSS
<i>ma</i>	<i>kor</i>	<i>achich</i>			
DEM	side	right			

‘The tree is behind the man; the man is facing your left-hand side but the tree is behind the man on your right-hand side’

(c) Participant (DP019): Twenty-three-year-old male DEK multilingual

Language context: Dholuo

Stimuli (MFAFBT): Man’s position is such that it aligns directly with the tree in a SAP-tree-man order. The man is facing the tree.

<i>Yien</i>	<i>nitie-re</i>	<i>mbele</i>	<i>mar</i>	<i>dichuo,</i>	<i>dichuo</i>
Tree	LOC-EMP	front	of	man	man
<i>o-chung'</i>		<i>e</i>	<i>tok</i>	<i>yien</i>	
SUBJ-stand/NPROG		at	behind	tree	

‘The tree is in front of the man/ the man is standing behind the tree.’

In **30(a)**, the man was interpreted as a Figure and the tree a Ground. The participant described the man as being *in front* of the tree thereby using a relative FoR. In **30(b)**, the participant considered the tree to be the Figure and the man to be the Ground. She instructs the recreator to place the tree behind the man thereby using an object-centred FoR. Notice that at the end of her description, she reasserts that the man is behind the tree but adds that the position occupied by the tree is also on the right-hand side of the recreator. By relating the position of an object (tree in this case) to a SAP (recreator) means she additionally used the direct FoR. Lastly, example

30(c) shows a construction that is in two parts. In the first part, the participant considers the tree as the Figure and describes its position as being in front of the man who is considered as a Ground. He employed the object-centred FoR up to that point. In the second part of the description, the participant, by way of emphasis reversed the order and marked the man as the Figure, and the tree as the Ground. The position of the man was deemed to be behind the tree. Mapping of the SAP's bodily coordinates had been involved to identify the back of the tree from which the position of the man was described. The relative FoR was used in this case.

From the examples, what is evident is that for the UF category, the assignment of Figure or Ground properties greatly determines the type of FoR to be used in the description. This is in contrast to the UU and the FF categories where no matter which object is designated as a Figure or a Ground, the FoR type used is not affected.

Example **31** illustrates a non-FoR usage in spatial description in this category.

31.

Participant (DP075): Twenty-year-old female DEK multilingual

Language context: English

Stimuli (MLTFAF): A man and a tree are standing side by side. The man is to the left of the SAP, the tree is to the right of the SAP. The man is facing the SAP.

Man is standing next to the tree facing... (she thinks) facing me or... (a little hesitation) facing South; like 'si' (filler word) we have left right, so it's facing me kinda South.

The participant describes the position of the man as simply *next to* the tree. She employs a general non-FoR descriptive term. Descriptions such as in example **31** featured at between 25%-30% in either language.

(b) Featured-featured (FF)

The object-centred frame was the most preferred for this category by the respondents both in Dholuo and English language contexts. An object centred description under the FF category is exemplified in 32.

32.

Participant (DP035): Twenty-five-year-old male DEK multilingual

Language context: Dholuo

Stimuli (COBHFABA): A cow is placed behind a house facing the back of the house.

<i>Dhiang'</i>	<i>nie</i>	<i>tok</i>	<i>ot</i>
Cow	LOC	back	house

'The cow is behind the house'

Such constructions as in example 32 were the most frequently used to express relationships between Figures and Grounds that were both featured e.g., a cow and a house.

Overall, for descriptions specific to object location, the participants used FoRs approximately 86% of the time in each language. The most dominantly used FoR across the location spatial platform were the relative reference frames, followed by the object centred frames. The landmark based frame is the least featured.

5.2.2. Inferential analysis under the location spatial platform

For the inferential testing, two separate modelling took place. In the first, choice of spatial frame was used as the dependent variable and the group language used as the predictor variable with two levels. In the second, the choice of spatial frame was used as the dependent variable and the item category was used as the predictor variable.

(a) Language as a predictor variable

First, an initial visual inspection of the data (see, Fig 5.1) shows that under both languages, instances where FoR were used in the spatial descriptions were more than instances where they were not used. The graph however does not clearly show a difference in FoR choice between the two language contexts.

As already stated, a mixed logit model with language (Dholuo and English) as the predictor variables and the binary choice/no choice of a FoR as the dependent variable was modelled. The random effects were by-participant and by-item. Since choice of FoR was coded as '1' and no choice as '0', the no choice (0) was the reference level for the dependent variable. It means therefore that the log odds were observed in terms of choice of FoR.

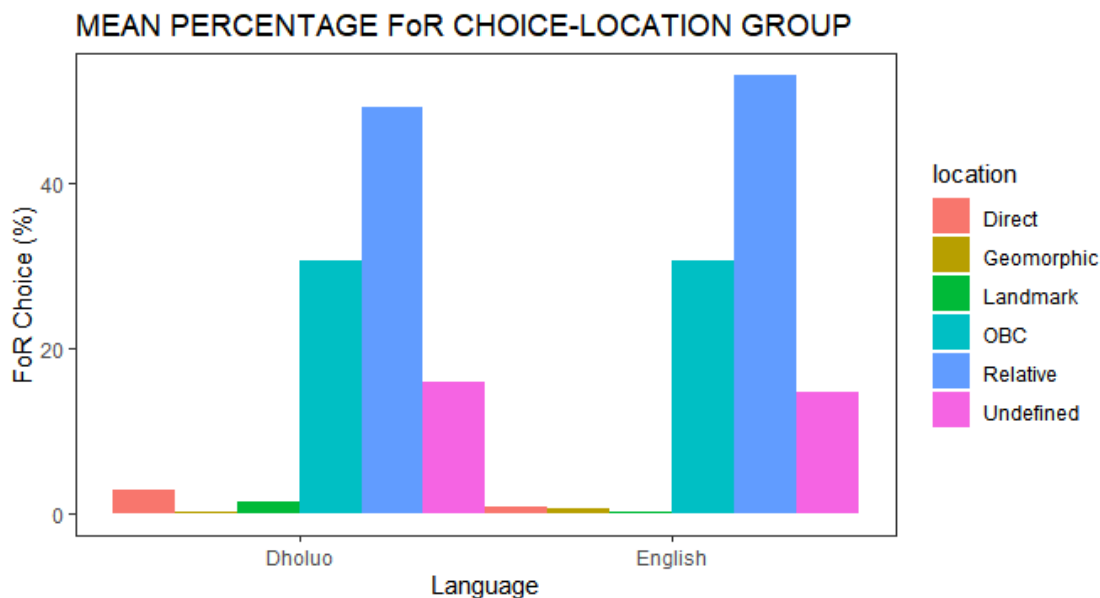


Fig 5.3 FoR choice representation for the location group

The first model with by-subject and by-item intercepts together with a language random slope for the item random effect was over-parametrized (correlation of 1 for the intercept and language slope of the item random effect). To simplify it, the language slope of the item varying effect was dropped and second model run.

The model output estimate predicted the log likelihood of choosing a frame of reference given the group language significantly above chance; $\beta_0 = 2.34121$, $SE = 0.39914$, Wald $z = 5.866$, $p < 0.00001$. The estimate showed no statistically significant difference between the two language contexts; $\beta_1 = -0.01384$, $SE = 0.40908$, Wald $z = -0.034$, $p = 0.973$. The observation is in tandem with the visual graphical representation in Figure 5.1.

(b) Item category as a predictor variable

The intercept shows that there was an overall preference for the FoR choices; $\beta_0 = 2.3014$, $SE = 0.2915$, Wald $z = 7.896$, $p < .00001$. There was a main effect of item category UF; $\beta_2 = -0.9465$, $SE = 0.2834$, Wald $z = -3.339$, $p < .0001$. This means that when for instance, the participants were presented with a picture of a tree and a man (category UF) to spatially describe, they

majorly relied on the nature of Figure and Ground in the picture to decide whether to use a spatial reference frame in the description or to give it a general description devoid of any spatial reference frame. Item category UU did not show any significant effect; $\beta_1 = -0.4261$, $SE = 0.2985$, Wald $z = -1.427$, $p = 0.15344$. There was a trending effect for item category FF; $\beta_1 = 0.5204$, $SE = 0.3052$, Wald $z = 1.705896$, $p = 0.08820$.

A likelihood ratio test of the model with the language predictor against the model with the item category predictor showed a significant difference between the models ($\chi^2(1) = 8.3$, $p = 0.003964$). This indicates a main effect for the item category as opposed to language.

5.2.3. Descriptive analysis under the Figure orientation spatial platform

Table 5.2 Percentage FoR types' distribution under Figure orientation category in Dholuo and English contexts

FIGURE ORIENTATION			
DHOLUO	Unfeatured-unfeatured (UU)	Unfeatured-featured (UF)	Featured-featured (FF)
Relative	3.30% ($SD = 0.56$)	17.50% ($SD = 0.94$)	10.00% ($SD = 0.68$)
Direct	5.00% ($SD = 1.42$)	28.30% ($SD = 0.96$)	46.70% ($SD = 1.61$)
Landmark	5.80% ($SD = 0.76$)	35.00% ($SD = 1.36$)	18.30% ($SD = 0.87$)
Geomorphic		0.80% ($SD = 0.23$)	
Undefined	86.00% ($SD = 1.37$)	18.30% ($SD = 1.33$)	25.00% ($SD = 1.95$)
ENGLISH			
Relative	1.70% ($SD = 0.73$)	29.20% ($SD = 1.25$)	11.70% ($SD = 0.50$)
Direct	2.50% ($SD = 0.32$)	22.50% ($SD = 1.12$)	32.50% ($SD = 1.49$)
Landmark	5.00% ($SD = 1.38$)	30.80% ($SD = 1.13$)	20.00% ($SD = 2.23$)
Absolute		6.70% ($SD = 1.07$)	10.80% ($SD = 1.60$)
Geomorphic		2.50% ($SD = 0.50$)	0.80% ($SD = 0.23$)
Undefined	90.80% ($SD = 1.75$)	8.30% ($SD = 0.48$)	24.70% ($SD = 1.93$)

(a) Unfeatured-unfeatured category (UU)

Orientation, which can be regarded as *the facing information*, seeks to show where the object (Figure in this case) is facing. In this category, there was no mention of the orientation of the Figure in 80% of the descriptions. In a further 8%, there was what we have called *general orientation description* (GoD), that is, there was some attempt at describing the orientation of the Figures using non-specific terminologies such as *close*, *aligned*, *straight* etc. The remaining 12% of the total cases displayed the use of FoRs in Figure orientation descriptions.

Ideally, the configurations of a stimulus in the UU category do not allow for any orientation. The 80% of no mention of Figure orientation was therefore largely expected. However, as already mentioned, there was a 12% attempt by the participants to describe the orientation of the Figures. Consider the following example:

33.

Participant (DP246): Twenty-one-year-old male DEK multilingual

Language context: Dholuo

Stimuli (BAFTFAF): A ball is aligned directly with a tree some distance apart, the arrangement is such that from the SAP, there is the ball then the tree (SAP-ball-tree.)

<i>Mpira</i>	<i>nie</i>	<i>mbele</i>	<i>yien</i>	<i>kanyo</i>
Ball	LOC	front	tree	there
<i>Nie mbele</i>	<i>yien,</i>	<i>e</i>	<i>mbele-ni,</i>	
LOC front	tree,	in	front-2SG.POSS	
<i>o-chim-re</i>		<i>kodi</i>		
SUBJ.3SG-align-with		2SG		

‘The ball is there in front of the tree, it is in front of the tree, in front of you, it is aligned with you.’

In the last part of the description in example 33, the participant mentions that ball’s orientation in relation to the SAP- *ochimre kodi* (is aligned with you) to mean that the ball is directly opposite the SAP. By orienting the Figure to the SAP, the Figure orientation description has used a direct FoR.

Other examples include

34.

Participant (DP051): Twenty-four-year-old male DEK multilingual

Language context: English

Stimuli (NLTV): A net is placed in a sagittal position on the right of the SAP. On the left of the net, close to it and directly aligns to its mid-section, is a tree

The net is at the middle facing the iron sheet side, then there is a tree beside the net on your left-hand side facing the net. So, meaning you should adjust the net to come this side which I am.

35.

Participant (DP019): Twenty-three-year-old male DEK multilingual

Language context: Dholuo

Stimuli (BABT): The ball is farthest from the SAP; it is directly aligned with the tree such that the tree blocks the SAP from seeing the whole ball but only parts of it on either side of the tree)

Mpira nie tok yien

Ball LOC back tree

‘The ball is behind the tree’

Instances of example 35, where featureless object e.g., a net, is deemed to be facing somewhere (iron sheet side) hence utilizing a landmark-based FoR orientation were the less common in either language.

The description in example 35 uses a relative FoR to describe the *location* of the Figure (ball) vis a vis the Ground (tree). Notice that there is no mention of the Figure facing something or some direction. Such a construction, in terms of Figure orientation, is considered ‘undefined’, that is, it lacks an orientation. As already mentioned, for this particular category, this type of Figure orientation-less description was the most dominant at 86% and 90% in Dholuo and English respectively.

(a) The Unfeatured -Featured category (UF)

Recall from the location platform that the UF category was unique for its ability to allocate either of the objects a Figure or a Ground role. This attribute extends to the Figure orientation spatial platform. When the participant chose the man as the Figure and the tree as the Ground during spatial encoding, the Figure (man) being featured was easily oriented as *facing something*. This

ease of orienting the man accounts for the majority of the FoR preference Figure orientation descriptions at 86%. When in turn it was the tree that was marked as a Figure and the man as the Ground, the data revealed that in almost all the cases it was still the man's orientation that was mentioned leaving the Figure (tree) as undefined. Similar to the UU category, the participants found it hard orienting an unfeatured object. The bulk of the 14% non-FoR descriptions were made up of descriptions where Figure orientations were not mentioned. Note that this occurred irrespective of whether the tree or the man was the Figure.

Regarding the specific spatial FoR used, there was no one type that was preferred to a greater extent than the others. Across both language contexts, the relative FoR (e.g., facing left/right) was used at 23%, direct (e.g., facing you/me) was used at 25%, Landmark-based (e.g., facing the wall) was used at 33%, geomorphic (e.g., facing up/upwards/downwards) was used at 2% and absolute (e.g., facing west) was used at 7%. Note that in all these instances, it was the man and not the tree that was perceived to be oriented to a particular direction or entity.

Examples in 36 illustrate the use of the direct and geomorphic frames in as used in this category.

36.

- (a) Participant (DP260): Twenty-one-year-old female DEK multilingual

Language context: Dholuo

Stimuli (MLTFAF): A man and a tree are standing side by side. The man is to the left of the SAP, the tree is to the right of the SAP. The man is facing the SAP.

<i>Dichuo</i>	<i>ni</i>	<i>dir</i>	<i>kacham</i>	<i>mar</i>	<i>yien</i>
Man	LOC	side	left	of	tree
<i>kasto</i>	<i>o-rang-o</i>	<i>in</i>			
then	SUBJ.3SG-face-INF/NPROG 2SG				

‘The man is on the left side of the tree facing you’

- (b) Participant (DP069): Twenty-two-year-old male DEK multilingual

Language context: English

Stimuli (MRTFABA): A man and a tree are side by side. The man is aligned to the right of the SAP and the tree to the left. The man has his back to the SAP.

In front of the tree there is a man standing facing upwards

In example 36(a) the participant uses the recreator who is seated beside her to define the orientation of the Figure (man). Use of a SAP as a reference in a description means that a direct FoR has been employed. Such a construction was used 28% of the time in Dholuo. In example

36(b) the Figure (man) is described as facing upwards. The participant uses the general topography and identifies the side the man is facing as sloping upwards hence revealing the use of geomorphic FoR. This type of description formed less than 3% of the total descriptions in the UF group.

(c) The Featured-featured category

There was a general tendency to use spatial frames of reference under this category (75%). As before, this is attributable to the nature of the objects. Specifically, a featured Figure e.g., a car, house etc., would most probably provide a ready platform for a Figure orientation description. That is to say, a person, a cow, a car etc., has the inherent ability to face something or to have their backs to something due to them having fronts and backs. This makes it easier for the participants to orient them with entities in the picture world e.g., facing a tree or entities in the real world e.g., facing you/me (SAP). The Figure can also be oriented with the left, right, front, back relations.

The types of spatial reference used were identified based on the entities that the Figures were oriented to. For instance, the direct FoR (Figure facing SAP) was used the most number of times at 40% across both contexts. Landmark-based FoR (Figure facing wall, town, school etc.) was used in 33% of the description and the relative (Figure facing left, right relations) was used 23% of the time. There was also the use of the absolute FoR where the Figure was oriented using cardinal direction. This occurred at 10% and it is exemplified as in 37

37.

Participant (DP069): Twenty-five-year-old female DEK multilingual

Language context: English

Stimuli (BFAFRCFAR): A boy is standing beside a car. The car is facing the right of SAP. The boy has his back to the car facing the SAP.

A boy is standing beside the car facing East, the car is facing Northwards

According to the participant in example 5.13, the boy (Figure) is facing East depicting the use of an absolute FoR. It is important to point out that for the absolute FoRs, there were some inaccuracies between the terminology e.g., North and the actual direction referred to. For this particular respondent however, all her absolute FoR usages for spatial description were spot on. A look at her language background characteristics did not however reveal anything out of the ordinary.

To sum up, the Figure orientation group revealed that the use of FoR in the participants' picture descriptions reduced from over 80% in the Location group to about 67% in Dholuo and 58% in English. There seemed to be no single preferred mode of spatial description (FoR or non-FoR) across the UU, UF and FF categories in the Figure orientation spatial platform as was the case with the dominant use of the FoR in the Location spatial platform group.

5.2.4. Inferential analysis under the Figure orientation spatial platform

Two separate statistical models were run. In the first one, choice of a spatial frame was used as the dependent variable and language as the predictor variable. In the second, choice of spatial frame was used as a dependent variable and the item category as the predictor variable.

(a) Language as predictor variable

Fig 5.4 shows that under both languages, the participants preferred to use the FoR in spatial descriptions over the non-FoRs though the margin of preference was not as big as it was under the location spatial platform. As for the predictor variable, there appears to be no difference between English and Dholuo's influence on the participants' choice.

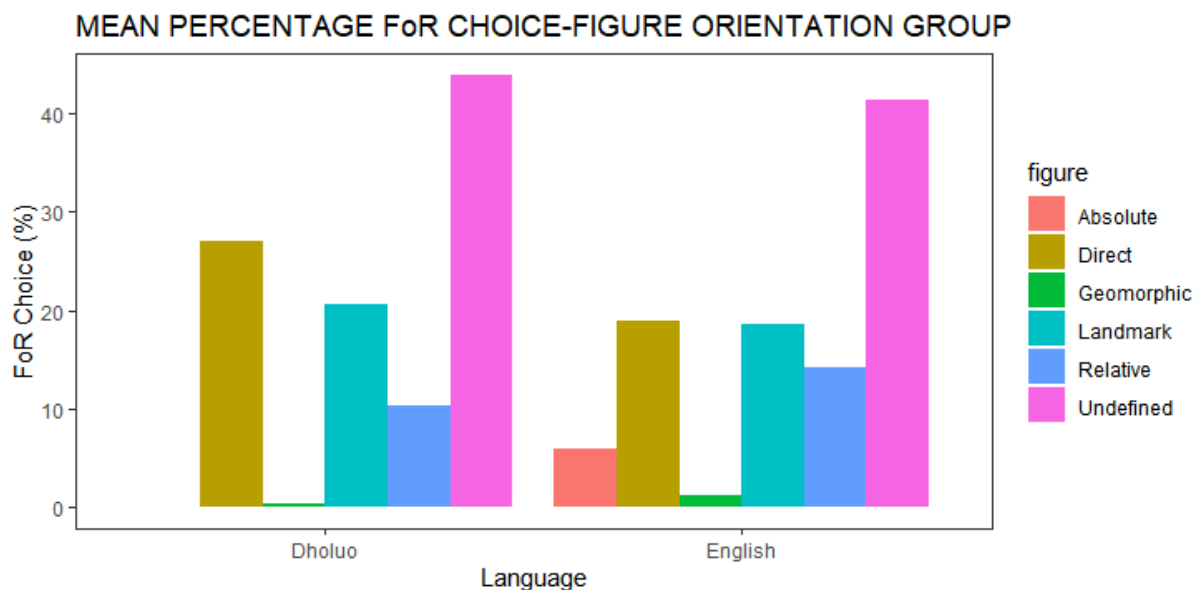


Fig 5.4 FoR choice for the Figure orientation group

Choice of FoR was modelled as a function of the predictor variable language. The random effects were by-participant and by-item. As in the previous case, the model with the random slope was over-parametrized (correlation of 1 of the intercept and language slope of the item random effect). The output for the intercept only model can be interpreted as follows;

A positive intercept estimate indicates that overall, the model predicts that the participants would choose spatial reference frames for picture descriptions; $\beta_0 = 0.4063$, $SE = 0.6688$, Wald $z = 0.607$, $p = 0.544$. There was no significant difference between the language contexts (logit difference; $\beta_1 = -0.2098$, $SE = 0.5054$, Wald $z = 0.415$, $p = 0.678$).

Notice that this estimate conforms to the visual presentation in Figure 5.4. Whereas the non-FoR (undefined) description appears to be the most preferred in both languages, when all the types of FoR are cumulatively considered, the FoR preferences are slightly higher. In the graph, English as opposed to Dholuo has higher estimates because it has one more FoR type used than Dholuo. Cumulatively therefore more FoR types and by extension choices are realized under English than in Dholuo. Overall, however whatever differences there are between the effects of English and Dholuo in participants decision to choose a FoR was not significant.

(b) Item category as a predictor variable

The intercept showed that there was more than 50% chance that the participants would use FoR in their description; $\beta_0 = 0.4577$, $SE = 0.2790$, Wald $z = -1.640$, $p = 0.101$. The effect was not significantly above chance though. There was a main effect of item category UU; $\beta_1 = -3.1454$, $SE = 0.2798$, Wald $z = -11.242$, $p < .00001$ and Item category UF; $\beta_2 = 2.0959$, $SE = 0.2575$, Wald $z = 8.139$, $p < .00001$ as well as item category FF; $\beta_1 = 1.0495$, $SE = 0.2260$, Wald $z = 4.644$, $p < 0.00001$.

Even though the model predicted that overall, the participants did prefer the use of FoR in Figure orientation- as supported by Fig 5.4., the main effect of item category UU means that the unfeatured nature of the Figures strongly discouraged participants from using any FoR in Figure orientation. In contrast, within the UF and FF category, the featured nature of the Figure did influence the participants to adopt the use of FoR in Figure orientation, accounting for the strong effect of the both categories.

A likelihood ratio test of the model with the language predictor against the model with the item category predictor showed a significant difference between the models ($\chi^2(1) = 46.141$, $p < 0.00001$), indicating a main effect of the item category over language.

5.2.5. Descriptive analysis under the Ground orientation spatial platform

Table 5.3 Distribution of FoR types under the orientation category in Dholuo and English contexts

GROUND ORIENTATION			
DHOLUO	Unfeatured-unfeatured (UU)	Unfeatured-featured (UF)	Featured-featured (FF)
Relative	6.70% (<i>SD</i> = 0.37)	1.70% (<i>SD</i> = 0.63)	11.70% (<i>SD</i> = 0.84)
Direct	14.20% (<i>SD</i> = 1.10)	1.70% (<i>SD</i> = 0.32)	25.00% (<i>SD</i> = 1.26)
Landmark	5.80% (<i>SD</i> = 0.68)	1.70% (<i>SD</i> = 0.32)	25.80% (<i>SD</i> = 1.45)
Undefined	73.30% (<i>SD</i> = 1.64)	95.00% (<i>SD</i> = 1.02)	37.50% (<i>SD</i> = 1.89)
ENGLISH			
Relative	2.50% (<i>SD</i> = 0.37)		13.30% (<i>SD</i> = 0.87)
Direct	15.00% (<i>SD</i> = 1.37)	0.80% (<i>SD</i> = 0.23)	28.30% (<i>SD</i> = 1.45)
Landmark	10.53% (<i>SD</i> = 1.38)		22.50% (<i>SD</i> = 1.58)
Absolute	0.80% (<i>SD</i> = 0.23)		11.70% (<i>SD</i> = 1.56)
Geomorphic			0.80% (<i>SD</i> = 0.23)
Undefined	71.70% (<i>SD</i> = 2.00)	99.20% (<i>SD</i> = 0.22)	23.30% (<i>SD</i> = 1.93)

(a) Unfeatured-unfeatured (UU)

Non-FoR descriptions were realized in 72.5% of all responses; 85% of the non-FoR descriptions were undefined, that is, there was no mention of a Ground orientation. The remaining had general orientation descriptions. There was 25% FoR descriptions that comprised the landmark-based, the direct, the relative and the absolute encodings.

(b) Unfeatured-featured (UF)

The respondents hardly used the spatial reference frames in stimuli description in this category. The single instance where a FoR was used in the English descriptions for this category is shown in 38

38.

Participant (DP023): Twenty-three-year-old male DEK multilingual

Language context: English

Stimuli (MLTFAF): A man and a tree are standing side by side. The man is to the left of the SAP, the tree is to the right of the SAP. The man is facing

The man and the tree facing you while the man is on the left of the tree

The participant uses a direct FoR to indicate that the man and the tree both face the SAP. At this point, we may not tell which of the two was used as the Ground or the Figure. It becomes clearer when he specifies the location of the man as being left of the tree (relative FoR for location). It is now evident that the tree is the Ground which does not only ‘face’ but has a left side as well.

(c) The Featured -Featured category (FF)

The direct and landmark-based FoRs were used almost equally across the language conditions. There was also the use of the relative and the absolute FoR. There was an average of 30% descriptions marked as undefined.

5.2.6. Inferential analysis under the ground orientation platform

Similar to the previous spatial platforms, there were two separate models each with the same dependent variable (choice of a spatial frame) but different predictor variables—one with language and the other with item category.

(a) Language as predictor variable

Fig 5.5 shows the visual representation of the FoR and non-FoR choice distribution within this group.

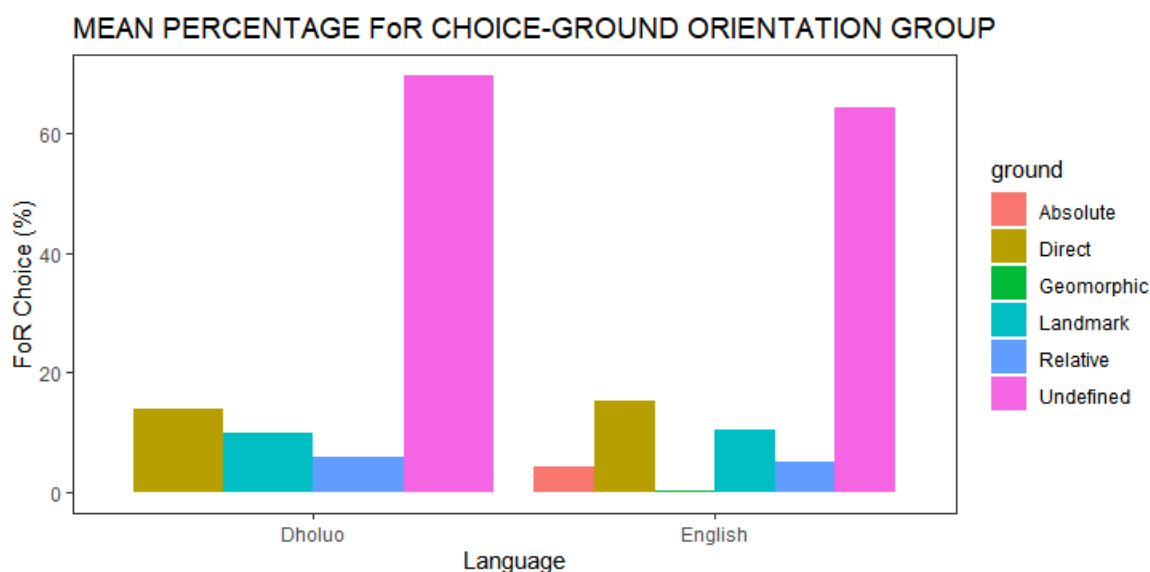


Fig 5.5 FoR choice for the Ground orientation group

It can be deduced from the visual representation above that more non-FoR choices were made as compared to the FoR choices. The graph however is uninformative as to what differences there are between English and Dholuo contexts regarding their effect on the participants' choice of FoR. A logit mixed model with a crossed intercept random effects for subject and for item was run.

The model intercept showed that there was a less than 50% chance that the participants were likely to choose a FoR in the Ground orientation class in either language; $\beta_0 = -1.91383$, $SE = 0.7373$, Wald $z = -2.596$, $p < .01$. Further, participants using English as opposed to Dholuo were more likely to choose a FoR. This difference however was not significant; $\beta_1 = 0.4070$, $SE = 0.5335$, Wald $z = 0.763$, $p = 0.44553$. This interpretation aligns with the graphical representation in Figure 5.5 where participants used two more FoR types in English as compared to Dholuo.

(b) Item category as a predictor variable

The intercept showed an overall significant preference for the non-FoR by the participants; $\beta_0 = -1.6548$, $SE = 0.3532$, Wald $z = -4.685$, $p < .00001$. The item category UF had a strong significant influence on the participant's decision not to use a FoR in their Ground orientation descriptions; $\beta_2 = -3.0103$, $SE = 0.4161$, Wald $z = -7.235$, $p < .00001$. The same was true for the item category FF; $\beta_2 = 2.8508$, $SE = 0.3499$, Wald $z = 8.148$, $p = 0.00001$. There was no significant effect for item category UU; $\beta_1 = 0.1595$, $SE = 0.3195$, Wald $z = 0.499$, $p = 0.618$. A likelihood ratio test of the model with the language predictor against the model with the item category predictor showed a significant difference between the models ($\chi^2(1) = 35.464$, $p < 0.00001$). This indicates a main effect of the item category over language.

On the whole, at the macro level, the participants chose to use FoRs in 57% and 60% of the descriptions in Dholuo and English across all groups and categories. The remaining descriptions were shared amongst the deictic expressions, general orientation descriptions or no orientation descriptions generally referred to as the non-FoR or the undefined class.

5.3. Photo-object matching task-analysis at the micro level

The results in this section seek to address the question: Does language influence the *type* of FoR used by participants in describing spatial relationships? In a similar pattern to the macro level, both graphs and statistical models have been used to present results in this section.

5.3.1 Descriptive and inferential analysis under the location spatial platform

In the inferential analysis, two mixed logit test were carried out. First, choice of a particular spatial frame was modelled against language context. Second, the same dependent variable was modelled against item category.

i) Relative FoR

(a) Language as predictor variable

A graphical representation of the choice of the relative FoR (y-axis) against language context (x-axis) as displayed in Fig 5.6 shows a slight preference for non-relative FoRs (all other types of FoRs combined) in Dholuo as compared to the relative FoR. In English however, the participants slightly preferred the use of the relative FoR to the other FoR categories.

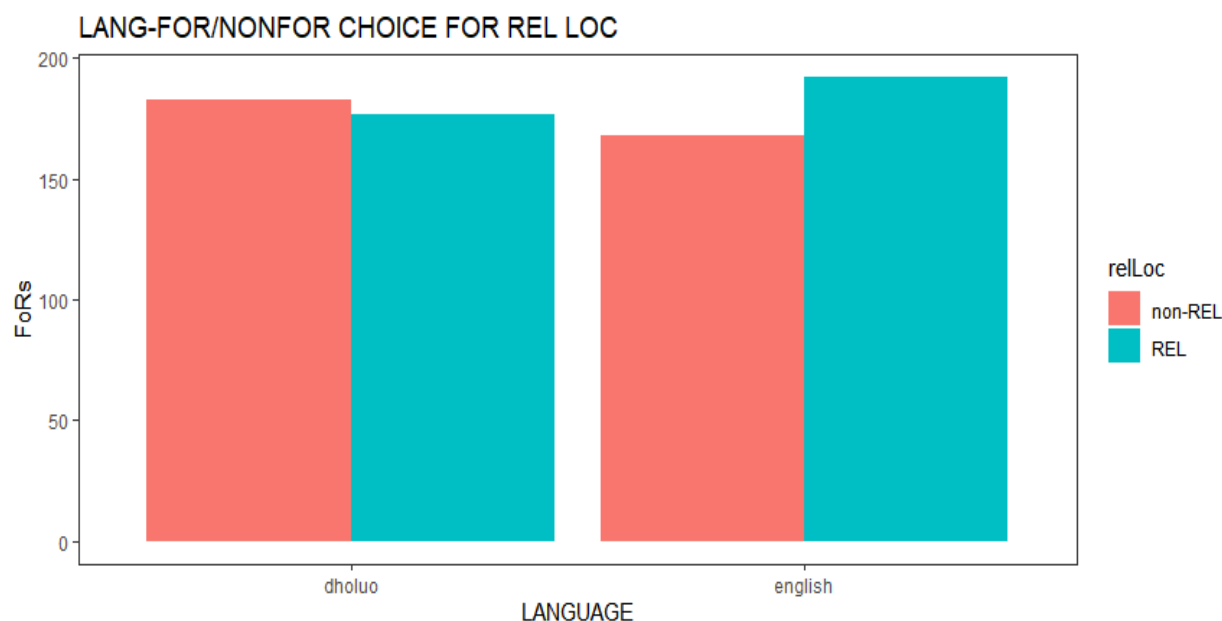


Fig 5.6 Relative FoR for location Platform

A random intercept only logit mixed model revealed an overall preference for the non-relative FoR, logit coefficient; -0.5444 , $SE = 0.6769$, $z = -0.804$, $p = 0.421$. The difference between the two language conditions was not statistically significant, logit coefficient; 0.3221 , $SE = 0.3394$, $z = 0.949$, $p = 0.343$.

(b) Item category as predictor variable

The model output revealed an intercept estimate which indicated an overall effect of non-relative FoR type preference; $\beta_0 = -0.2727$, $SE = 0.3398$, Wald $z = -0.803$, $p = 0.4222$. This effect was not significant. There was a large significant main effect (in logit space) of item category UU; $\beta_1 = 2.2010$, $SE = 0.4323$, Wald $z = 5.091$, $p < .00001$. The UU item category therefore greatly influenced the participants to use the relative FoR. The effect of the UF category for choice of the relative FoR type was not as large as the UF category; $\beta_2 = 0.7217$, $SE = 0.4206$, Wald z

=1.716, $p = .0.0862$, and definitely not as significant. The effect of the FF category was equally statistically significant; $\beta_3 = -2.9227$, $SE = 0.4890$, Wald $z = -5.976$, $p < 0.00001$

A likelihood ratio test of the model with the language predictor against the model with the item category predictor showed a significant difference between the models ($\chi^2(1) = 24.519$, $p < 0.00001$). There is therefore a main effect of the item category over language

ii) Object centred FoR

(a) Language as a predictor variable

The graph in Fig 5.7 was plotted with language in the x-axis and OBC choice in the y-axis. The graph shows no difference in OBC/non-OBC preference between the two language contexts. Instead, it shows a higher preference for non-OBC FoR choices and usage across categories and language contexts.

A mixed logit model was run revealing logit difference that shows a significant preference for the cumulative non-OBC FoR types thereby agreeing with the graphical representation in Fig.5.7. ; $\beta_1 = -1.3648602$, $SE = 0.6761182$, $z = -2.019$, $p = 0.0435$

It further shows no statistically significant difference in OBC FoR choice between Dholuo and English; $\beta_1 = -0.0009165$, $SE = 0.2741348$, $z = -0.003$, $p = 0.9973$

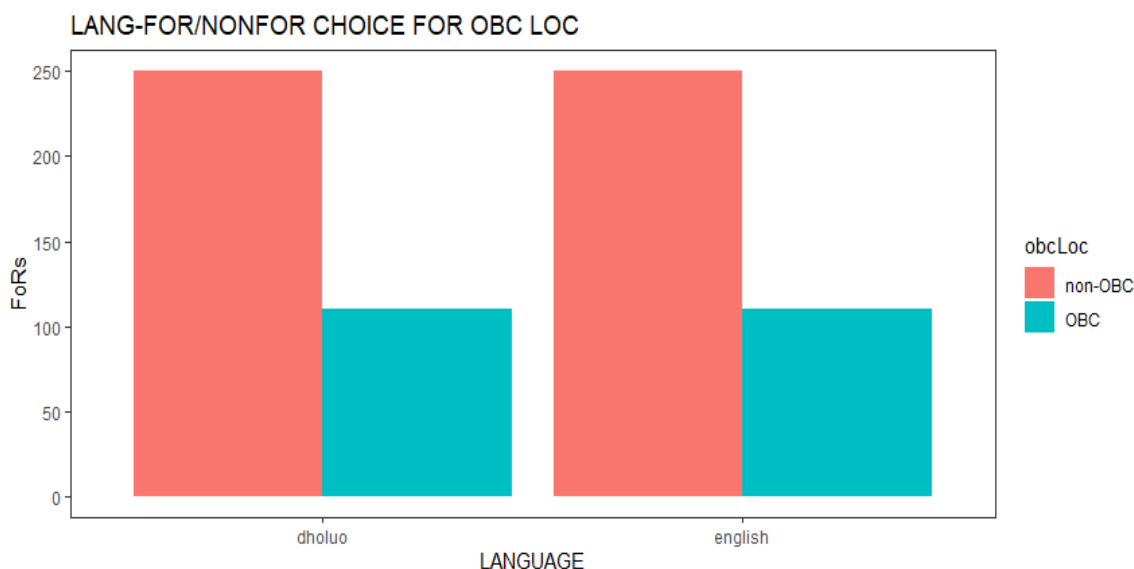


Fig 5.7 Object centred FoR choice under location spatial platform

(b) Item category as predictor variable

The model showed an overall significant effect of non-object centred FoR type preference; $\beta_0 = -1.3664$, $SE = 0.3057$, Wald $z = -4.469$, $p < 0.00001$. There was a large significant main effect (in logit space) of item category UU; $\beta_1 = -2.0371$, $SE = 0.4494$, Wald $z = 4.469$, $p < .00001$. The UU item category therefore greatly influenced the participants to avoid the use of the object-centred FoR type. The UF category also had a significant effect of non-object centred FoR type preference but to a less degree as compared to the UU category; $\beta_2 = -0.9428$, $SE = 0.4084$, Wald $z = 2.308$, $p = 0.021$. The FF category showed more preference to the use of the object centred FoR type as compared to the other two categories; $\beta_0 = 2.9798$, $SE = 0.4295$, Wald $z = -6.938$, $p < 0.00001$

A likelihood ratio test of the model with the language predictor against the model with the item category predictor showed a significant difference between the models ($\chi^2(1) = 24.519$, $p < 0.00001$).

This indicates a main effect of the item category over language

5.3.2. Descriptive and inferential analysis under the Figure orientation spatial platform

i) Relative FoR

(a) Language as a predictor variable

A visual inspection of Fig 5.8 shows a slight difference in relative/non relative choice representation between the two languages. The graph shows that participants who used Dholuo slightly utilized the cumulative non-relative FoRs types more than their English counterparts. In contrast, in the few instances that the relative FoR type was used, those in the English context used them slightly more than those who used Dholuo. Overall, the cumulative non-relative FoR types were greatly preferred to the relative-FoR type in both languages across all the UU, UF and FF categories.

The model reveals an intercept estimate which shows a statistically significant preference for the non-relative FoR choice given the language contexts; $\beta_0 = -3.8284$, $SE = 0.5748$, $z = -5.748$, $p < 0.00001$. Between the languages, English language mode users chose the relative FoR to a greater degree than their Dholuo counterparts. Even though the model agrees with the graphical interpretation in Fig 5.8, the difference is not statistically significant; $\beta_1 = 0.6258$, $SE = 0.4072$, $z = 1.537$, $p = 0.124$

(b) Item category as a predictor variable

The predicted log likelihood showed that the participants preferred the non-relative FoR type significantly above chance; $\beta_0 = -3.4923$, $SE = 0.5516$, Wald $z = -6.331$, $p < 0.00001$. There was a significant effect (in logit space) of item category UF; $\beta_2 = 1.4006$, $SE = 0.6599$, Wald $z = 2.122$, $p = 0.0338$. Meaning, more relative FoR types were chosen by the participants as compared to the UU category where more non-relative FoR types were preferred; $\beta_1 = -1.2521$, $SE = 0.7105$, Wald $z = -1.762$, $p = 0.0780$

A likelihood ratio test of the model with the language predictor against the model with the item category predictor showed no significant difference between the models ($\chi^2(1) = 2.29$, $p = 0.1302$).

The language predictor model however had a lower AIC compared to the second model hence it was considered to be the best fit

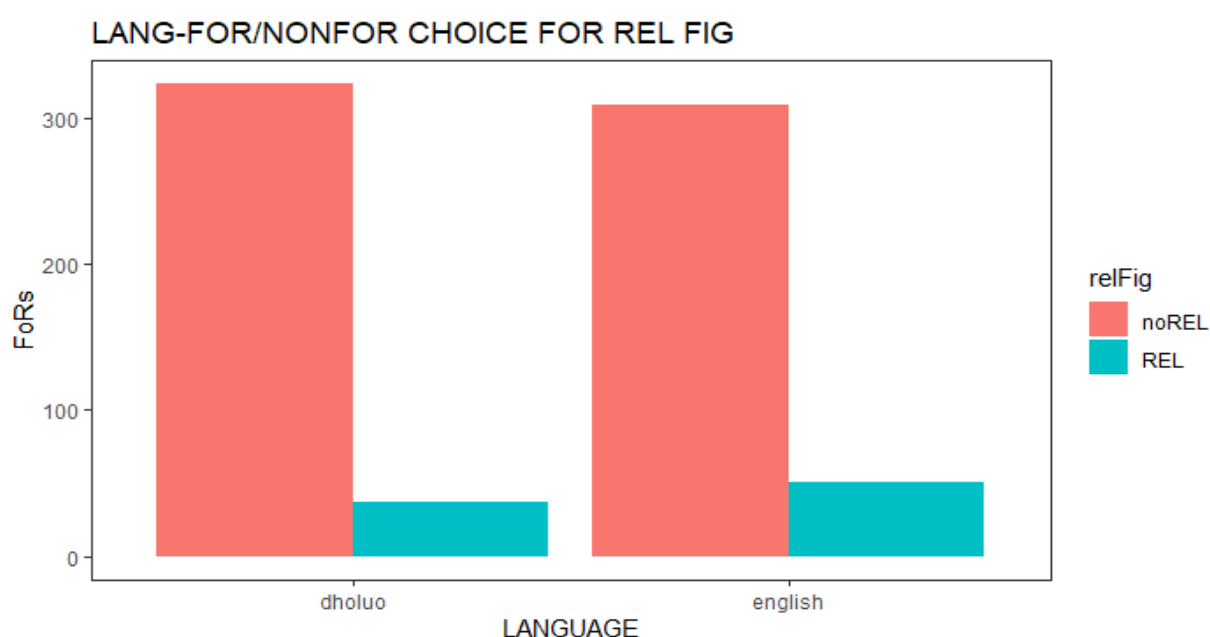


Fig 5.8 relative FoR choice under the Figure orientation group

ii) Direct FoR

(a) Language as a predictor variable

Fig 5.9, shows that the participants generally chose to use other types of FoRs as compared to the direct FoR. Between the languages however, under the English language context, slightly more non-direct FoR types were used as compared to Dholuo. The direct-FoR usage was however slightly higher in Dholuo context than English context

The modelling output revealed a general inclination towards the use cumulative non-direct FoR types as compared to the direct FoR. The estimate shows that Dholuo context participants as compared to English had a slightly greater preference for the use of direct FoR types. This difference remains at the level of a trend, not quite reaching statistical significant; $\beta_1 = -0.8359$, $SE = 0.4889$, Wald $z = -1.710$, $p = 0.08732$.

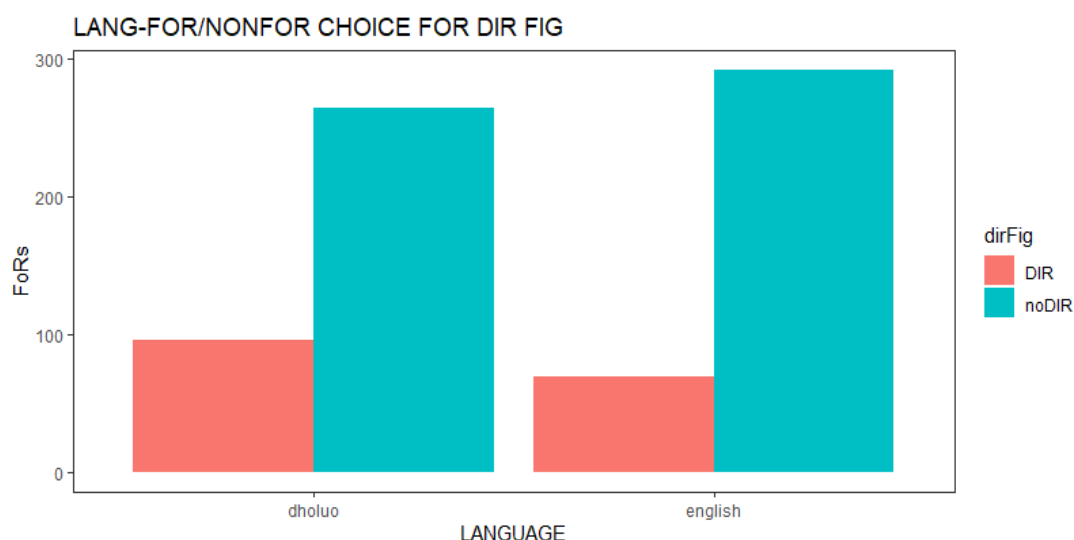


Fig 5.9 Direct FoR choice under Figure orientation

(b) Item category as a predictor variable

The intercept showed an overall significant effect of non-direct FoR type preference; $\beta_0 = -2.5553$, $SE = 0.5206$, Wald $z = -4.908$, $p < 0.00001$. There was a significant effect (in logit space) of item category UU; $\beta_1 = -2.3043$, $SE = 0.6786$, Wald $z = -3.396$, $p < 0.001$. The UU item category greatly influenced the participants to use the non-direct FoR types. In the UF category, more direct FoR types were used as compared to the UU category; $\beta_2 = -0.6012$, $SE = 0.6136$, Wald $z = -0.980$, $p = 0.32700$

A likelihood ratio test of the model with the language predictor against the model with the item category predictor showed significant difference between the models ($\chi^2(1) = 8.0436$, $p = 0.004567$).

This indicates a main effect of the item category as opposed to language

iii) Landmark FoR

(a) Language as a predictor variable

Fig 5.10 reveals the non-landmark FoR representation far outnumbers the usage of the landmark frames in both languages. Between the language contexts, the graph indicates a slightly more landmark FoR preference for Dholuo context as compared to English

A logit mixed model shows a strong tendency for the choice of the non-landmark FoR types as compared to the landmark types thus agreeing with the graphical representation. Specifically, the model predicts log odd values; $\beta_0 = -2.2174$, $SE = 0.4959$, Wald $z = -4.471$, $p < 0.00001$. The estimate showed no significant difference between English and Dholuo in the use of landmark FoR; $\beta_1 = -0.0153$, $SE = 0.4253$, Wald $z = -0.361$, $p = 0.718$.

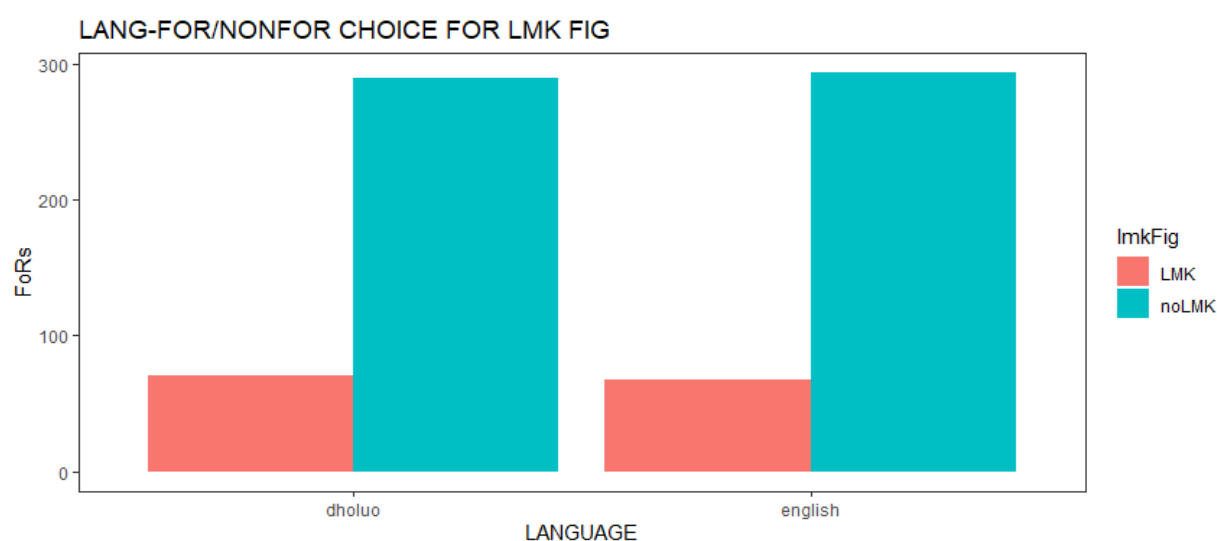


Fig 5.10 Landmark-based FoR choice under figure orientation

(b) Item category as a predictor variable

The negative intercept predicted a more than 50% chance that non-landmark FoR type would be chosen over the landmark FoR type; $\beta_0 = -2.3046$, $SE = 0.3954$, Wald $z = -5.288$, $p < 0.00001$. There was a significant effect (in logit space) of both item category UU; $\beta_1 = -1.2525$, $SE = 0.4920$, Wald $z = -2.546$, $p = 0.0109$ and UF; $\beta_2 = 1.1929$, $SE = 0.4686$, Wald $z = -2.546$,

$p=0.0109$. It means therefore that the nature of the pictures in the UU category discouraged the participants to a greater degree from using the landmark FoR as compared to the UF category

A deviance test of the model with the language predictor against the model with the item category predictor showed significant difference between the models ($\chi^2(1) = 6.9851, p < 0.01$). This indicates a main effect of the item category over language

5.3.3. Descriptive and inferential analysis under the ground orientation spatial platform

i) Relative FoR

(a) Language as a predictor variable

The trend observed from the previous location and Figure orientation groups analyses extends to the Ground orientation group. Here, the relative FoR type is hardly used, instead participants chose other types of FoR or the non-FoR for spatial Ground orientation description. Fig 5.11 reveal the dominant preference for the non-relative type and most evidently the non-FoRs by the participants. Put differently, the graph demonstrates that confronted with the task of spatially defining the relationship between two objects in a picture stimulus, a DEK multilingual was likely to ignore the orientation of the Ground, that is, not use any FoR or that they would use other types of FoRs to express the Ground orientation but not use the relative reference frame. Further the graph shows that the bias against the relative FoR was slightly higher amongst the group that used English during the task.

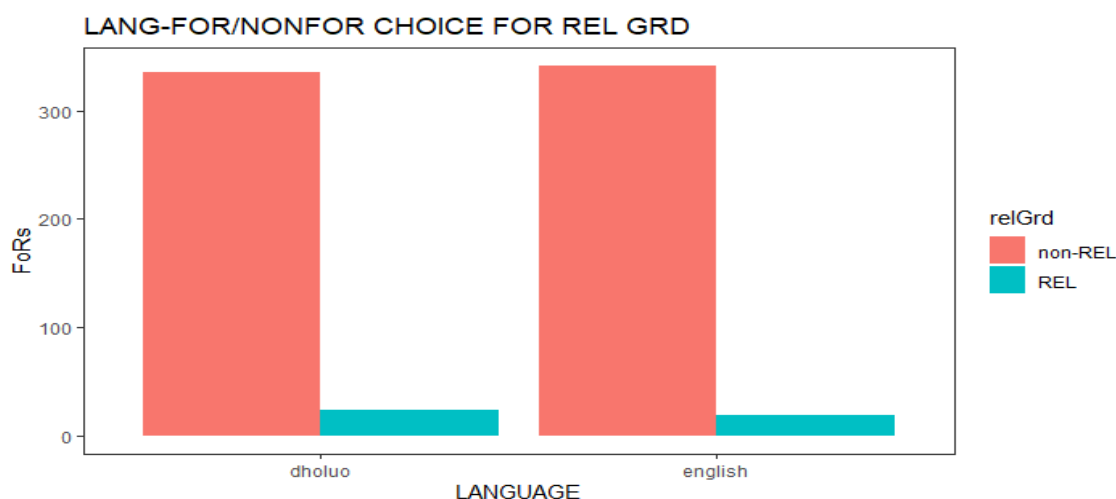


Fig 5.11 Relative FoR choice for Ground orientation

When statistically tested, the results from a logit mixed models confirm that indeed the non-relative representation is strongly preferred; $\beta_0 = -3.9623$, $SE = 0.6312$, Wald $z = -6.278$, $p < 0.00001$). Further confirmation of a difference, however slight, between Dholuo and English contexts is also evident. (logit difference $\beta_1 = -0.3067$, $SE = 0.4874$, Wald $z = -0.629$, $p = 0.529$)

(b) Item category as a predictor variable

The model produced an intercept estimate which indicated an overall large significant effect of non-relative FoR type preference; $\beta_0 = -4.1897$, $SE = 0.5449$, Wald $z = -7689.331$, $p < 0.00001$. There was a significant effect (in logit space) of item category UF; $\beta_2 = -1.5886$, $SE = 0.6833$, Wald $z = -2.325$, $p = 0.0201$. The UF item category influenced the participants to use the non-relative FoR types. More relative FoR type were used in the UU; $\beta_1 = -0.3123$, $SE = 0.5602$, Wald $z = -0.557$, $p = 0.5772$ than in the UF category.

A likelihood ratio test of the model with the language predictor against the model with the item category predictor showed significant difference between the models ($\chi^2(1) = 6.5491$, $p = 0.01$).

This indicates a main effect of the item category over language

ii) Direct FoR

(a) Language as a predictor variable

Whereas the direct FoR appears to be most preferred type of FoR for Ground orientation (see, Fig 5.5), when considered independently against the rest (both other FoRs and non-FoRs), its usage is minimal as shown in Figure 5.12.

A logit mixed model with a crossed random intercept of item and subject failed to converge. To simplify the model, the subject intercept was dropped and modelled with the item random intercept as the only random effect. The results were, $\beta_0 = -2.4450$ (logit coefficient: 0.1086, $SE = 0.2284$, $z = 0.475$, $p = 0.635$). Another model was run, this time dropping the item random effect while retaining the subject random effect; $\beta_0 = -1.94215$ (logit coefficient: 0.07112, $SE = 0.28003$, $z = 0.254$, $p = 0.8$).

To test which model would best represent the data, a likelihood ratio test was run using the anova function in R. The outcome is not very informative but between the two, the language model had a lower AIC (519.69) compared to the item category model (587.95). It was therefore chosen as the best representation of the data.

The model predicts no significant difference between the two languages' effects on the participants' choice of direct FoR types. It however confirms that across both languages, the participants preferred the non-direct spatial references.

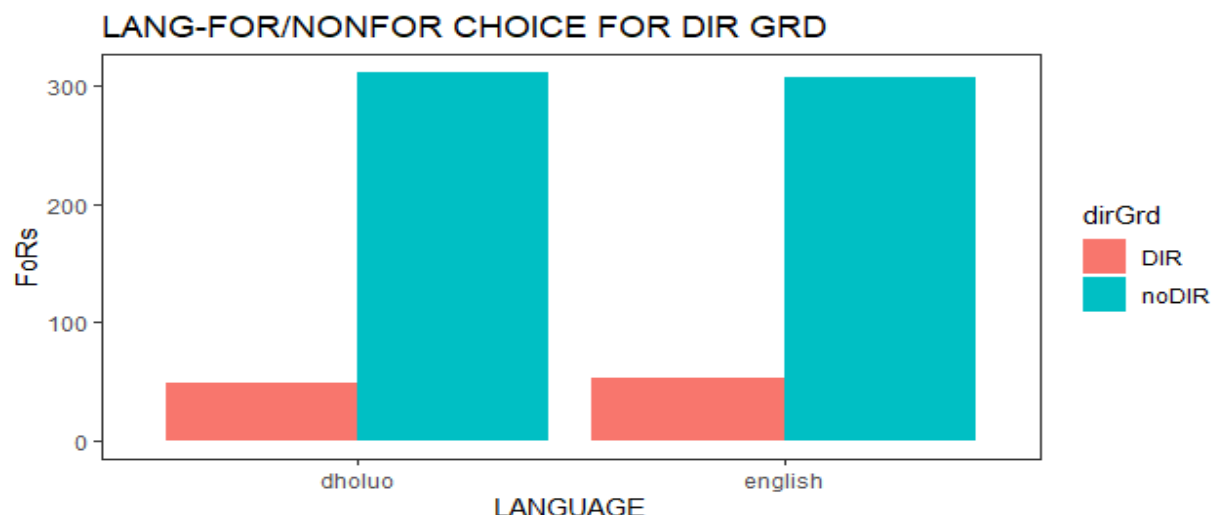


Fig 5.12 Direct FoR choice for Ground orientation

(b) Item category as a predictor variable

The model was run with only the by-subject intercept since an earlier one with the two intercepts failed to converge.

The log likelihood that the participants would prefer the use of non-direct FoR for Ground orientation description was significantly above chance; $\beta_0 = -2.7621$, $SE = 0.3278$, Wald $z = -8.425$, $p < 0.00001$. There was a significant effect (in logit space) of item category UF; $\beta_2 = -2.1193$, $SE = 0.4819$, Wald $z = -4.398$, $p < 0.00001$. The UF item category influenced the participants to choose the non-direct FoR types. The effect of the UF category was higher than the UU category; $\beta_1 = -0.6195$, $SE = 0.3536$, Wald $z = -1.752$, $p = 0.0797$.

A likelihood ratio test of the model with the language predictor against the model with the item category predictor showed significant difference between the models ($\chi^2(2) = 32.407$, $p < 0.00001$).

This shows a main effect of the item category as opposed to language

iii) Landmark FoR

(a) Language as a predictor variable

The graph from Fig 5.13 shows no noticeable differences between the two languages in their influence of the participants' choice of landmark FoR vis a vis the non-landmark types of FoR.

The results from the mixed logistic regression shows no significant difference between English and Dholuo's influence on the student's choice of either the landmark or non-landmark FoR types test (logit difference $\beta_1 = -0.1853$, $SE = 0.6776$, Wald $z = -0.273$, $p = 0.785$). Overall, there was a less than 50% chance that either language could influence the participants to choose the landmark FoR type for spatial picture description

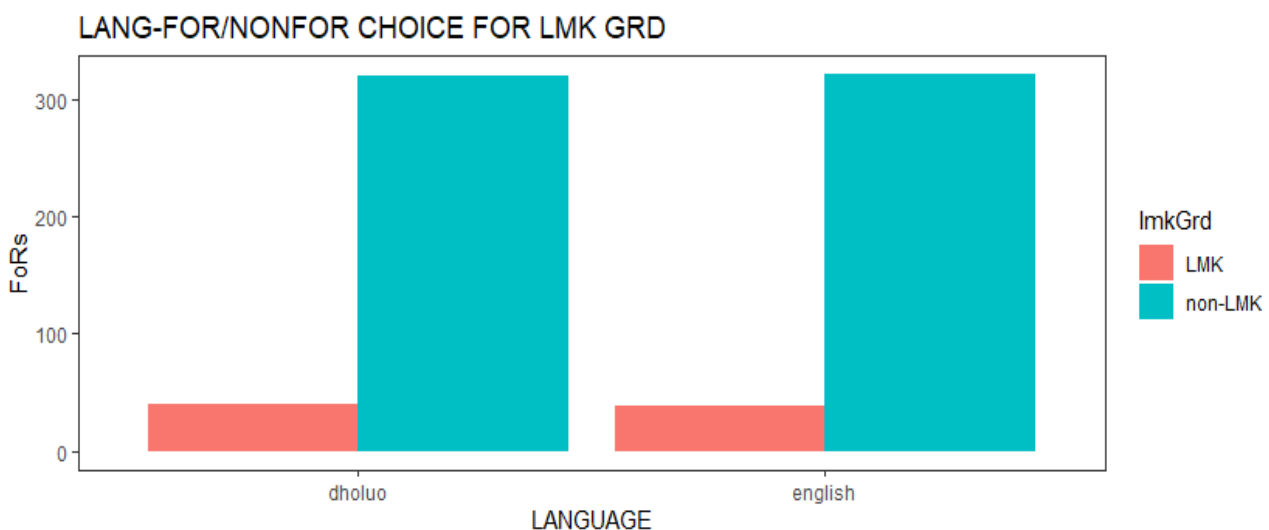


Fig 5.13 Landmark choice FoR Ground orientation

(b) Item category as a predictor variable

There was a more than 50% chance that the participant would prefer the non- landmark FoR types for Ground orientation descriptions; $\beta_0 = -4.1374$, $SE = 0.5578$, Wald $z = -7.417$, $p < 0.00001$. There was a significant effect (in logit space) of item category UF; $\beta_2 = -2.5093$, $SE = 0.6487$, Wald $z = -3.868$, $p < 0.0001$. The UF item category influenced the participants to use the non-direct FoR types. In contrast, the participants chose more landmark FoR types in UU than they did in UF categories; $\beta_1 = 0.2962$, $SE = 0.4833$, Wald $z = 0.613$, $p = 0.53992$

A likelihood ratio test of the model with the language predictor against the model with the item category predictor showed significant difference between the models ($\chi^2(1) = 20.359$, $p < 0.00001$).

This indicates a main effect of the item category as opposed to language

5.3.4. The use of the right /left relations

The left- right relation was used by the participants in spatial description across all the categories and spatial platforms. Generally, the left-right relation was used primarily with the relative FoR and the OBC to some extent. The focus however is not on the spatial frames with which it was used but the misrepresentation and misinterpretation that accompanied its usage by some of the participants.

It was observed that there were a number of inconsistencies in using these bodily derived relations especially in Dholuo context. A number of participants failed to correctly identify which side was *acham* ‘left’ and which side was *achich* ‘right’. Instead in majority of the cases, they resorted to their English equivalents which they used with ease and seemed to understand and interpret very well. Other times, if unguided, the participants carried on with the task unperturbed while misrepresenting the left-right relations. In some instances, the director got it right but the recreator did not, resulting into a wrongly recreated array. Worse still was when the director got it completely wrong thereby misleading recreator. There were cases where the participants hesitated before using the left-right terms apparently in a bid to think of which was which.

When the experimenter noticed these difficulties he would correct the participant and allow for the re-performing of the task. Other times, the participants themselves sought clarification from each other on which side was left and which one was right. One such instance where the recreator sought for help in interpreting what was meant by *acham* ‘left’ elicited an interesting response from the director. She chided 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 the process of correcting her, she (the director) too gave a completely wrong interpretation of *acham*. Below is part of the conversation between the two ladies.

39.

Participant (DP256): Twenty-year-old female DEK multilingual

Participant (RP257): Twenty-year-old female DEK multilingual

Language context: Dholuo

Stimuli (COFART): A cow facing right of SAP just before a tree in a SAP-cow -tree arrangement

(DP256):

<i>Ket</i>	<i>dhiang'</i>	<i>e</i>	<i>mbele</i>	<i>yien</i>	<i>to</i>
Put.IMP	cow	in	front	tree	and
<i>o-ng'i-yo</i>		<i>ka</i>	<i>cham</i>	<i>mari</i>	
SUBJ.3SG-face-INF/PRG		to	left	2SG.POSS	

(RP257)

<i>Acham</i>	<i>en</i>	<i>kon</i>	<i>mane?</i>
Left	is	side	which?

(DP256)

<i>Acham</i>	<i>en</i>	<i>right</i>	<i>nyathi-ni</i>	<i>mama-u</i>
Left	is	right	child-this	mother-2SG.POSS
<i>ok</i>	<i>o-puonj-i</i>	<i>Dholuo ?</i>		
not	SUBJ.3SG-teach-2SG	Dholuo?		

(DP256): "Place the cow in front of the tree and let it face to your left".

(RP257): "Which side is *acham* 'left'?"(DP256): "*Acham* 'left' is the right side. You kid; your mother has not taught you Dholuo?" (*Laughter from both sides*)

Such misrepresentations of left-right relations were not experienced under the English context.

5.4. Non-verbal experiment (mirror image task)

This section reports on the findings of the mirror image task. The data were analysed using both descriptive and inferential statistics.

5.4.1. Distribution of participants' mirror image choices (descriptive analysis)

The descriptive analysis reports the participant distribution per the number of image pairs identified as identical in percentages. Further, the analysis reveals the mean mirror image choice per participant presented both as a table and as a graph

Table 5.4 Percentage participants' representation of mirror image choice in Dholuo

	DHOLUO					
	NO. OF MIRROR IMAGES IDENTIFIED AS IDENTICAL					
Mirror Images	0	1	2	3	4	5
Total Participants	11	0	2	2	2	3
Percentage	55%	0%	10%	10%	10%	15%
(0) Identical MIs	55%					
Between 1-5 Identical MIs	45%					

Table 5.5 Percentage participants' representation of mirror image choice in English

	ENGLISH					
	NO. OF MIRROR IMAGES IDENTIFIED AS IDENTICAL					
Mirror Images	0	1	2	3	4	5
Total participants	8	5	0	0	1	6
Percentage	40%	25%	0%	0%	5%	30%
(0) Identical MIs	40%					
Between 1-5 Identical MIs	60%					

Overall, 60% of the English context participants identified at least one pair of mirror images as similar while 45% of those who used Dholuo behaved in a similar way. Of the total DEK multilinguals, about 53% identified at least a pair of mirror images as identical.

Below is a graphical representation of mean identical images distribution across the language contexts.

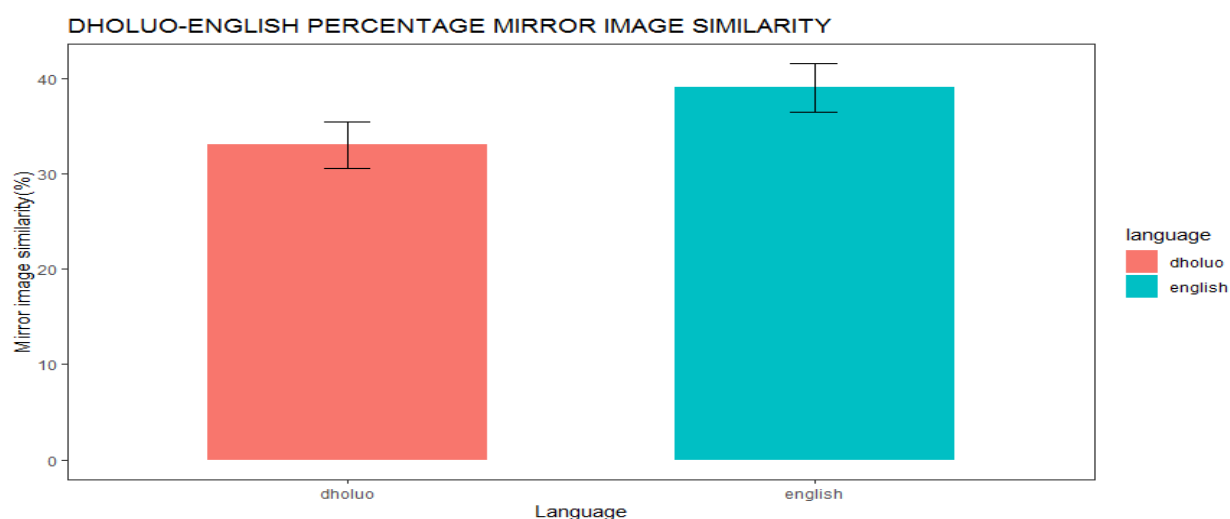


Fig 5.14 Percentage means mirror image similarity across Dholuo and English contexts. Error bars show the standard error of the mean

5.4.2. Inferential testing

A logit mixed model predicted no significant difference between Dholuo and English mirror image similarity choices; $\beta_1 = 0.9537$, $SE = 0.9589$, Wald $z = -0.995$, $p = 0.3199$. The negative intercept co-efficient means that overall, there was a less than fifty percent chance that language context would influence the participants to classify mirror images as identical; $\beta_1 = -1.9108$, $SE = 1.0568$, Wald $z = -1.808$, $p = 0.0706$.

(a) Use of Linguistic background as predictor variable

i) Dholuo

A Pearson correlation test was performed on Dholuo proficiency and Dholuo frequency of use and found them to be very highly correlated $r(198) = 1$, $p < .00001$. An average of the two variables was therefore calculated and labelled Dholuo entrenchment. The mirror image response variable was therefore modelled as a function of Dholuo entrenchment variable.

The negative estimate for the intercept coefficient showed that for $x=0$, it is the case that $p(y=MI \text{ similarity}) < 0.5$; $\beta_0 = -4.509$, $SE = 2.228$, Wald $z = -2.024$, $p = 0.043$. This means that there was a less than 50% chance that less proficient speakers and infrequent users of Dholuo would classify mirror images as similar. The model further shows no significant effect of Dholuo entrenchment; $\beta_1 = 1.592$, $SE = 1.108$, Wald $z = -1.437$, $p = 0.151$.

ii) English

A Pearson test was performed on English proficiency and frequency of use and found them to be highly correlated $r(198) = .91, p < .00001$. An average of the two variables was calculated and named English entrenchment. The mirror image response variable was therefore modelled as a function of English entrenchment and English age of acquisition variables. The model output shows a positive intercept log co-efficient showed a predicted likelihood of identifying mirror images as similar though the effect is not significant; $\beta_0 = 0.01323, SE = 2.91686, \text{Wald } z = 0.005, p = 0.996$. There was no significant effect of language proficiency and frequency of use estimate; $\beta_1 = 0.15684, SE = 0.55121, \text{Wald } z = 0.285, p = 0.776$. There was also no significant effect of age of English acquisition; $\beta_2 = -0.42573, SE = 0.35302, \text{Wald } z = -1.206, p = 0.228$

5.5. Summary

The macro level analysis was conducted for Location, Figure orientation and Ground orientation across all the three categories of UU, UF and FF. The binary dependent variable choice/no choice of FoR was modelled as a function of the two-level predictor variable language. The visual inspection of the various graphs (Figures 5.1-5.5) largely proved uninformative as far as the participants' use of spatial frames across the language contexts was concerned.

The outputs from the logit mixed models from all the classes revealed that there were differences in the participants' use of a FoR across the two languages; (Location; $\beta_0 = 2.34121, \beta_1 = -0.01384$: Figure orientation; $\beta_0 = 0.4063, \beta_1 = -0.2098$: Ground orientation; $\beta_0 = -1.91383, \beta_1 = 0.4070$). However, these differences were not statistically significant. From the results therefore it can be concluded that based on the items and the nature of participants in this study, language context has no effect on the participants' use of a frame of reference in spatial descriptions when considered at a macro level

The second analysis was performed at a micro level. At this level, the specific types of FoR were considered. In this case, the binary dependent variable was the choice of a specific type of FoR against all the others combined. It therefore means that either that type of FoR was used for a particular description (coded as 1) or not, where 'not used' means that any other type of FoR or even a non-FoR was used (coded as 0). The analysis was carried out across the Location, Figure orientation and Ground orientation spatial platforms

The graphical representation (Figs 5.6-5.13), like in the macro level analysis, proved less useful in explaining the differences in FoR type choices across the two languages. The results from the

logit mixed models, while confirming the presence of slight variations in FoR type choices across languages failed the significance test; {Location; relative FoR ($\beta_1=0.3221$), object centred FoR ($\beta_1=-0.000916$): Figure orientation; relative FoR ($\beta_1=0.6258$), direct FoR ($\beta_1= -0.8359$), landmark FoR ($\beta_1= -0.0153$): Ground orientation; relative FoR ($\beta_1= -0.3067$); direct FoR ($\beta_1= 0.1086$); landmark FoR ($\beta_1= -0.1853$)}. Similar to the macro level, the micro level analysis provided outcomes that prove no possible effect of language context on DEK multilinguals' choice of FoR for spatial descriptions considering the nature of the dataset, items and participants.

Up to this stage, it was clear that based on the outcome of the linguistic reference frames experiment, there was no significant relationship between the language the participants used and their decision to choose and use a reference frame. These analyses however prompted us to explore the data further to investigate what other variables if not language might be responsible for the differences in the spatial descriptions and use of different FoR types. Following the macro and micro pattern mentioned earlier, the FoR use and FoR type choice as response variables were modelled as a function of item category (UU, UF and FF) which acted as a predictor variable.

The results of the mixed effects logistic modelling from both the macro level analysis and micro level analysis with item category as a predictor variable revealed main effects that were highly significant. Macro-level analysis; (Location; $\beta_0= 2.34121$, $\beta_2 = -0.9465$: Figure orientation; $\beta_0= 0.4577$, $\beta_1 = -3.1454$, $\beta_2 = 2.0959$: Ground orientation; $\beta_0 = -1.6548$, $\beta_2= -3.0103$). Micro level analysis; {Location; relative FoR ($\beta_1 = 2.2010$), object centred FoR ($\beta_1 = -2.0371$, $\beta_2 = -0.9428$): Figure orientation; relative FoR ($\beta_2 = 1.4006$), direct FoR ($\beta_1 = -2.3043$), landmark FoR ($\beta_1 = -1.2525$, $\beta_2 = 1.1929$): Ground orientation; relative FoR ($\beta_2 = -1.5886$), direct FoR ($\beta_2 = -2.1193$), landmark FoR ($\beta_2 = -2.5093$)}.

Further, comparisons between the *language as predictor variable models* and *item category as predictor variable* models showed that the latter models were significantly best fit considering the nature of the items, participants and the datasets; macro level analysis (Location; ($\chi^2 (1) = 8.3$, $p = 0.003964$): Figure orientation; ($\chi^2 (1) = 46.141$, $p < 0.00001$); Ground orientation; ($\chi^2 (1) = 35.464$, $p < 0.00001$). Micro level analysis; {Location; relative FoR ($\chi^2 (1) = 24.519$, $p < 0.00001$), object centred FoR ($\chi^2 (1) = 24.519$, $p < 0.00001$): Figure orientation; direct FoR ($\chi^2 (1) = 8.0436$, $p = 0.004567$), landmark FoR ($\chi^2 (1) = 6.9851$, $p < 0.01$): Ground orientation; relative FoR ($\chi^2 (1) = 6.5491$, $p = 0.01$), direct FoR ($\chi^2 (2) = 32.407$, $p < 0.00001$), landmark FoR ($\chi^2 (1) = 20.359$, $p < .00001$).

The second analysis involved the non-verbal experimental tasks. In this analysis, the binary classification of a mirror image as identical or not was the dependent variable. Like before, language was used as an independent variable with two levels. The results from a mixed logit model showed no significant effect of language context on the participants' categorization of mirror images as identical, Dholuo; $\beta_0 = -2.864$, $SE = 1.621$, Wald $z = -1.767$, $p = 0.0772$. English; $\beta_1 = 1.907$, $SE = 1.918$, Wald $z = -0.995$, $p = 0.3199$.

Additional analysis was done using language proficiency, frequency of language use as well as age of language acquisition as predictor variables. This was done across the Dholuo and English languages. Whereas the outputs revealed varying degrees of effects across the two languages, none of these were significant. Dholuo proficiency and frequency of use; $\beta_1 = 1.592$, $SE = 1.108$, Wald $z = -1.437$, $p = 0.151$: English proficiency and frequency of use; $\beta_1 = 0.15684$, $SE = 0.55121$, Wald $z = 0.285$, $p = 0.776$: English age of acquisition; $\beta_2 = -0.42573$, $SE = 0.35302$, Wald $z = -1.206$, $p = 0.228$. The non-verbal task, like the linguistic one, failed to show any significant effect of language context on the DEK multilinguals' choice of a FoR.

CHAPTER 6

MOTION EVENT CATEGORISATION

6.1. Introduction

In this chapter, the findings and analyses relating to experiments from motion event categorization are reported. Details of these experiments are highlighted in chapter four (methodology) and will therefore not form part of the data presented in this chapter. The motion events categorization tasks are founded on research question number one, hereby restated as;

What is the relationship between Dholuo verb aspect and motion event categorization in DEK multilinguals?

The section that follows, 6.2, reports findings from the verbal motion event construal task. The analyses are conducted in terms of descriptive and inferential statistics which form the respective sub-sections under in. The subsequent section, 6.3, introduces the progressive aspect and presents both descriptive and statistical analyses across the DEK contexts and L1 Kiswahili group. Section 6.4 presents detailed analysis of the verb types (manner, path etc.) as used across the DEK and the L1 Kiswahili contexts. Section 6.5 introduces and outlines the findings and analyses of the non-verbal motion categorization task. The order of presentation in this section follows the descriptive and inferential analysis pattern similar to section 6.2. The final section, 6.6, concludes the chapter by summarizing the key findings.

6.2. Motion event verbal endpoint encodings (MEVEE)

In the descriptive analysis, the results presented are based on the number of endpoints mentioned by the participants in their respective L1 groups. These results are summarized in tables and graphs. The inferential analysis results are from the mixed model logit statistical testing.

6.2.1. Descriptive analysis of MEVEE amongst the DEK group

The graph in figure 6.1 reads as follows; the DEK multilinguals mentioned endpoints at (34.6%, $SD = 2.7$) while speaking Kiswahili. This means that in an event that a DEK multilingual observed a person walking or cycling on the streets with an endpoint in sight, they were more prone to describing the actor (in Kiswahili) as simply *anatembea* (he/she is walking) or *anaendesha baiskeli* (he or she is cycling) without mentioning where they were going. The same is true for Dholuo context, in which endpoints were encoded (37.1%, $SD = 3.1$) of the time. In

English the participants mentioned endpoints at (40.4%, $SD = 3.8$) which was slightly more than the other two languages. The fact that the error bars generally overlap across the language contexts shows that the mean or mean percentage differences in endpoint preferences are not significant.

Overall, DEK multilinguals mentioned motion events endpoints at an average of (37.5%, $SD = 3.2$) while speaking in any of the three languages. For instance, a clip of a lady walking on a road while a car is parked slightly ahead of her was prone to be described by DEK multilinguals as *a lady is walking* and not *a lady is walking towards a car*, irrespective of the choice of the language context.

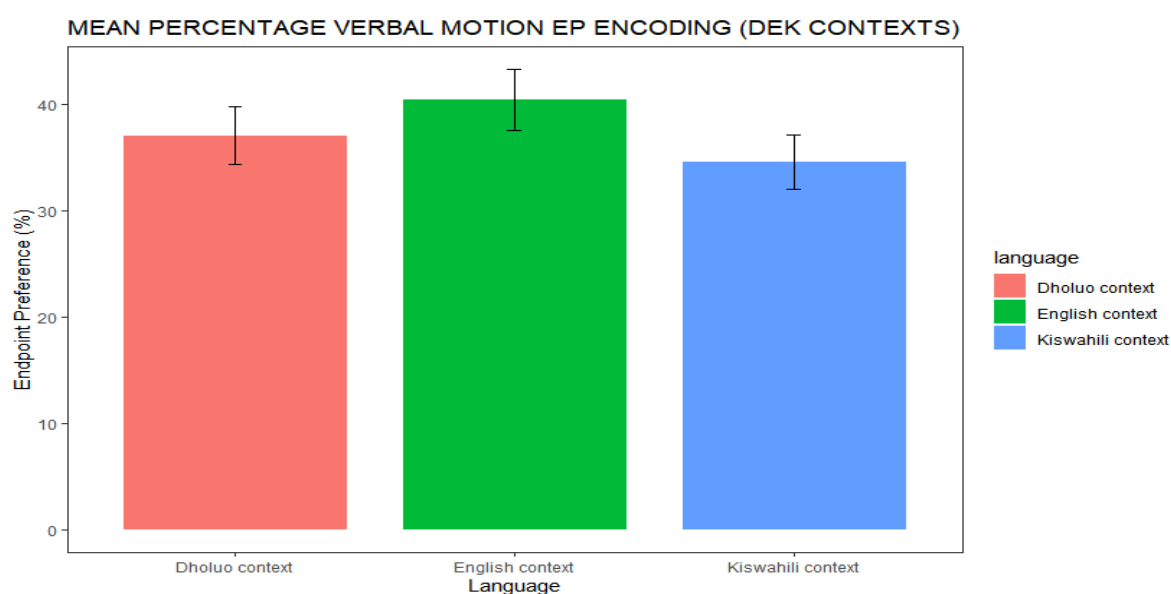


Fig 6.1 Mean percentage endpoint preference for DEK contexts; the error bars represent the standard error of the mean

6.2.2. Inferential testing of MEVEE amongst the DEK group

The results show the modelling of endpoint preference against the three-level language group predictor variable as well as against the language proficiency and frequency of use for the DEK group

(a) Language context as predictor variable

For the language context group, the grand mean estimate for the DEK group showed a significant effect of language group; $\beta_0 = -0.8397$, $SE = 0.3974$, Wald $z = -2.113$, $p = 0.0346$. Simply put, there was a less than 50% chance that motion events descriptions under the DEK

contexts were likely to mention endpoints. The model however showed no statistically significant effect of Dholuo, Kiswahili or English contexts; $\beta_1 = -0.0303$, $SE = 0.3163$, Wald $z = -0.096$, $p = 0.9237$; $\beta_2 = -0.1662$, $SE = 0.3162$, Wald $z = -0.526$, $p = 0.5992$ and $\beta_3 = 0.19650$, $SE = 0.31761$, Wald $z = 0.619$, $p = 0.5361$ respectively.

(b) Dholuo proficiency and frequency of language use as predictor variables

When Dholuo linguistic background was used as predictor variable, the following outcomes were realized; the intercept logit coefficient showed an overall tendency for DEK participants to defocus endpoints. The model showed no significant effect in the predicted log likelihood of the frequency of use of Dholuo and Dholuo proficiency.

Intercept logit coefficient; $\beta_0 = -0.60074$, $SE = 1.04952$, $z = -0.572$, $p = 0.567$,

Dholuo frequency; $\beta_1 = -0.07514$, $SE = 0.25346$, $z = -0.296$, $p = 0.767$

Dholuo proficiency; $\beta_2 = 0.01278$, $SE = 0.31496$, $z = 0.041$, $p = 0.968$.

(c) Kiswahili proficiency, frequency and age of acquisition as predictor variables

The model's intercept estimate showed no significant effect of Kiswahili proficiency, frequency of use and age of acquisition.

Logit estimate; $\beta_0 = -0.7385$, $SE = 1.22277$, $z = -0.604$, $p = 0.546$.

Proficiency; $\beta_3 = -0.09912$, $SE = 0.33391$, $z = -0.297$, $p = 0.767$.

Frequency; $\beta_1 = 0.15667$, $SE = 0.28968$, $z = 0.541$, $p = 0.589$.

Age of acquisition; $\beta_2 = -0.05125$, $SE = 0.08869$, $z = 0.578$, $p = 0.563$

(d) English proficiency, frequency and age of acquisition as predictor variables

The model showed an intercept logit coefficient which aligns with the prediction of the previous two models, that is, the tendency to defocus endpoints in motion events descriptions by DEK participants; $\beta_0 = -0.94831$, $SE = 1.52907$, $z = -0.620$, $p = 0.535$. It however revealed no significant effect of the frequency of use, age of acquisition and proficiency of English.

Frequency; $\beta_1 = -0.33883$, $SE = 0.28961$, $z = -1.170$, $p = 0.242$;

Age of acquisition; $\beta_2 = -0.03562$, $SE = 0.10020$, $z = -0.355$, $p = 0.722$

Proficiency; $\beta_3 = 0.39036$, $SE = 0.37965$, $z = 1.028$, $p = 0.304$

6.2.3. Descriptive analysis of MEVEE amongst L1-Kiswahili group

The L1-Kiswahili group mentioned events endpoints (37.08%, $SD = 3.38$) of the time. This means that the L1-Kiswahili participants largely preferred to describe the video clips without mentioning their goal. For instance, when presented with a video clip of a lady holding a child's hand walking on a playground and playground equipment ahead of them, they are likely to describe the scene as *Mwanamke na mtoto amemshika mkono wanatembea* (the lady and the child whom she holds his hand are walking)

The L1-Kiswahili mean preference is slightly higher than their L1-Dholuo counterparts under the Kiswahili context 34.6%. A Dholuo speaker using Kiswahili would mention slightly less endpoints than an L1 Kiswahili speaker using the same language

6.2.4. Statistical testing of MEVEE amongst the L1-Kiswahili group

Mixed logit modelling was performed to test the significance of the endpoint preference observed amongst the L1-Kiswahili language group. The results show the modelling of endpoint preference against the L1-Kiswahili linguistic background

(a) L1-Kiswahili linguistic background as predictor variables

The model's estimates confirm the predicted likelihood that L1 Kiswahili participants tend to focus more on the ongoing phase of motion; $\beta_0 = -3.3692$, $SE = 6.0836$, Wald $z = -0.554$, $p = 0.580$. There was however no significant influence of the L1 Kiswahili proficiency and frequency of use on endpoint encoding; $\beta_1 = -0.9222$, $SE = 0.9251$, Wald $z = -0.997$, $p = 0.319$ and $\beta_2 = -0.3793$, $SE = 1.0092$, Wald $z = -0.376$, $p = 0.707$ respectively.

6.2.5. Descriptive analysis of MEVEE - comparison of the three L1s

Table 6.1 summarizes the L1 Dholuo (Dholuo context), L1 Kiswahili and L1 English in terms of mean percentage endpoint preferences. Fig 6.2 shows a comparison of the three.

Table 6.1 Percentage means endpoint encodings across Dholuo, Kiswahili and English L1s

Language	Mean	Percentage Mean	SD	SE
L1. Dholuo	4.45	37.08	3.09	0.69
L1. Kiswahili	4.45	37.08	3.38	0.78
L1. English	5.14	42.80	17.20	3.85

Fig 6.2 visually represents the information in Table 6.1. The graph shows a comparison between L1 Dholuo (Dholuo context), L1 Kiswahili and L1 English (see section 4.5 for more information on English L1) in terms of mean percentage endpoint preferences.

The graph in Fig 6.2 shows a (37.1%, SD 3.1) and (37.1%, SD 3.4) mean endpoint preference for both L1 Dholuo and L1 Kiswahili speakers respectively in motion verbal description. L1 speakers of English however do mention endpoints at about (42.8%, SD 17.2). Put differently, when confronted with scenes of two women walking on a path approaching a building from a distance, English speakers are likely to describe the scenes as *two women are walking towards the church* in four out of ten scenes. Dholuo and Kiswahili speakers would on average use the same description slightly less than four times. It can therefore be concluded that speakers of the three languages would be prone to describing the scene in our example as *two women are walking* as opposed to *two women are walking towards the church*

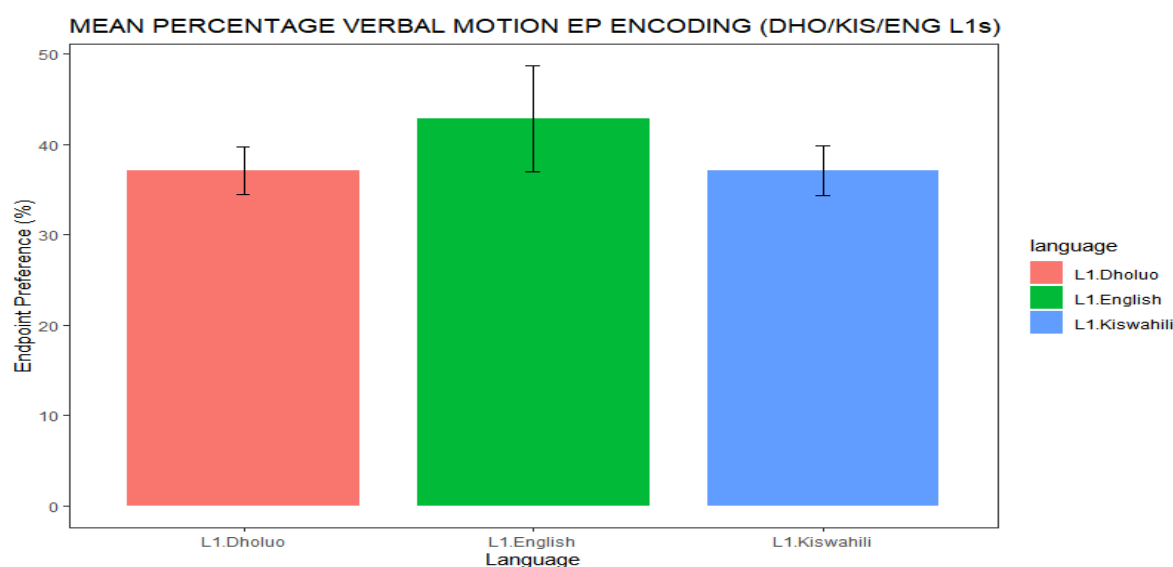


Fig.6.2 Percentage mean endpoint encodings in Dholuo, Kiswahili and English motion verbal description

6.2.6. Statistical testing of MEVEE - comparison between L1-Dholuo and L1-Kiswahili

Mixed logit modelling was performed to test the significance of the endpoint preference observed amongst the L1 Dholuo and the L1Kiswahili group. Notice that L1 English was not included in the inferential testing because unlike the other two, English was not part of the present investigations and the values we have used so far for comparison were taken from studies that had been conducted earlier (see section 4.5). We could however not access the raw data to use in inferential testing.

The results show the modelling of endpoint preference against L1 Kiswahili and L1 Dholuo as predictor variables. Fig 6.2 shows no difference of endpoint preference between L1 Dholuo and L1 Kiswahili. The logit mixed model confirms this. Neither the L1 Dholuo participants nor the L1 Kiswahili participants significantly mentioned more endpoints than the other when describing motion events; (logit difference) $\beta_1 = -0.005104$, $SE = 0.258044$, Wald $z = -0.020$, $p = 0.9842$.

6.3. The progressive aspect

The interpretation of the results in this section is based on the use of the progressive aspect in motion events description across Dholuo, English and Kiswahili language contexts. A few examples of the perfective and the perfect aspect have also been included in this section.

6.3.1. Descriptive analysis of progressive aspect amongst the DEK group

Table 6.2 presents a summary of the frequency of use of the progressive aspect amongst DEK participants in describing the motion events scenes

Table 6.2 Percentage progressive aspect usage across DEK language contexts

Language	Mean	Percentage Mean	SD	SE
Dholuo context	11.9	99.2%	0.3	0.1
English context	11.9	99.2%	0.3	0.1
Kiswahili context	11.8	98.33%	0.7	0.2

The graph in Fig 6.3 reveals the use of the progressive aspect across the three language contexts. The use of the progressive aspect amongst the participants was not just high but uniformly so to the extent that any differences between them could not be captured by either the bar graphs or the error bars. This explains the similar heights of the bar graphs and the short straight lines in place of the error bars.

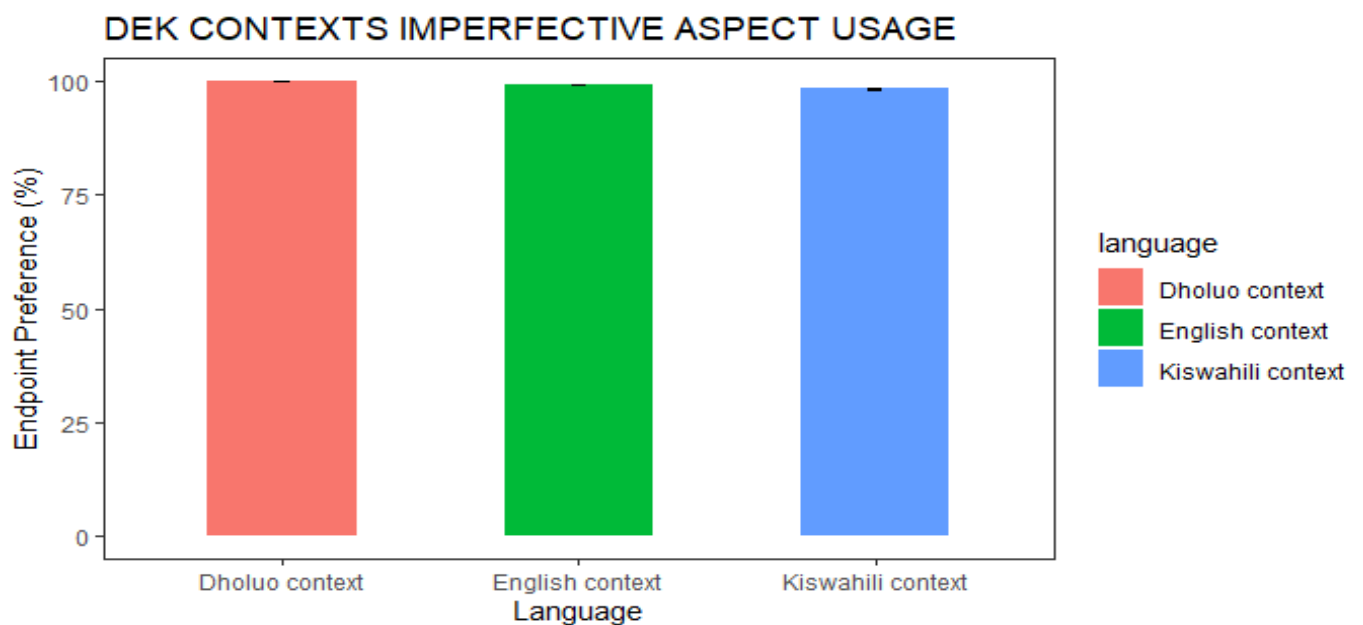


Fig 6.3 Percentage mean aspect usage in DEK contexts motion verbal description

The following examples show the progressive aspect under Dholuo context. In **40(a)**, progressivity is expressed but devoid of endpoint mention. In **40(b)** however, there is both progressivity and the mention of an endpoint.

40.

- (a) Participant (P135): Twenty-three-year-old male DEK multilingual

Language context: Dholuo

Stimuli (CgtGS): A car is moving on a road, ahead in sight is a petrol station

<i>A-nen-o</i>	<i>gari</i>	<i>moro</i>	<i>ka-kadh-ó</i>
1SG-see-INF/NPROG	car	certain	while-pass-INF/PROG
<i>e</i>	<i>ndara</i>		
on	road		

‘I am seeing a certain car passing on the road’

- (b) Participant (P124): Twenty-three-year-old female DEK multilingual

Language context: Dholuo

Stimuli (tLwtC): Two women walking on a path; they are approaching a building that resembles a church

<i>Nyiri-gi</i>	<i>wuoth-ó</i>	<i>chalni</i>
NOM.PL-DEM.PL	walk-INF/PROG	seemingly
<i>gi-dhí</i>	<i>e</i>	<i>kanisa</i>
SUBJ-go.INF/PROG	to	church

‘These girls are walking; it seems they are going to church’

In **40(a)**, the progressive *kakadhó* (while passing) has been used with no mention of the endpoint; instead the participant periphrastically mentions the path *e ndara* (on the road). In **40(b)**, the participant uses the progressive *wuothó* (walking) and *dhí* (going) and mentions *e kanisa* (to church) as the possible endpoint.

There was an instance of use of the perfective aspect as shown in **41**

41.

Participant (P134): Twenty-six-year-old male DEK multilingual

Language context: Dholuo

Stimuli (tLwpB): two ladies are walking on a pavement

<i>Nyidende</i>	<i>ariyo-go</i>	<i>chalo</i>	<i>jo-ma</i>	<i>o-wuok</i>
Ladies	two-those	seem	people-REL	SUBJ-leave-INF/PFV
<i>kamoro</i>	<i>gi-ting'-o</i>		<i>bag</i>	
somewhere	SUBJ-carry-INF/NPROG		bag	

‘Those two ladies seem to have left some place carrying a bag.’

As the graph in Fig 6.3 shows, the progressive aspect was also largely used in the English context. Example in **42** shows the verb *walking* indicating progressivity without mentioning of an endpoint.

42.

Participant (P153): Twenty-year-old female DEK multilingual

Language context: English

Stimuli (tLwB): Two ladies are walking on grass in a park in the direction of a pavement; there are some benches opposite the pavement.

Two ladies walking they look like they are discussing something

In **43**, *walking* was used alongside the mention of an endpoint *towards the church*.

43.

Participant (P153): Twenty-year-old male DEK multilingual

Language context: English

Stimuli (tNwtC): Two women dressed like nuns are walking on a road. In front of them are buildings.

There are two nuns walking towards the church

The participant in **44** describes the scene without using any verb. Motion of the vehicle is not explicitly stated and the participant most probably assumes that this will be inferred from the context. The path is mentioned but not the endpoint. Absence of action verbs means absence of the progressive aspect (see section 4.6.5 for an explanation)

44.

Participant (P165): Twenty-year-old male DEK multilingual

Language context: English

Stimuli (CgtGS): A car is moving on a road, ahead in sight is a petrol station

A vehicle on a road

In **45**, the participant uses a non-progressive verb but does not mention an endpoint. This description is interpreted in a similar manner to the one in **44**, that is, there is no use of the progressive aspect

45.

Participant (P167): Twenty-one-year-old male DEK multilingual

Language context: English

Stimuli (CgtGS): A car is moving on a road, ahead in sight is a petrol station

I am seeing a car

Similar to the case of Dholuo and English, the participants in the Kiswahili condition produced descriptions that were largely hinged on action verbs exhibiting aspectual properties. The use of the progressive aspect in this context followed the patterns of the previous contexts, that is, aspectual markers were present whether or not endpoints were mentioned as demonstrated by examples in **46** and **47**

46.

Participant (P176): Twenty-one-year-old female DEK multilingual

Language context: Kiswahili

Stimuli (LrBcC): A lady is cycling

<i>Msichana</i>	<i>a-na-endesha</i>	<i>baiskeli</i>
NOM-girl	SUBJ-PROG-ride	bicycle

‘A girl is riding a bicycle.’

Example 6.8 shows a description expressing progressivity but devoid of an endpoint mention. In **47**, the description contains two action verbs expressing progressivity, *anatembea* (he is walking) which is a manner verb and *akienda* (while going), which is a general verb. Notice that there is the mention of endpoint *sokoni* (to the market) in this description.

47.

Participant (P187): Twenty-one-year-old male DEK multilingual

Language context: Kiswahili

Stimuli (LwnM): A lady is walking carrying a basket, in front of her is a food market.

<i>Baba fulani</i>	<i>a-na-tembe-a</i>	<i>a-ki-end-a</i>
NOM certain	SUBJ-PROG-walk-IND/PROG	SUBJ-CNC-go-IND/PROG
<i>soko-ni</i>		
market-LOC		
‘There is a man who is walking going to the market’		

Example in 48 shows a situation where one verb is in the perfect aspect while the other is in the progressive aspect

48.

Participant (P187): Twenty-one-year-old male DEK multilingual

Language context: Kiswahili

Stimuli (CgtGS): A car is moving on a road; ahead in sight is a petrol station

<i>Gari</i>	<i>moja</i>	<i>li-me-pit-a</i>	<i>li-ki-endesh-wa</i>
NOM-car	certain	NC1-PRF-pass-IND	NC1-CNC-drive-PASS/PROG
‘A certain car has passed while being driven’			

In example 48, the general verb *limepita* (has passed) has been used in the present perfect. The other verb *endesha* (drive) has been used in both the progressive aspect and the passive form *endeshwa* (being driven) to specify the manner of motion. The description was interpreted as having been uttered in the perfect aspect. See reasons for this in section 4.6.5

6.3.2. Statistical testing of progressive aspect amongst the DEK group

To test the significance of the differences in the progressive aspect usage across the DEK contexts, aspect was modelled as a function of language. The following was the output across the three language contexts;

Logit coefficient $\beta_0 = 27.50$, $SE = 147.34$, $z = 0.187$, $p = 0.852$;

Dholuo logit coefficient $\beta_1 = 22.37$, $SE = 295.67$, $z = 0.076$, $p = 0.940$;

Kiswahili logit coefficient $\beta_2 = 11.29$, $SE = 147.85$, $z = 0.076$, $p = 0.939$.

The output presents interesting readings. Even though the estimate is positive, which corresponds to the usage of the progressive aspect across the three language contexts as depicted

by the bar plot in figure 6.4, the values of the estimates are not reflective of the same. The standard errors are more than ten times larger than the co-efficient estimates. These large values and inaccuracies in the estimates can be partly explained by the collinearity between the fixed effects ($|r| = -1.00$)

The inconsistent readings from the model means that the differences between the DEK contexts can be best explained graphically (Figure 6.4.). The significance testing for this particular case was therefore abandoned

6.3.3. Descriptive analysis of the progressive aspect amongst the L1-Kiswahili group

The L1-Kiswahili group used the progressive aspect in all their descriptions. This they did irrespective of whether they mentioned the endpoints or not .See examples in 49.

49.

- (a) Participant (P273): Twenty-six-year-old male L1-Kiswahili participant

Language context: Kiswahili

Stimuli (WcMw): A man, a child and a woman are walking in the direction of a supermarket

<i>Jamaa</i>	<i>na</i>	<i>mke</i>	<i>wak</i>	<i>wa-na-tembe-a</i>
NOM	and	wife	his	3PL-PROG-walk-IND

‘The man and the wife are walking’

- (b) Participant (308): Twenty-two-year-old female L1-Kiswahili participant

Language context: Kiswahili

Stimuli (tNwtC): Two women dressed like nuns are walking on a road. In front of them are buildings.

<i>Hapo ,</i>	<i>wanawake</i>	<i>wawili</i>	<i>labda</i>	<i>wa-na-end-a</i>
There	women	two	maybe	3PL-PROG-go-IND

msikiti-ni
mosque-LOC
‘Two women seem to be going to the mosque’

The description in 49(a) shows progressivity, *wanatembea* (they are walking), without mentioning any endpoint. In 49(b), there is both progressivity in *wanaenda* (they are going) and the mention of an endpoint in *msikitini* (to the mosque)

6.3.4. Descriptive analysis of progressive aspect - comparison across the three L1s

The graph in Fig 6.4 shows a near 100% usage of the progressive aspect in motion description for all the L1s. It can therefore be deduced from the graph that when native speakers of Dholuo, Kiswahili and English are tasked with describing motion events, they do so using the progressive aspect almost hundred percent of the time.

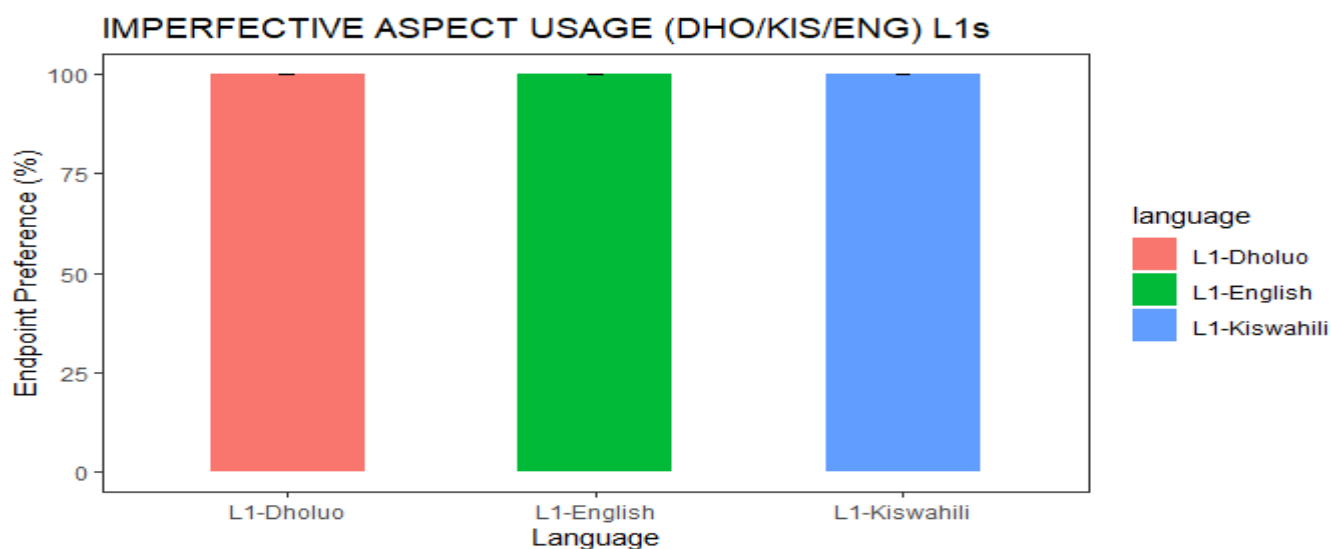


Fig.6.4. Percentage mean aspect usage in Dholuo, Kiswahili and English motion verbal description: the error bars represent relative standard errors

6.3.5 Statistical testing of progressive aspect - comparison between L1-Kiswahili and L1-Dholuo

A logit mixed model with a by-subject and by-item random effects produced an overfitted model. When run without the by-item random effect, the problem of collinearity ($|r| = -0.996$) between the fixed effects was evident. Like in the case of the DEK group, the use of the logit mixed model to test for significance in the difference of the aspect usage between L1 Dholuo and L1 Kiswahili could not be relied upon due to the problem of collinearity. It was therefore abandoned for the interpretation in Figure 6.4

6.4. Distribution and analysis of verb types

This section highlights the various verb types used by the participants in their motion event verbal description across the DEK and the L1 Kiswahili groups

6.4.1. Distribution of verb types as used by the DEK group

The table summarizes the distributions of the types of verbs across the DEK language contexts.

Table 6.3 Types of verbs used in motion events description

	Manner verbs	General verbs	Path verbs	NA
Dholuo context	80.00%	19.58%	0.42%	0.00%
Kiswahili context	83.33%	16.67%	0%	0%
English context	91.25%	7.08%	0	0.83%

The manner verbs were generally preferred over the general verbs. The path verbs were hardly used across the DEK groups. Manner verbs were identified as those verbs that showed a particular nature of motion. Path verbs indicated the path of motion. There were no *defining* path verbs used in the Kiswahili and English context. *Defining* in the sense that the verb was used as a main verb in the description. In Dholuo context however, there were instances of use of path verbs as exemplified below

50.

Participant (P125): Twenty-three-year-old male DEK multilingual

Language context: Dholuo

Stimuli (LwnM): A lady is walking carrying a basket, in front of her is a market.

<i>Kaendi</i>	<i>a-nen-ó</i>	<i>ka</i>	<i>mama-ni</i>
Here	1SG-see-INF/PROG	when	woman-this
<i>o-ting'-o</i>	<i>bag</i>	<i>o-donj-é</i>	<i>hotel</i>
SUBJ-carry-INF/NPROG	bag	SUBJ-enter-LOC/PROG	hotel
<i>ama</i>	<i>restaurant</i>	<i>moro</i>	
or	restaurant	certain	

‘Here I am seeing this woman carrying a bag she is entering a hotel or a certain restaurant.’

Example in 50 shows a description with the action verb *odonj*(she is entering) as a path verb expressing progressivity. Notice that there was no other action verb besides the verb *odonje* (she

is entering), hence the path verb was the defining verb. Notice also that the path verb was accompanied by the mentioning of an endpoint, as would be expected.

There were instances in the English context where either a verb was missing completely or a non-action verb was used as the main verb. These constructions were marked NA for verb type and are illustrated by examples in 44 and 45 respectively

6.4.2. Distribution of verb types as used by the L1-Kiswahili group

Table 6.4 summarizes the distributions of the types of verbs for the L1-Kiswahili group

Table 6.4 Types of verbs used in motion events description-L1 Kiswahili group

	Manner verbs	General verbs	Path verbs	NA
Kiswahili L1	70.83%	28.75%	0.42%	0.00%

The L1-Kiswahili group used more manner verbs compared to general and path verbs. However, more general verbs were used in this group compared to the DEK group. There was one case of use of a path verb as the defining verb. It is exemplified below

51.

Participant (P274): Eighteen-year-old-male DEK multilingual

Language context: Kiswahili

Stimuli (WcMw): A man, a child and a woman are walking in the direction of a supermarket

<i>Wageni</i>	<i>wa-na-ingi-a</i>	<i>katika</i>	<i>makazi</i>	<i>ya</i>
NOM-PL	SUBJ-PROG-enter-IND	in	house	of
<i>bustani</i>	<i>fulani</i>	<i>hapa</i>		
park	certain	here		

‘The visitors are entering a house that is within this park’

Example in 51 illustrates a description indicating progressivity using a path verb. The path verb is the main verb since it is the only verb used. The description is therefore in the progressive aspect.

In 52, the description contains two verbs, a manner and a path verb. Both verbs are in the progressive aspect. However, the sentence is considered to have *wanatembea* (are walking) as the defining verb as opposed to *wanaingia* (are entering).

52.

Participant (P282): Twenty-three-year-old female DEK multilingual

Language context: Kiswahili

Stimuli (tLwtC): Two women walking on a path; they are approaching a building that resembles a church

<i>Wanawake</i>	<i>wawili</i>	<i>wa-na-tembe-a</i>	<i>wa-na-ingi-a</i>
Women	two	3PL-PROG-walk-IND	3PL-PROG-IND
<i>kwa</i>	<i>nyumba</i>		
in	house		

‘Two women are walking, they are entering the house’

6.4.3. Detailed analysis of verb type usage across the DEK and L1-Kiswahili groups

In our categorization of the verbs, it should be understood that some of the classes or categories used are not the traditionally recognized ones. For instance, the term *general verbs* should be interpreted in the context of a verb not explicitly showing any path or manner attributes. Further, the verbs classified as manner verbs herein in most cases do not indicate manner in the specific sense as in such verbs as *crawl*, *stagger*, *hop* etc. Instead it mostly refers to the general manner such as *walking*, *running*, *cycling* etc. It is also important to restate that in some of the descriptions; more than one motion verb was used. Between the two or the three motion verbs, it is the main verb that has been considered as a referent point for both aspect and the manner of motion. It means therefore that apart from the main verb, there are other verbs e.g., deictic verbs, directional verbs etc., which will also form part of our analysis. Besides, there are adpositions used alongside the verbs which will also be analysed.

In the subsections that follow, the types of verbs used in the descriptions and the contexts of their occurrences are highlighted and explained. A detailed discussion concerning manner and path attributes of both the DEK group and the L1-Kiswahili group is given in the discussion chapter.

(a) Dholuo context

The frequency of use of the general verbs was highest in Dholuo context compared to other contexts. Examples of these general verbs include *dhí* (go), *kaló/kadhó* (pass) and *owuok* (has/have left). Examples of manner verbs include; *wuothó* (walk), *riembó* (ride/drive), and *ringo* (run/move (in case of a vehicle)). There was also a path verb *odonjó* (he/she is entering). In all these instances, these verbs were used as the main verb. Let us consider each of them:

Whenever the deictic verb *dhí* (go) was used, as would be expected the participants mentioned the events endpoint. This is because the moving entity was considered to be towards a goal. In most of the constructions, the goal was represented by another deictic expression *kucho/kucha* (there) used in the sentence final position. Additionally, the verb *dhí* (go) was in most cases used alongside the manner verb *wuothó* (walk), the verb *chimo/chomo/chiko* (head) or the adposition *e* (to).

The verb *chiko/chimo/chomo* (head) can be considered as a directional morpheme that conflates motion with direction. In the absence of a main verb, they act as the main verbs in the descriptions. Such instances were rare. Instead these verbs were used with other manner verbs such as walking, cycling and running to indicate direction of motion. In such instances the goal/endpoint was mentioned.

The general verb *kaló/kadhí* (pass) was used particularly when describing stimulus *LwcP* (a lady going past) and stimulus *CgtGS* (a car going past) (refer to the appendix C(ii) for details of these stimuli). Unlike the other general verb *dhí* (go), *kaló* (pass) was not used alongside any other verb but the path adposition *e* (on) e.g., *kaló e ndara* (passing on the road). Other times it was used without mentioning a path e.g., *nyako kadhó/kaló* (a girl is passing). No endpoint was mentioned whenever this verb was used. As for the perfective *owuok* (has/have left), it was not used in combination with any other verb and no endpoint was mentioned

In Dholuo, the manner verb *wuothó* (walk) was hardly used as an auxiliary. Instead, it was mostly used as the main verb while the deictic verb *dhí* (go) used as a supporting verb e.g.; *owuothó kodhí kocha* (he/she is walking while going there). As a main verb, *wuothó* (go) was also used alongside the aforementioned directional morphemes *chimo/chiko/chomo* (head), the adpositions *e* (to), *yo* (towards) and the deictic expressions *kanyo* (there), *kucha/kacha* (over there) etc. In all these instances, an endpoint was mentioned. In other cases however, it was used without all these goal-directing morphemes and in such instances, endpoints were not mentioned.

The other manner verb such as *riembó* (ride/cycle/drive) was used transitively with the participants mentioning endpoints only when the directional morphemes and the adpositions such as *bath* (beside) were used alongside it. The verb *ringó* (run of a person or of a moving car) however was used intransitively with path being mentioned almost all the time through the adposition *e* (on). Endpoints were mentioned whenever it was used alongside adpositions such as *bath* (beside) or the directional morphemes, absence of which no endpoints were mentioned.

The path verb *donjó* (enter) was used with stimulus *LwcP* (a lady going past). This scene seemed to the participant as an enclosed place to be entered e.g., *ng'at moro be donjó kanyo...* (there is someone entering that place). There was definitely the mention of an endpoint.

(b) DEK Kiswahili context

Similar to Dholuo context, the use of manner verbs as the main verb predominated the descriptions in the Kiswahili context. However, there were instances of general and directional verb usage. For instance, the verb *linapita* (it is passing, (in the case of a car)) was used without the mention of an endpoint in all instances but one. In the one instance, it was paired with a directional verb *likielekea* (while heading) which provided both path and direction information e.g., *linapita likielekea ...* (it is passing while heading...). The verb *elekea* (head) was also used as a main verb in a number of instances and whenever that happened, it was followed by an adposition *kwenye/kwa* (to) almost all the time e.g., *anaelekea kwa* (he/she is heading to).

Interestingly unlike in Dholuo context where the deictic verb *dhí* (go) was used in a number of descriptions both as a main verb and as an auxiliary verb, in Kiswahili context, there was only one instance of its use as a main verb e.g., *wanaenda* (they are going). As would be expected, a goal was mentioned in this description. As an auxiliary verb, it was used a couple of times, but not as much as in Dholuo context. In these instances, it was used alongside the predominantly used manner verb (*w*)*anatembea* ((they) he/she/ (are) is walking) e.g., *wanatembea wakienda* (they are walking while going...).

In descriptions involving the manner verb *tembea* (walk), there were instances where an endpoint was mentioned and other instances where it was defocussed. Whenever it was used as a main verb and supported by a deictic verb *enda* (go) or a directional morpheme *elekea* (head) endpoint were mentioned. Whenever these additional path and direction information were not added, there was no mention of an endpoint. There were cases where the main verb *tembea* (walk) was followed by the adposition *kwa/kwenye* (in/on). In such instances, the adpositions showed location and not direction e.g., *wanatembea kwenye uwanja* (they are walking in the field). Other manner verbs such as *endesha* (drive/ride/cycle) and *kimbia* (run/move of a car) were mostly used without mentioning of endpoints.

(c) English context

The data revealed that the participants were more specific in their descriptions in this context compared to Dholuo and Kiswahili contexts. For instance, a description of a motion event from stimulus e.g., X was described with a general deictic verb *going* in Dholuo but the same stimulus X in English was described using the manner verb *walking*. In another example, *a car moving along a path* was mostly described in Dholuo and Kiswahili using general verbs e.g., *the car is passing/ moving*. In English however, the same stimulus attracted verbs like *being driven*, *driving* etc.

Besides the manner verb *walking*, *riding/cycling* and *moving/ driving (being driven)* which was common to all three contexts, there was the use of the manner verb *strolling*. Such specificity was not unique to manner verbs but present in the general verbs as well. There was the use of the deictic verbs *going* as well as the general verb *passing* but so was the use of the specific non-manner verbs *approaching* and *being escorted*.

The verb *passing* was used both as a main verb and a helping verb. Besides, *passing*, the other deictic verb *coming*, was also used e.g., *the lady is riding a bicycle coming towards...* The verb *coming* showed both path and direction. Direction was also shown using the verb *heading* which was used both as a main verb and as a helping verb. Participants in the English context did not only use more specific manner verbs but more adpositions *to* and *towards* than in any other context. The adpositions were used in combination with both the manner and general verbs. In all these instances of adposition use, there was the mention of endpoints.

(d) L1 Kiswahili context

This group of participants used a wider variety of motion verbs but less manner verbs compared to the DEK group. The manner verb *tembea* (walk) as expected was still the most widely used. The other manner verbs *endesha* (ride/drive) and *peleka* lit (take to) but meaning (cycle) in this context, were used in combination with the directional *elekea* (head), the adpositions *kwenye/ katika* (to) or the deictic verb *enda* (go). In these instances, the endpoints were mentioned. The descriptions that lacked these additional direction information failed to mention endpoints.

Besides its use as a helping verb, the direction verb *elekea* (head) like before was used as a main verb in a number of descriptions. Another direction verb that featured in some of the descriptions as a helping verb was the verb *karibia* (nearing). Endpoints were mentioned in such descriptions. Similar to the manner verbs, the general verbs *pita* (pass), *enda* (go) and *toka* (leave) were used

either with the direction verbs *elekea* (head) and the adposition *kwenye/ katika* (on/to/from) or without. There was also the use of the path verb *ingia* (enter) as a main verb in a few instances.

6.5. Motion event non-verbal endpoint matching (MENVEM)

In the descriptive analysis, the results presented are based on the frequency of endpoint matches made by the participants in their respective L1 groups. These results are summarized in tables and graphs. For the inferential testing, the results are from the mixed model logit statistical testing

6.5.1. Descriptive analysis of MENVEM amongst the DEK group

Table 6.5 Mean [+] endpoint matching across the DEK language contexts

Language	Mean	Percentage mean	SD	SE
Dholuo context	13.6	35.7	6.2	1.4
Kiswahili context	12.8	33.6	4.4	1.0
English context	14.2	37.3	5.6	1.3

Fig 6.5, shows a visual representation of the information summarized in Table 6.5.

The columns from the bar graphs show percentage differences in mean endpoint preference between the DEK language contexts. The error bars show the standard errors. The graph reads as follows:

Of the three DEK language contexts, English had the highest mean percentage endpoint preference at (37.3%, $SD=5.6$) meaning out of thirty-eight possible [+] endpoint alternates, participants in the English context on average matched fourteen such alternates to the target clip. Dholuo context follows in the mean endpoint preference at (35.7%, $SD= 6.2$) which translates to a range of between thirteen to fourteen [+] endpoint choices on average. Kiswahili has the least percentage mean of the three at (33.6%, $SD=4.4$) which means choices between twelve to thirteen [+] endpoint alternates on average. The overlapping nature of the error bars show that there was no significant difference in [+] endpoint and target alternate matches between the language contexts

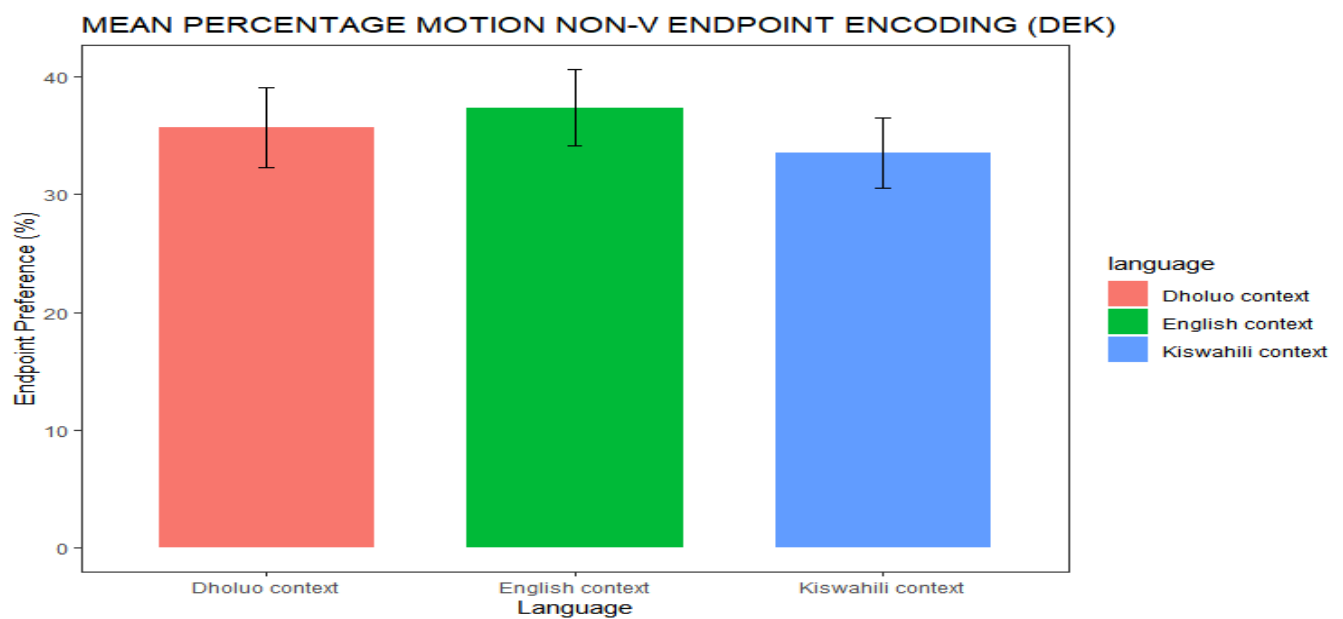


Fig 6.5 Percentage endpoint preferences across the DEK language contexts for non-verbal motion task. The error bars represent the standard errors

Considered as a group, the DEK participants matched the [+] endpoint alternates (35.5 %, $SD = 5.4$) of the time to the target clips or simply an average of between thirteen to fourteen choices, out a possible thirty-eight [+] endpoint alternates.

6.5.2. Statistical testing of MENVEM amongst the DEK group

Mixed logit modelling was performed to test the significance of the endpoint preference observed amongst the DEK language group. Endpoint preference was modelled against the three-level language group predictor variable for the DEK group

(a) Language as a predictor variable

The estimate showed that there was a less than 50% chance that DEK participants using any of the three languages would match the [+] endpoint alternate with the target clips; $\beta_0 = -0.64580$, $SE = 0.09208$, Wald $z = -7.014$, $p < 0.00001$. This effect was highly significant. The model showed no significant effect in log odds of English and Kiswahili contexts on choice of [+/-] endpoint alternate; $\beta_1 = -0.05990$, $SE = 0.12181$, Wald $z = -0.492$, $p = 0.623$ and $\beta_2 = -0.02438$, $SE = 0.12153$, Wald $z = -0.201$, $p = 0.841$ respectively.

(b) Dholuo proficiency and frequency of use as predictor variables

A Pearson correlation test was performed on Dholuo proficiency and Dholuo frequency of use and found that they were very highly correlated $r(58) = .94, p < .00001$. An average of the two variables for each participant was therefore calculated and labeled *Dholuo entrenchment*. The endpoint preference response variable was therefore modeled as a function of Dholuo entrenchment predictor variable. Intercept logit coefficient showed that there was an overall tendency to defocus endpoints; $\beta_0 = -0.46901, SE = 0.26337, z = -1.781, p = 0.0749$. The effect of Dholuo entrenchment was not statistically significant; $\beta_1 = -0.04711, SE = 0.06611, z = -0.713, p = 0.4761$.

(c) Kiswahili proficiency, frequency of use and age of acquisition as predictor variables

Similar to the case of Dholuo, a Pearson correlation test revealed a high correlation between the Kiswahili proficiency and Kiswahili frequency of use; $r(58) = .85, p < .00001$. This prompted the creation of a new variable named Kiswahili entrenchment which averaged the values between the two variables. A logit model between the response variable endpoint preference and predictor variables Kiswahili entrenchment and Kiswahili age of acquisition revealed an intercept estimate $\beta_0 = -0.278912, SE = 0.312968, z = -0.891, p = 0.3728$.

The model test revealed that those who acquired Kiswahili earlier were less likely to match the [-] endpoint alternates with the target clip. This effect was significant; $\beta_1 = -0.019221, SE = 0.009743, z = -1.973, p = 0.0485$. There was no effect of Kiswahili entrenchment; $\beta_2 = -0.074921, SE = 0.082215, z = -0.911, p = 0.3621$

(d) English proficiency, frequency of use and age of acquisition as predictor variables

To avoid the problem of possible collinearity between English proficiency and frequency of use; $r(58) = .80, p < .00001$. The two variables were merged and their average calculated to create a new variable that was used as an additional predictor variable to age of acquisition fixed effect. A logit mixed model run with endpoint preference as the dependent variable and the two fixed effects produced a logit intercept of; $\beta_0 = -0.23042, SE = 0.43926, z = -0.525, p = 0.5999$. The model thus predicted in log likelihood that the DEK participants would pair the [-] endpoint alternates with the target clips. The effect of age of acquisition was statistically significant meaning that those who learnt English at a later age were likely to defocus endpoints more than those who acquired the language earlier; $\beta_1 = -0.09364, SE = 0.04499, z = -2.081, p = 0.0374$.

English frequency of language use and proficiency had no significant effect on endpoint preference; $\beta_2 = -0.03022$, $SE = 0.08846$, $z = -0.342$, $p = 0.7326$.

6.5.3. Descriptive analysis of MENVEN amongst L1-Kiswahili group

The L1-Kiswahili group had a percentage mean endpoint encoding of (34.34%, $SD = 6.70$). It means that this group on average chose thirteen [+] endpoint clips as a match for the target clip out of thirty eight. Considering this statistic, we can conclude that L1-Kiswahili speakers are prone to defocussing endpoints.

6.5.4. Statistical testing of MENVEM amongst L1-Kiswahili group

(a) Language as predictor variable

Since one predictor variable with a single level fails to model, we did include the L1 Dholuo under Dholuo language mode as a second predictor to the L1 Kiswahili one. The model's intercept estimate showed a highly significant language group effect; $\beta_0 = -0.7141$, $SE = 0.1774$, $z = -4.025$, $p < .00001$. It predicts that the log likelihood that both L1 Kiswahili and L1 Dholuo participants would choose [-] endpoint alternates as the match to the target clip is above chance. There was no statistical difference between L1-Kiswahili participants' choice of [-] endpoint alternates and L1-Dholuo counterparts; $\beta_1 = -0.1101$, $SE = 0.2514$, $z = -0.438$, $p = 0.661$.

(b) L1 Kiswahili proficiency and frequency of use as predictor variable.

Unlike in the high correlation in the DEK group, Kiswahili frequency of use and language proficiency were moderately correlated $r(58) = .38$, $p < .00001$. The response variable, endpoint preference was therefore modeled as a function of the two fixed effects. The model estimate showed that overall, the L1 participants matched the target clip more with the [-] endpoint alternates; $\beta_0 = -0.8999$, $SE = 2.5867$, $z = -0.348$, $p = 0.728$. Since this effect was not statistically significant, we cannot tell with certainty that they chose more [-] endpoint alternates as a result of L1-Kiswahili proficiency and frequency of use. There was equally no significant effect of Kiswahili frequency of use and Kiswahili proficiency; $\beta_1 = -0.1307$, $SE = 0.5479$, $z = -0.239$, $p = 0.811$ and $\beta_2 = 0.4917$, $SE = 0.3805$, $z = 1.292$, $p = 0.196$ respectively.

6.5.5. Descriptive analysis of MENVEM-comparison across the three L1

The L1 Kiswahili mean endpoint preference is compared to L1 Dholuo and L1 English groups. L1 Dholuo speakers lead by matching [+] endpoint alternates to the target clips at (35.7%, $SD=6.2$) of the times. Following closely are the L1 Kiswahili group with a (34.3%, $SD 6.7$) [+] endpoint alternate choices while the L1 English speakers have the fewest [+] endpoint preference choices of the three at (24.8%, $SD 8.8$).

Whereas the results as depicted Figure 6.6 show a general disfavour for the [+] endpoint alternates as a match for the target clip, there is quite a large difference between the percentage mean endpoint preference for English and that of Dholuo and Kiswahili. This is a sharp contrast to the DEK contexts where English had the greatest percentage of mean endpoint preference and a much smaller difference between its percentage mean, to those of Dholuo and Kiswahili.

From Fig 6.6, the error bars between L1 Dholuo and L1 Kiswahili appear to overlap, an indicator that there is likely no significant difference in the mean endpoint preferences between the two. However, even though the error bar for L1 English appears larger, it does not overlap with any of the two languages. It is possible therefore to conclude that there is a significant difference in mean endpoint preference between English and the other two languages. Note that a statistical test was not possible since the English 'raw' figures were not available.

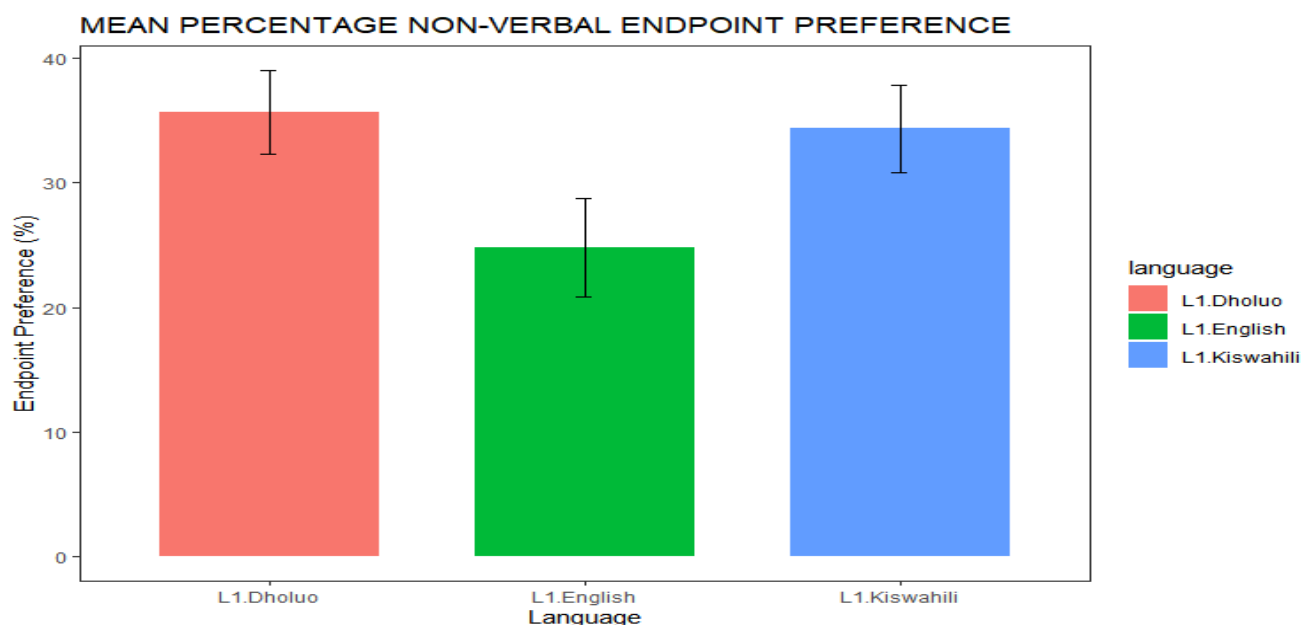


Fig 6.6 Mean endpoint preference amongst the native speakers of Dholuo, Kiswahili and English. Error bars show the standard error of the mean.

6.5.6. Statistical testing of MENVEM-comparison between L1 Kiswahili and L1 Dholuo

The model's intercept estimate showed a highly significant language group effect; β_0 -0.7141, $SE = 0.1774$, $z = -4.025$, $p < .00001$. It predicts that the log likelihood that both L1 Kiswahili and L1 Dholuo participants would choose [-] endpoint alternates as the match to the target clip is above chance. There was no statistical difference between L1 Kiswahili participants' choice of [-] endpoints alternates and L1 Dholuo counterparts; β_1 -0.1101, $SE = 0.2514$, $z = -0.438$, $p = 0.661$.

6.6. Conclusion

The chapter has presented in-depth analyses of the data generated from the verbal and non-verbal motion event categorization tasks. The mode of analysis was through descriptive and inferential statistics. The descriptive analyses for the verbal motion events categorization findings showed that the DEK multilinguals generally defocused motion events endpoints almost in a similar manner, whether they used Dholuo, Kiswahili or English. Additionally, the analyses revealed the predominant use of the progressive aspect while encoding motion events endpoint. For the non-verbal tasks, the descriptive statistics revealed that similar to the verbal tasks, the DEK multilinguals preferred almost in equally measure, the choice of the [-] endpoint alternates as the match for the target alternates irrespective of the language contexts used. For both verbal and non-verbal tasks, there were differences albeit small ones between the language contexts .

The second stage of analyses involved inferential testing using modelling techniques in R. The intention was to test if there was any statistical significance in the differences observed from the descriptive analysis. The tests were also intentioned to assess whether the multilingual experience of the participants had a role to play in the motion events endpoint preferences. The logit mixed models revealed no statistically significant differences, that is, save for the age of acquisition under Kiswahili and English contexts, there were no effects of the DEK participant's linguistic backgrounds on their preference for the [-] endpoint targets.

The next chapter will seek to interpret these findings and explain the possible reasons for the nature of the relationship between grammatical aspect in Dholuo and motion events categorization as revealed in this chapter.

CHAPTER 7

GENERAL DISCUSSION OF FINDINGS

7.1. Introduction

The chapter brings together findings as analysed in chapters five and six. An in-depth critical discussion is undertaken weaving in relevant theoretical frameworks and previous research upon which conclusions are drawn with regard to the research questions. The chapter divides into nine sections. The subsequent section, 7.2, discusses the findings related to the spatial frame of reference in terms of the spatial platforms and feature categories. Section 7.3 briefly discusses the mirror image findings. Following this is section 7.4 which extensively discusses both the linguistic and the non-linguistic findings drawing on comparisons from previous findings and highlighting theoretical implications. Section 7.5 introduces and discusses in detail motion event at the linguistic level before ushering in section 7.6 which expounds on the findings of the motion events at the non-linguistic level. Section 7.7 highlights the effects of language context while in section 7.8, effects of language proficiency and frequency of use are discussed. Lastly section 7.9 highlights the standout conclusions drawn from the discussions in the chapter.

7.2. Discussions of findings from the photo -object task (linguistic task)

The results of the photo-object linguistic task are interpreted and discussed within the three FoR coding spatial platforms of Location, Figure orientation and Ground orientation. For each spatial platform, discussions and interpretations of the results follow the tripartite (UU, UF & FF) feature category classification. Findings relating to these categories from both descriptive and inferential statistics are linked and discussed together as a unit under each spatial platform.

Both the macro and micro level findings across Location, Figure orientation and Ground orientation platforms; and the UU, UF and FF categories will be interpreted and discussed. At the macro level, the discussion will be centred on whether the participants chose to use or not to use a FoR and to what extent. To put this into context, consider the basic idea that underlies the use of spatial frames in general. These co-ordinates systems are universal thus available to all humans. According to Levinson (2004a), when a person is confronted with a spatial notion that is *complex* enough to evoke spatial thinking, coordinate systems will be employed. So, what entails a complex spatial notion? Any arrangement of two or more objects which are some distance apart whose location would require an element of specificity and direction to gauge qualifies as complex. It would be expected therefore that while describing such complex scenes,

one would use a FoR. However, when a spatial notion is less complex e.g., an object A is at a position B, the coordinates would not normally be involved and any speech experience that relates to the same would be regarded as devoid of spatial thinking (Levinson (*ibid*)).

Going by the outlined understanding of a complex spatial notion, the arrangement of objects (Figure and Ground) in our picture stimuli across all the categories were therefore complex enough to warrant the use of a spatial reference frame. Ideally then, all the descriptions should have used a spatial reference frame. The question that needs to be addressed at the macro level thus is why some of the descriptions were devoid of FoR usage.

At the micro level, the discussion will be based on the distribution of the specific types of FoR both across the spatial platforms and the feature categories

7.2.1. Location Description

There was a significant main effect of the item categories indicating a general preference for FoR choice under the location spatial platforms. All discussions under location description will therefore be on the basis of the aforementioned significant effect.

(a) Unfeatured-unfeatured (UU) category

The results from the UU category show that participants chose to use the FoR at about 90% of the time across both language contexts. Since there was no significant effect on language context for this category, results from both Dholuo and English have been averaged and treated as one. The statistic shows that under Levinson's (*ibid*) complex spatial notions proposals discussed above, the participants' responses largely turned out as expected. However, there was a 10% non-FoR descriptions that needs to be accounted for. Non-FoR descriptions are likely to occur under two possibilities. One, when the descriptions involve non-angular systems such as topological, deictic or proximal relations. Two, when the descriptions are undefined, that is it neither uses an angular nor a non-angular system but makes use of general and sometimes vague statements. The following examples explain the non-conformity by the non-For usage.

53.

(a) Participant (DP037): Twenty-four-year-old male DEK multilingual

Language context: Dholuo

Stimuli (BAPT): The ball is farthest from the SAP; it is directly aligned with the tree such that the tree blocks the SAP from seeing the whole ball but only parts of it on either side of the tree

<i>Mpira</i>	<i>nie</i>	<i>bwo</i>	<i>yien</i>
Ball	LOC	under	tree

‘The ball is under the tree’

(b) Participant (DP069): Twenty-two-year-old male DEK multilingual

Language context: English

Stimuli (BAFNV): A net is placed transversely. A ball is aligned directly to the middle of the net on the side that is closer to the SAP; the arrangement thus is, SAP-ball-net.

Beside the net there is a ball

Clearly, examples **53(a)** (*under*) and **53(b)** (*beside*) are instances of topological and proximal relations respectively. In **53(a)**, the spatial relator *bwo* (under) would be interpreted to mean anywhere around the foot of the tree. That would mean that the speaker gave a loose description of the position of the object in relation to the ground. Example **53(b)** draws a similar interpretation in the use of the general term *beside*. Contrast these examples with the example in **54** below.

54.

Participant (DP073): Nineteen-year-old female DEK multilingual

Language context: English

Stimuli (BAFTFAF): The ball is closest to the SAP; it is directly aligned with the tree such that from the SAP, there is the ball, then the tree.

The ball is in front of the tree, the South side: The south side

In **54**, the speaker uses a relative FoR to define the position occupied by the ball as ‘in front’ with respect to the position of the SAP. Unlike in the first two examples that lacked specificity, in **54**, the speaker makes her description more exact by using yet another type of FoR (the absolute) and informs the recreator that the ball can as well be regarded as being in the South side of the tree. It can be concluded that descriptions in examples **53** do not involve FoR usage as opposed to the example in **54** which uses two FoRs.

What examples in 53 indicate is that both speakers, though tasked with a complex spatial arrangement, chose to encode and describe the scenes in a simple general manner devoid of any use of a coordinate system. Participant in 54 and majority of the others on the other hand, chose to spatially encode and describe the same set of spatially complex scenes through the use of spatial reference frames. The use of generic spatial relators such as *beside* in a context that would require more specific descriptions is definitely not new in spatial reference studies. Romero-Méndez (2011, p. 939), observes that in a photo-photo matching task, most of the Ayutla Mixe speakers preferred to use the non-specific descriptions which they felt were easier to process and informationally sufficient for the matcher to select the correct photo. That the majority and not the minority of the participants in Romero-Méndez's (*ibid*) study opted for the non-FoR descriptions is contrary to our present findings. One also needs to question why the majority of participants would encode spatially complex notions without using spatial frames of references when, in theory, they should.

Holding Levinson's proposal as true, there are possible ways to explain the contrasting findings between Romero-Méndez's (2011) work and the present one. It can be argued that there must be other factors besides the complexity of a spatial notion that would account for the disparity in results. One such factor might be the different types of tasks. In Romero-Méndez's (2011) work, the space game was a *photo-photo matching* task as opposed to the *photo-object task* in Dholuo. The nature of these two tasks differs by way of administration and design. In the photo-photo matching task, the matcher's task is to pick from an array of photos, one which fits the description given by the director. In the photo-object task, the matcher recreates the spatial scene as described by the director. Between the two, the task that involves a simple picking of a matching photo would require less descriptive details since any contrasting aspect of the photos would likely suffice. More significantly, however, is the difference in the general design of the two tasks. The photo-photo matching task used in Romero-Méndez's (*ibid*) study was the *ball and chair task (B&C)* (see Bohnemeyer & Pérez Báez, 2008; O'Meara & Báez, 2011, for a detailed task description) while the photo-object task was the *new man & tree game (NMT)*. The former task contains different array of stimuli some of which have the Figure and the Ground in a contiguous relationship similar to the non-complex spatial notions mentioned by Levinson (2003), see Fig 7.1A, adapted from O'Meara (2011). The latter task contains two objects that are separated in space (See Fig. 7.1B). Objects that are in contact would automatically call for topological descriptions (non-FoR) which essentially explains the high number of non-FoR descriptions not only in Romero-Méndez's (2011) work but in most other studies making use of the B&C task



Fig 7.1. (a) Sample stimulus from the Ball & Chair task; (b) Sample stimulus from the UU category of the Man & Tree task.

From the foregoing discussion, we have accounted for the high non-FoR descriptions amongst the Ayutla Mixe. The high FoR usage under the UU category for Dholuo description does conform with Levinson's (2003) complex spatial notion proposal and therefore poses no problem. The small percentage of the non-FoR description in Dholuo could be attributed to individual variations in the sense that the participants construed the spatial scenes as less complex and therefore adopted a non-FoR description. Recall that even though overall, the variable item category significantly influenced the participant's choice of a FoR, the specific category UU did not. By ruling out any effect of the UU category on the participant's choice of FoR, the argument advanced so far remains plausible.

Moving on to the findings at the micro level, we examine if the rest of the results in this category agree with our discussion. The relative FoR was the preferred spatial frame for this category at about 80% followed by the OBC at 5%. The prevalence of the relative FoR can be explained using Slobin's (1996) thinking for speaking hypothesis. The TFS framework posits that during the event of speech by an interlocutor, there is a related online form of thinking that transpires concurrently with the speaking. According to this theory, language acts as a filter through which experience is verbalized. It has been stated already that the coordinate systems responsible for encoding complex spatial notions are available to all languages including Dholuo. At the point of speech preparation, the speaker is exposed to the picture stimuli. The speaker then has to decide, pre-speech, whether the picture stimuli is complex enough to warrant use of the coordinate system. This is what Slobin (*ibid*) calls the non-linguistic coding that is, making sense of non-linguistic elements (picture stimuli) with a view of picking up aspects of it that can be easily coded in the language. If the picture stimuli is regarded as complex enough then a coordinate system will be used at the *experience time*, if not, a different type of spatial orientation would be

employed by the speaker. TFS is silent on this pre-speech decision making process though we can speculate that it does involve a kind of thinking which in our case informs the choice to use a spatial frame at the macro level. As such, TFS fails to explain the conceptualization process that happens at the macro level. This is true across the categories.

What it does explain however is the selection process of the specific FoR that adequately encodes the spatial scene at the time of verbalization. During speech, language chooses, out of all the coordinates systems available to it, the required spatial frame that would fit the verbalization of the spatial arrangements of the objects within the picture stimuli. The specific FoR that language chooses to encode the spatial scene will depend on one; how readily available the FoR is in the language, and two; the nature of the stimuli. The nature of stimuli is therefore crucial in two ways to TFS. At the pre-speaking phase, the speaker decides whether it is complex enough to warrant the use of a spatial frame. At the speaking phase, the speaker decides based on it, which spatial frame out of those available to the language would best fit the verbalization of the spatial scene. This process involves giving of form to the abstract coordinates system through selection and filtering which eventually gives rise to the relevant types of FoR. The conceptualization mechanism that is responsible for the transformation of the abstract coordinates systems into encodable units used in the language is what we would call *thinking* for speaking in our case.

Following the above explication, it is evident that the decisions leading to the choice of the relative and OBC FoR were borne out of a process of the nature described above. Precisely for our case, a UU picture stimulus was presented to the participant. The participant by nature through language has access to the coordinate systems which are readied in anticipation of the spatial description once they see the picture. At the speaking phase, language transforms the coordinate systems into encodable components that would *best fit the conceptualization of the event*. These encodable components turned out to be the relative and OBC FoRs. Simply put, the decision to use the relative in majority of the descriptions and the OBC FoRs in minority of the cases was partly informed by the characteristics of the UU category and the ability of the speaker's language (Dholuo) to give form to these types of FoRs. This assertion is further reinforced by the logit mixed model results which shows a significant effect of item category in the choice of the relative and OBC FoR.

It can be argued that the use of the relative FoR for this particular spatial encoding was possible because it was the most relevant and available frame. On availability, Slobin (2003) suggests that under the TFS, the selection of the relevant linguistic encodings depends on the saliency of such

encodings, which in turn relies on the habitual online attention given to these linguistic encodings by the language. Saliency is therefore equated with ready availability in this case. The frequent use of the intrinsic (OBC) FoR in solving everyday tasks in Dholuo (Ogelo, 2017) creates a cognitive routine, thus making the frame more salient in the speaker's mind. The saliency of the relative system can be explained this way; all the participants involved in the tasks were DEK multilingual college students who started speaking English at an average age of 6 years. The average self-reported proficiency was 78% and they frequently used the language 70 % of the time in their daily everyday interactions. English is heavily relativistic (Levinson, 2003). The high proficiency and frequency of use of English by the participants mean that English, and by extension the relative FoR like the OBC, would be salient in the multilingual mind of the participants.

Beside the direct FoR which is considered near universal (Danziger, 2010, p. 180), the realization of the geomorphic frame of reference albeit sporadically seeks to show that Dholuo allows a wide range of FoR to be encoded under different spatial settings. This multiple FoR manifestations will be returned to later. Of essence is to continue with the discussion to the UF category

(b) Unfeatured-Featured (UF) category

The UF category differs from the UU and FF categories in that it contains both the featured and the unfeatured objects. This unique attribute of the UF category is key in interpreting the findings relating to the use or choice of the FoR. A 74% FoR usage in the UF category largely conforms to Levinson's spatial thinking proposition. However, compared to the 90% FoR usage in the UU category, there seems to be a drop. The stimulus design is integral to this difference. The *man*'s positioning in UF stimuli; MLTFAF, MLTFAAFT, MRFAT and MRTFABA (see appendix A(ii) for picture details) largely evoked the usage of the generic spatial relator *bath* (beside).

Ordinarily, in Dholuo, a spatial scene of a man standing adjacent to a tree would be described using the general term *bath* (beside) within a shared context between the interlocutors. This would give rise to constructions such as *dichuo ni e bath yien* "the man is beside the tree". The same observation was made by Wilkins (2006, p. 61) amongst Arrernte speakers. In the case of our experiment, however, there was need to be specific for the matcher to accurately recreate the spatial scene leading to descriptions such as *dichuo ni e bath yien gi kor ka acham* "the man is beside the tree to the left" which does give rise to a relative interpretation. The data reveals that

both descriptions were present, the latter being the majority. Instances of the former led to the rise in non-FoR descriptions. This explains the increase in non-FoR usage from 10%-30% at the macro level.

As was earlier mentioned, Levinson's (2004a) assertion that a complex spatial scene evokes spatial thinking means that any observation to the contrary can be credited to either the discrimination in the language or the nature of the stimulus or both. So far, from our analysis of the UU category we have seen the impacts of both. These impacts, which have been discussed under the TFS interpretation of the UU category, similarly apply to the UF category. The only difference is that in the case of the UF category, the non-linguistic experience at the pre-verbal stage posed a challenge to the speaker due to the stimuli configuration.

Beavers et al. (2010) suggest that speakers naturally choose the least difficult available linguistic experience to encode and process. Marking the tree as the Figure and the man as the Ground would have been easier to process since the subsequent descriptions would not require mapping of bodily coordinates. However, the configuration of the stimuli was manipulated such that interpreting the man as the Ground and tree as the Figure seemed implausible. The constrain is similar to the obligatory grammatical marking suggested by Slobin (1996, 2000, 2006) that dictates not what a speaker can notice but what they must notice. Unlike in Slobin's manner and path examples, where failure to pick the requisite linguistic element would lead to ungrammaticality, failure to mark the man as a Figure would lead to using a different FoR (OBC in this case) but still produce a grammatically sound description.

(c) Featured -featured (FF) category

Similar to the UU category, FoR was used 90% of the time in the FF category. The category FF contains objects with defined features such as a car, a person etc. A featured ground object with defined parts such as left, right, front etc. provides a more favourable platform for use of a spatial reference than the unfeatured one. For example, a cow would simply be described as being behind or in front of a house, since behind and front parts of the house can easily be recognized.

A trending effect of item category FF coupled by the ability of Dholuo to filter in and select the FoR that would best describe the FF scenes means that the OBC system was most preferred (at 76%). It is observed that even though an easier means for encoding the featured stimuli was readily available and utilized in the majority of the descriptions (OBC FoR), a sizeable percentage of the descriptions (11%) were still borne out of the more complex relative frame

spatial conceptualization process. This goes against Beavers et al's. (2010) proposal but works to reinforce the earlier observation that the relative FoR is not only salient in the language but seems to permeate the object-centred reference frame's domain as well.

7.2.2. Figure orientation description

(a) Unfeatured-unfeatured (UU) category

As earlier stated, by design, the UU category does not support any spatial orientation. This explains in part the 80% non-mention of a Figure orientation. Two theoretical issues arise out of this; first, the possible reasons why the UU category fails to support figure orientation descriptions needs to be discussed. Second, the motivation to orient the figure and the fact that these attempted figure orientation used either the direct (which is considered near universal, (see Danziger, 2010)) or the relative FoR , need to be interrogated and discussed. All these are captured under the general discussion section.

(b) Unfeatured -featured (UF) category

The uniqueness of this particular category pointed out earlier in the location platform extends to the Figure orientation platform. We need to mention that in the task administration, the instructions simply required the participants to describe the pictures in as much detail as possible to the recreator. No overt attempts were made to direct them into mentioning the orientations of the objects. Despite this, an 86% FoR usage in Figure orientation was observed for this category.

The data revealed that within any descriptions uttered by the participants, the following scenarios were possible regarding the use of FoR in locative and orientation description. First, it was possible for the entire construction to lack a FoR in both locative and orientation description, e.g., *dichuono ochung' e dir yien* “that man is standing beside the tree”. *Standing beside the tree* involves the use of the proximal relators and not FoR. Second, there were instances of use of a FoR in location description but not mentioning the Figure orientation e.g., *dichuo nitie e tok yien* “the man is behind the tree”. Third, there were cases of a FoR locative description and a non-FoR Figure orientation e.g., *dichuo ni e tok yien kocha to opimore gi yien* “the man is behind the tree on the other side but he is aligned with the tree”. Fourth, a FoR could be used for locative description and the same type of FoR used for Figure orientation e.g., the use of the relative FoR in, *there is a man facing right and he is standing in front of the tree*. Fifth, in many other cases, the FoR used for location differed from the one used for orientation e.g., *A man on the right side of the tree facing the tree*. That is, *right side of the tree-* relative interpretation; *facing the tree-*

landmark-based orientation. Lastly, there were instances where only the facing information was present but not locative description e.g., *the man is standing looking at the tree*. All these dynamics give a glimpse of what Slobin (1996, p. 75) refers to as filtering and selecting of experience through language into verbalized events.

7.2.2.3. Featured-featured (FF) category

In the Figure orientation platform, the FF category is comparable to the UF category when the Figure in the latter is featured. In such a case, the Figure orientation for one would tend to correlate with the other. It is therefore no surprise that a 75% FoR usage was observed for FF and 86% for UF. These relationships are expounded on further in the sections that follow.

7.2.3. The ground orientation description

(a) Unfeatured-unfeatured (UU) category

Similar to the Figure orientation category, Ground orientation for UU category was largely expected not to use any orientation. This explains the 72% no orientation. The 25% FoR descriptions that comprise the landmark-based, the direct, the relative and the absolute encodings seek to emphasize on the multiplicity of the FoRs in Dholuo.

(b) Unfeatured-featured (UF) category

Non- FoR Ground orientation descriptions were realized in 97% of all responses for the UF category. However, similar to the previous categories, there was the use of the FOR (landmark-based, direct, relative) albeit in a much smaller proportion.

(c) Featured-Featured category

Unlike the previous two categories, the participants used the FoR more (71%) in their descriptions than the non-FoRs (29%). There was a significant effect for this category FF, meaning the preference for the different types of FoR used in the spatial descriptions over the non-FoR was due to an aspect of the FF item categories. The fact that both objects were featured does account for the high FoR usage. However, about 30% of the total descriptions did not mention the orientation of the Ground even though the objects were featured. Not mentioning Ground orientation corresponded with the failure to mention Figure orientation such that if the participant saw no point in adding the facing information for the Figure, there was no need to do so for the Ground. It can be argued that similar to the cases of the AyMi (Romero-Méndez, 2011) and the Arrernte (Wilkins, 2006), the participants simply felt that the information on

location they had given would suffice and therefore there was no need for Figure or Ground orientation.

7.3. Findings from the mirror image task (non-linguistic task)

Of the participants who used English, 60% of them identified at least one pair of mirror images as similar while 45% of those who used Dholuo behaved in a similar way. However this difference was not statistically significant. Further statistical testing using Dholuo proficiency and frequency of use revealed null effect on telling apart mirror images. The same was true for the English proficiency, frequency of use and age of acquisition. As far as the effect of language context is concerned, the lack of significant difference means further discussions on the same would be unnecessary. However, in the next section, the overall results of the experiment will be compared with findings from other studies and discussed.

7.4. General discussion

To the best of my knowledge, there is no spatial frames of reference study that has been explicitly systematized by way of what I call the *spatial platforms* (Location, Figure orientation and Ground orientation) and the *feature categories* (UU, UF, FF) in the manner that it has been done in this dissertation. Instead, most of the reviewed literature (see Burenhult & Levinson, 2008; Bohnemeyer & Stolz, 2006a, 2006b; Danziger, 2011; Levinson, 2003; O'Meara & Báez, 2011; Pederson, 2006; Pederson et al., 1998; Romero-Méndez, 2011; Wilkins, 2006) have predominantly focussed on locative and orientation descriptions in a framework that brings together a non-featured object e.g., tree, ball etc., and a featured object e.g. a man, a chair etc. In fact, save for Senft (2001) who begins by investigating FoR in Kilivila using the widely used M&T game approach similar to the UF locative approach used herein before expanding his investigation to include the FF category, the rest of the studies largely used the former.

The novelty of my approach poses a challenge since it becomes difficult to compare the findings and discussions herein to previous studies of spatial FoR. Be that as it may, there are studies that differ from this dissertation in terms of experimental tasks or analytic approaches but share a common conceptual base and as such would be comparable to our findings. Further, in the paragraphs that follow, I will foreground the theoretical underpinnings that inform the spatial frame of reference usage, some of which have been mentioned already, linking them to the findings and discussing their wider implications.

7.4.1. General discussions on the Unfeatured-unfeatured (UU) category

The participants had the freedom to choose any of the objects from the picture stimuli and mark them either as a Figure or as a Ground. As mentioned in section 4.4.3, this liberty of choice solves a long-standing challenge that has bedevilled the M&T task. According to O'Meara (2011), the intended configuration of the traditional M&T tasks has always been to depict *the man* as a Figure and *the tree* as a Ground. With a featureless tree as a Ground, making references to it in the course of the stimulus' descriptions would call for complex processes, such as mapping and rotation which would more likely yield the use of the extrinsic system. However, this intended aim sometimes suffers a setback when participants overlook the predefined arrangement and mark *the tree* as a Figure and *the man* as Ground (Senft, 2001), possibly because making references to a featured Ground rather than an unfeatured one would lessen the processing burden (Beavers et al., 2010; Bohnemeyer & Baez, 2008). A UU configuration achieves the original intention of the M&T task since both Figure and Ground would be unfeatured.

Further, the data from the UU category in the location platform revealed a variety of FoR types that were used to describe the stimuli. This was evidence of multiplicity of FoRs in the language. Put differently, the UU object configurations as would be expected, in the most part resulted into the relative FoR usage since they lacked inherent features. However there were participants who encoded the stimuli using various other types of FoR, an indicator that Dholuo has the ability to encode the same stimuli using different spatial lenses. Such internal variations of spatial frames representation point to possible effects of other factors such as *multicompetence* or rather it shows that Dholuo exhibits a spatial style which Bohnemeyer (2011) calls *referential promiscuity*, or both. We will return to this question later.

Under the various spatial platforms, the UU category yielded the use of spatial frames at 90% for the Location platform, 88% non-FoR usage for the Figure orientation platform and 73% non-FoR usage for the Ground orientation platform. It is clear that whereas the UU category provides a suitable platform for locative descriptions involving FoRs, it does not adequately support the FoR usage for spatial orientation. This is one of the criticism of the traditional M&T tasks pointed out by Bohnemeyer & Baez (2008). The unfeatured Ground simply lacks the inherent parts that would be oriented towards any entity. However, the fact that a sizeable number of the participants still did orient these unfeatured objects using FoRs exposes the intricacies of the language in spatial encoding that warrant further explanation as spelled out in the paragraph that follows.

These language intricacies can be explained as follows: In the time frame of the TFS framework, besides the pre-linguistic experience, there is the contextual information that is available to the speaker. This information is important especially at the speaking phase where it reinforces the role of language in selecting and filtering the relevant aspects of the picture information for verbalization. In our case, the experimenter's explicit instructions to the participants that they be as detailed and as accurate as possible in their descriptions might have forced the participants to orient an otherwise featureless object for an accurate recreation of the spatial array to be possible. The language therefore relies on this extra, albeit linguistic, information to prepare an appropriate FoR type to use in Figure or Ground orientation. The reason the majority of the participants used non-FoR descriptions might have been because of the less attention they gave to the experimenter's instruction or may be because the overbearing nature of the featureless objects simply restrained them from attempting an orientation. Either way, the sifting, selecting and choosing of the appropriate aspect of the stimulus to verbalize which happens up to and during the eventual speaking phase is an indicator of the conceptualization process that goes on during the task administration.

7.4.2. General discussions on the Featured-featured (FF) category

The criticism of the traditional M&T task which is also evidenced in the NMT referential task under the UU category that the non-featured Ground fails to provide a template for orientation has been addressed in the FF category. Here, both objects are featured. There are studies (e.g., Senft, 2001) that have used a photo-photo and a photo-object matching tasks with featured objects. As Senft (*ibid*) affirms, the use of the featured objects provide more plausible results than the traditional M&T tasks especially when dealing with languages where intrinsic usage is predominant. As such, our approach seems to be self-sustaining. The shortcomings of the UF category which are similar to the traditional M&T tasks are addressed by the UU category. The inadequacies of the UU categories are in turn mitigated by the FF category- all within a single study!

The data reveals that spatial reference encodings were consistently preferred at 90%, 75% and 71% across Location, Figure orientation and Ground orientation platforms respectively under the FF category. The TFS processes involved in the locative descriptions under the FF category are similar to those of the of the UU category. The fact that the objects under the FF category are featured solves the Figure and Ground orientation problems in the UU category as already stated. Despite the apparent success of the FF category at enhancing spatial encoding, there was a significant percentage of non-FoR location and orientation descriptions. Similar to the UU cases,

descriptions that do not conform to the predicted outcomes can be due to a number of other factors most of which are language related

7.4.3. General discussions on the Unfeatured-featured (UF) category

Aspects of the UF category compares with the traditional M&T task. Even as we consider the findings of this category in light of previous findings elsewhere, the comparison is made within a shared context. Ogelo (2017) concluded that all three Levinsonian FoRs (intrinsic, relative and absolute) are present in Dholuo. He further claimed that all these FoR have specific domains within the language from which they are preferred. However, Ogelo (*ibid*) concludes much like Senft did with Kilivila, that overall, Dholuo prefers the intrinsic FoR.

We will use the UF category findings to compare the conclusions in both Ogelo (2017) and Senft (2001). First, the current data revealed an average of 58% relative FoR usage and a 11% OBC usage. This clearly demonstrates a relative FoR preference as opposed to the intrinsic (OBC) as suggested in the previous research. So why the stark contrast in the findings? The first stop is at the task design. Ogelo (*ibid*) used both a featured and a non-featured object as the Ground. Description elicited from stimuli where the Ground objects were featured resulted into intrinsic (OBC) usage. Those that had the unfeatured Ground gave rise to descriptions based on the relative FoR. The more preference in intrinsic usage came about as a result of more stimuli having a featured Ground than unfeatured Ground. This result therefore does not back the conclusion that the preferred FoR in Dholuo is the intrinsic FoR but seeks to affirm the proposition that specific tasks call for specific FoR usage. The present findings do indeed match Ogelo (*ibid*) in the sense that from both studies, the relative and the intrinsic (OBC) FoRs are available in the language.

Senft (2001), unconvinced of the traditional M&T task's finding of a preferred intrinsic usage in Kilivila, conducted a further five different tasks, one of which was the photo-object task involving featured objects. He affirmed that Kilivila does indeed prefer the use of the intrinsic system for locative description and the absolute landmark system (the landmark-based FoR as defined in this dissertation) for orientation description. However, since this particular task primarily used featured objects, such an outcome was highly expected. It compares nicely to the present finding where the OBC FoR is preferred under FF category for location description as well as a moderate use (about 23%) of the landmark FoR for Figure and Ground orientation. Senft's work further showed that the relative FoR and deixis were both used for location and orientation description though to a lesser degree. He used the presence of multiple FoRs in

Kilivila to reformulate his earlier proposition that speakers who prefer one reference frame in a specific spatial domain would rely on the same frame for memorizing spatial configurations (Senft, 2001, p. 527) to;

The relative, intrinsic, and absolute frames of reference can all be found and can be utilized for verbal spatial references in a given language. However, 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 of spatial reference....thus different means and tasks within the realm of spatial reference may evoke the preferred use of similarly different frames of reference in a given language (Senft, 2001, pp. 545–546)

He disagrees with Pederson et al.'s (1998) reference of Kilivila as a mixed language claiming that Kilivila, unlike mixed languages has preferences for certain FoR in certain spatial contexts for particular functions. This proposition is consistent with the findings and discussions which we have had thus far. Danziger (1996, 1999, 2010), on her part, found that amongst the Mopan there were strong preferences for the intrinsic FoR in solving most everyday tasks. She also found a prevalent use of the direct FoR and a few instances of the relative FoR usage.

The presence of multiple FoR is not only observed in studies that used the traditional M&T communication referential tasks. A number of other studies hinged on data elicited from other versions of the M&T task such as the B&C task have showed results that are analogous to the findings herein. For instance, findings from (Báez, 2011; Garza, 2011; O'Meara & Báez, 2011; Romero-Méndez, 2011; Soto, 2011) all show the presence of more than one FoR. There are two additional studies, Bohnemeyer (2011) and O'Meara (2011), which equally used the B&C tasks and found like the rest, the availability of multiple FoRs. Unlike the rest though, these studies could not conclusively indicate which of the many FoRs were predominant in the language. Instead, they concluded that their respective languages, the Seri and the Yucatec languages, exhibit a state that is referred to as *referential promiscuity*.

7.4.4. Referential Promiscuity

According to Bohnemeyer (2011), referential promiscuity refers to a style in the language characterized by the unrestricted availability of all (most) types of FoRs and the absence of a default perspective. He argues that there are two perspectives- the default and the unrestricted availability- from which languages can be classified. Languages that adopt the default system have a single FoR as the predominant system with other less used FoRs present purposefully for support. Examples of languages with a default relative system include German, English, Japanese, Dutch etc. For the absolute systems, examples include the Tzeltal (Maya languages), the Arrernte (Australian) etc. Those that have unrestricted availability do not have any primary default system but exhibit almost equal FoR manifestations. Examples include the Kgalagadi (Bantu), Kwa languages (Niger Congo) and Yucatec (Mayan)

Bohnemeyer argues that referentially promiscuous languages have a high propensity to shift from one FoR to another primarily because they lack a default FoR that would restrict such a variation. The presence or absence of a default system is linked to the position of the anchor in spatial descriptions (see table 3.1). In the intrinsic system, the anchor is the Ground and as such, a change of Ground means a change in anchorage. Intrinsic language users will therefore have as many anchors as there are Grounds. Extrinsic systems on the other hand have an anchor that does not change. The relative system for example has the SAP as the anchor who may move around but still remains the same. Similarly, the absolute system has the anchor on an environmental feature or other abstracted features that are generally unchanged. It becomes easier for extrinsic users to develop a default system due to the less variability that their systems have as compared to the intrinsic systems. The extrinsic systems are also considered as general-purpose due to the wide range of spatial tasks that they can be employed to perform as opposed to the so-called localized intrinsic system (Bohnemeyer, 2011). An intrinsic user will need to change strategies in solving different spatial problems that cannot be solved through the intrinsic system. This change of strategies (variability) is the possible reason for the multiplicity of FoR and the lack of a default system amongst most intrinsic system users.

Such variations are dictated by the task specificity, that is, language would select the FoR that will encode a particular event, similar to the Slobin's proposal under the TFS framework. Bohnemeyer's (*ibid*) investigation on the Yucatec language validates his assertions. He points out that true to his prediction; the speakers vary their use of the FoR. There is both the intrinsic (OBC) and the relative use of the back, front, right and left relations. There is also the use of the solar-based systems similar to the use of the cardinal points. The data also revealed the use of the

landmark-based system as well as the direct FoR to a lesser degree for locative descriptions. However, for the orientation description, these latter two formed the bulk of FoR representation in Yucatec.

Similar observations were made in O'Meara's (2011) study of the Seri language. She points out that the Seri speakers have a variety of options regarding FoR choice particularly in reference to locative and orientation descriptions. She observes that there was no pronounced FoR type which would be considered as default but an almost equal preference for the OBC, the direct, the landmark-based and the relative to a lesser degree. There were instances of the absolute but like in Yucatec, there was hardly any description involving the geomorphic system.

What seems intriguing from both the Yucatec and the Seri studies is the deliberate silence on multicompetence. We are then obliged to ask if speaking more than one language has any bearing on the concept of referential promiscuity. At one point, Bohnemeyer observes that from the available literature in spatial frames, Balinese is the closest to Kwa, Kgalagadi and Yucatec in exhibiting referential promiscuity. However, he is quick to emphasize that Balinese can only be recognized as referentially promiscuous if the manifestations of all its FoRs are witnessed from amongst monolingual speakers. Contrary to his insistence on monolingualism as a base for referential promiscuity, he later states that all his participants were not only bilinguals but literate ones (Bohnemeyer, 2011, p. 897). The same goes for the Seri speakers who came from a community where Spanish in addition to Seri was widely spoken. It goes without saying therefore that the participants from both Seri and Yucatec were bilinguals even though this has not been stated explicitly by the two authors.

From the data in the current dissertation, Dholuo does not only make use of all the FoR mentioned in the Yucatec and Seri studies, but also has evidence of the use of the geomorphic system which is missing from both studies. Similarly, Dholuo data has been collected from a multilingual population. Dholuo therefore fits the realm of referential promiscuity discussed above. What needs to be addressed is whether the multiplicity of FoR in Dholuo is naturally occurring or it has been developed overtime from exposure to other languages.

A brief review of the manifestations of the various types of reference frames in Dholuo would shed more light on the referentially promiscuous nature of Dholuo. The intrinsic group in the manner that it has been used in this dissertation includes the OBC and the direct frames. This group of reference frames are considered to be near universal (Danziger, 2010) with very few languages in the literature, such as the Guugu Yimithir (Levinson, 2003), apparently lacking it. It

can therefore be said that both FoRs are naturally encoded in Dholuo. The data has revealed the OBC as the most preferred in FF locative descriptions. The direct system like the relative FoR has been used in almost all the task conditions. However, it has been involved majorly in both Figure and Ground orientation. Next is the absolute FoR which was not used by the participants under Dholuo context but was involved in both Figure and Ground orientations to a lesser degree under the English context. Ogelo (2017) reports that the absolute system is used for general locative and direction descriptions such as the direction towards (or) the location of a town. Additionally the system was also used for navigation purposes by fishermen. The absolute system therefore is limited functionally but is and has always been present in the language.

On the same vein, the data revealed that the landmark-based system was largely used in Figure and Ground orientation. Since its operation is based on *ad hoc* landmarks within the speaker's immediate environment, it can be said to have always been present in the language. As for the geomorphic frame, the data does indeed reveal minimal usage especially when locative or orientation descriptions are made with reference to the sloping landscape. For instance, an object could be considered to be either positioned or oriented towards *mwalo* 'down the slope' or *malo* 'up the slope'. For as long as there are slopes within the environment of the speaker, a geomorphic construction would always be realized.

Palmer (2015) introduces the Topographic Correspondence Hypothesis (TCH), which asserts in part that the absolute system is not only anchored in the external world but motivated by it. In other words, the absolute encoding that a community prefers is in a way influenced by the physical environment. The absolute system as used by Palmer includes the absolute, the landmark-based and the geomorphic FoR. TCH therefore explains that there is a possibility of both the geomorphic and the landmark-based systems' presence in Dholuo being dictated by the physical surrounding. Palmer (*ibid*) further asserts that the TCH can as well be used to explain the availability of the relative FoR in a language. For instance, a number of studies have shown that the relative as opposed to the absolute system is predominantly used in urban areas (Burenhult & Levinson, 2008; Majid et al., 2004; Pederson et al., 1998).

The assertion that relative system is mostly associated with populations that are largely literate and reside in urban areas might be true though it is not immune to contestations. For instance, Ogelo (2017) found the availability of the relative FoR in Dholuo though the participants engaged were less literate and resided in the villages. This system is mostly realized through the use of spatial relators left, right, front, behind as perceived by the speech act participant. There are languages such as the Tenejapans that do not only fail to encode the relative FoR but never

use the left-right relations (Levinson & Brown, 1994). Other languages, such as Mopan, do have the left and right terminologies but hardly use them for spatial descriptions (Danziger, 1996). Unlike the Tenejapans and the Mopan speakers, Dholuo speakers use *acham* ‘left’ and *achich* ‘right’ both to refer to sides of their bodies as well as in spatial descriptions. Against the TCH prediction, this usage is not confined to the environment. It is interesting though that the use of the *acham/achich* gave a number of participant’s problems particularly in its interpretations (see section 5.3.4 for an interesting example). The director would use either of the terms wrongly thereby misleading the recreator. In other instances the director would use the right/left terms correctly but the recreator would interpret this by reversing the relations. This mostly happened when these spatial relators were used in a Dholuo context. The confusion surrounding the usage of left/right relation is not unique to Dholuo. Romero-Méndez (2011) observes that amongst the AyMi speakers, the participants, while using Mixe language, could not in most cases tell which side was *akä’äny* ‘left hand’ and *anä’äjny* ‘right hand’ and therefore failed to make accurate locative and orientation descriptions. Similar to Dholuo speakers who used English to clarify what they meant, the AyMi participants used Spanish for the same. Dholuo speakers did not exhibit a similar confusion when in the English language context.

7.4.5. Interaction between referential promiscuity and Multicompetence

Having considered all the FoR and how they are used in Dholuo, we conclude as follows: Dholuo language exhibits a similar style to Yucatec and Seri as far as referential promiscuity is concerned. Unlike in the two languages however, there seems to be an impact of multicompetence in Dholuo’s referential promiscuous state. This particularly applies to the relative FoR. The relative spatial reference by virtue of the presence of the left/right relations in Dholuo is available in the language to be used whenever appropriate. Unlike most of the other FoRs however, the usage of the relative FoR has been witnessed in all spatial platforms across almost all the feature categories. This shows a saliency in the multicompetent mind of the DEK speaker that is not witnessed in any other FoR. This saliency can be partly credited to the influence of the L2 English which is heavily relativistic. Since DEK multilinguals use English 70% of the time in their everyday communicative tasks, it can be argued that this has massively impacted on their multilingual make up.

We therefore suggest that there is multiplicity of spatial reference frames that includes L1-based Dholuo related OBC and L2-based English related relative FoR, as well as L1-based FoRs such as the direct, the landmark-based, the absolute and the geomorphic FoRs. We can also speculate

that English has contributed to the presence of the absolute encoding in the Figure and Ground orientation under the English context.

7.4.6. Referential Promiscuity-the case of non-linguistic spatial reference experiments (mirror image task)

Carrying on the referential promiscuity discussion to the non-verbal reference spatial tasks, an attempt is made to account for the observations realized under the Mirror image tasks. This non-linguistic task was designed based on Levinson & Brown's (1994) study amongst the Tenejapans. It was found that the Tenejapans who are predominant absolute encoders, lack the right/left relations even though the terms for left and right exist in the language. This inability to spatially differentiate left/right relations intuitively connects to an inability to differentiate pairs of mirror images. Danziger (1999) tested this amongst the Mopan, whom like the Tenejapans hardly spatially encode events using the left/right relations. She did find that non-literate and female participants had greater difficulties in telling apart mirror images. It was believed that the reason for their inability to differentiate between mirror images was majorly due to the non-literacy of most of the participants. Other subsequent studies such as (Pederson, 2003) confirm that the ability to tell apart mirror images is a learnt trait that comes primarily through exposure to formal learning. Later, Danziger (2011) conducted another study amongst the heavy intrinsic Mopan speakers using 3D as opposed to the earlier 2D objects. The research confirmed that indeed the Mopan have difficulty in differentiating Mirror images. She further linked the inability to differentiate mirror images to the fact that the Mopan speakers were heavy intrinsic users.

The reason for this background is to provide a context under which the mirror image task was undertaken in Dholuo. Working on the premise that heavy intrinsic users fail to differentiate between incongruent images, alongside an earlier finding (which we now consider inaccurate) in Ogelo (2017) that Dholuo speakers predominantly use the intrinsic FoR, the task was administered to the DEK multilingual group. Let us put this into perspective. Most previous studies (e.g., Levinson, 2003; Pederson et al., 1998; Wilkins, 2006) have used the *Animal in a Row Experiment* to test for evidence of reference frames in non-verbal encodings. This task has proved to be successful in discriminating between predominantly absolute and relative speakers but fails when used with heavy intrinsic languages. The *mirror image task* on the other hand, though used by Danziger (2011) to test for the intrinsic encoding in non-linguistic tasks, is best suited for languages such as Mopan and Tenejapan which lack or hardly use the left/right relations. Languages that have no default FoR but exhibit multiplicity of them are somewhat left

in a limbo, with no defined experiment in the literature to test their non-linguistic realization. O'Meara (2011) working with the Seri speakers does not conduct a non-linguistic experiment. Bohmeyer (2011) on the other hand does perform the *New Animal in a Row task* amongst the referentially promiscuous Yucatec group but states that the task was not in any way connected to the spatial non-linguistic behaviour of the Yucatec speakers. He terms his non-linguistic experiment as exploratory. He confirms that the multiple non-default FoR nature of the FoRs makes it almost impossible to test their usage in non-linguistic tasks.

Even though the original intention of the *Mirror Image task* followed on Danziger's (2011) intrinsic investigation study, it is herein treated as an exploratory exercise. On the basis of the present discussion, earlier outcomes involving the *now* referential promiscuous Dholuo language can be accounted for. First, Ogelo (2017) performed the *Animal in a row experiment* whose results were inconclusive on the first and second versions only posting evidence of intrinsic usage in non-linguistic tasks after the third version. This final task modification involved orienting the animals to an *ad hoc* landmark (a house) under a rotation of 90% degrees. The second previous task performed in the same study involved a slightly different version of the *Mirror Image task*. The results of the task too were inconclusive. Lastly, the findings of the present exploratory *Mirror Image task* is not only inconclusive as far testing of non-linguistic behaviour of spatial reference frames is concerned but fails to find any effect of language context – which was the primary focus.

The findings and discussions in this section have indicated signs of relativity effects amongst DEK multilinguals at the linguistic level. Specifically, the style of referential promiscuity as used in Dholuo has shed light on the failure of the non-linguistic spatial reference tasks to provide evidence of use of spatial frames in cognition. We are curious to find out evidence of relativity effects in a sister domain of motion event categorization and how these effects are manifested amongst DEK multilinguals in both the linguistic and the cognitive level

7.5. Motion Event Categorization (linguistic task)

The results show that L1-Dholuo and L1-Kiswahili speakers in describing goal oriented motion events defocussed endpoints. This way, Dholuo and Kiswahili results compare with other aspect languages such as English. Further, Dholuo and Kiswahili findings corroborate the grammatical aspect hypothesis which states that languages that have grammatical aspect are less prone to encoding motion events endpoints as compared to languages that lack grammatical aspect (von Stutterheim et al., 2012; von Stutterheim & Nüse, 2003). Using the grammatical aspect approach as a base, the section that follows discusses in detail the mechanism that might have led to the findings herein. Both Dholuo and Kiswahili are considered to be typologically similar as far as grammatical aspect is concerned and these discussions would therefore apply to both .

Motion events verbal encoding in Dholuo can be interpreted from the perspective of Slobin's (1996) thinking for speaking hypothesis. Dholuo differentiates between the progressive and the perfective aspect tonally. In the TFS framework, aspect is considered as an obligatory grammatical element. According to TFS, experiences are selected, filtered and verbalized based on the options provided by obligatory grammatical categories of the language. In this case, the motion events from the video clips were the experiences and the construal of these experiences was dictated by the obligatory grammatical aspect. Specifically, the Dholuo language, through tone, made available the progressive form to encode a scene which had a moving entity, at the verbalization stage.

The above outlined TFS interpretation differs slightly from most of Slobin's (1996, 2000, 2003) case studies involving manner and path verbs. Take for instance an experimental set up that constrains the speakers to use manner verbs in expressing motion that involves boundary crossing. To combine a manner verb with boundary crossing would be considered ungrammatical in some V-framed languages but the speaker would have no choice but to try and fit the manner verb into such a construction. Such a strict interpretation of the obligatory grammatical marking as advanced by Slobin using his path and manner *parade case* might have its downside as explained. The approach we take however is that in motion event construal, despite the progressive form in Dholuo restricting the viewing frame to the immediate phase, it does not hinder the speaker from mentioning the endpoints. Progressivity is still maintained even as the participant includes endpoint in their description. Mentioning of endpoints against the constraints of grammar (for aspect languages) at the speaking time is one of the indicators that conceptualization is going on. Clearly, such a demonstration represents a better case of online conceptualization at the speaking phase than some of Slobin's (1996) demonstration. This is

because for the latter, a breach of linguistic constraints would lead to ungrammaticality which would possibly impede the process of verbalization and by extension conceptualization

There are complementary views to the TFS that can be used to further explain motion events construal in Dholuo. These other views have a theoretical connection to the grammatical aspect hypothesis, which was formally concretized by von Steutterheim et al. (2012) but traces its roots to Steutterheim (2003). Grammatical aspect hypothesis is primarily hinged on TFS which is in turn modelled on Talmy's (1991) language typology. Talmy's work is encapsulated under the *cognitive semantics framework*. Cognitive semantics is a sub-strand of a larger theory called cognitive linguistics. Another sub-strand of cognitive linguistics is *cognitive grammar (also CG)* (for details on the CG, refer to section 3.7). Though cognitive semantics and cognitive grammar theories subscribe to different theoretical grounds and provide different angles to interpreting linguistic domains, in the present case, the latter reinforces the former by offering a more formalised way of understanding the mental mechanisms found in TFS effects, as the following paragraphs show.

The grammatical aspect approach interpreted through the lenses of the CG is therefore used as a complementary approach to the TFS in putting into perspective the findings from Dholuo's motion events construal tasks. Langacker (1987, 2000, 2008) proposes a routinisation and entrenchment model which explains the possible underlying mechanism by which grammatical aspect influences motion events encoding. According to the proposal, when a linguistic structure is frequently used over time, it becomes entrenched in the minds of the speakers. As a result of this entrenchment, the associated grammatical attributes of the said linguistic structure become part of the cognitive routine. The linguistic or grammatical structure in the case of Dholuo can be said to be the use of aspect, specifically, imperfectivity.

As an aspect language, Dholuo speakers use the imperfective (progressive) aspect frequently and consistently, which over time leads to the routinisation of grammatical attributes associated with it. Let us take these grammatical attributes of the imperfective (progressive) aspect to be the viewing scopes. Put differently, the recurrent use of the imperfective (progressive) aspect leads to the schematization of certain viewing frames. These viewing frames (maximal and immediate) are called time schemas (Radden & Dirven, 2007). There is thus a linkage between imperfective (progressive) aspect and time schemas. Specially, there is a direct association between grammaticized markers of imperfectivity and the time schema which denotes the immediate viewing frame. This means that the use of the imperfective (progressive) aspect will activate the relevant time schemas (immediate scope). The frequency of activation of the time schemas will

depend on the degree of usage of the imperfective aspect. This explains why, a Dholuo speaker and any speaker who uses a language which grammatically distinguishes aspect (such as Kiswahili and English) would prefer the use of the immediate viewing scope when encoding ongoing motion events.

According to the CG therefore, since the imperfective (progressive) aspect contrasts the maximal and the immediate scope, its absence in non-aspect languages means the absence of a structural obligation to encode ongoingness. This reduces the likelihood of routinization and entrenchment of the immediate viewing frame which would eventually lead to a preference for the construal of the event as a single bounded situation.

From the discussion, we now know why Dholuo and Kiswahili preferred to defocus the events endpoint. In the TFs paradigm, the tight linkage between the imperfective (progressive) aspect and the immediate viewing frame is explained through saliency. When the imperfective/progressive aspect is salient in the mind of the speakers, it makes it readily available to the speakers who in turn uses it for the construal of the ongoing motion event phase (Slobin, 2000; Stutterheim, 2003). In other words, the saliency of the imperfective/progressive aspect can be *loosely* interpreted as the obligatory marking in the language that would dictate the encoding of motion events using the unbounded viewing frame.

7.5.1. Discussion on the imperfective/progressive aspect

Dholuo distinguishes between the imperfective/perfective aspects tonally. Under Dholuo context, the DEK multilinguals used the progressive aspect in all their descriptions but one. The process of encoding the motion events by zooming in on the immediate viewing scope has been explained in the previous section. The reason for choosing the imperfective/progressive aspect over the perfective in encoding the motion events has also been explained. The preference for the progressive aspect was witnessed under the Kiswahili and English contexts as well. Recall that even though the statistical test comparing the use of the progressive aspect cross the three language contexts failed to converge, it can still be concluded with certainty that there were no differences owing to near uniform progressive encoding across the language contexts as revealed by the graph in Fig 6.3.

Notice that whereas there were only four instances where the progressive aspect was not used in the construal of the motion events across the three language contexts, none of them included the use of the habitual aspect. In two of the instances, the perfect aspect was used under Kiswahili

context while the perfective aspect used under Dholuo context and in the other. A non-progressive imperfective was used under English context in the remaining instance. The reasons for the preference for the progressive aspect over the perfect or perfective as explained previously also explain why the habitual aspect was not considered as a choice for encoding the motion events encoding. Simply put, as an aspect language that grammatically distinguishes the perfective from the imperfective, frequent uses of the progressive over time leading to its saliency thus making it readily available for use in motion events encoding. Additionally, since the events were ongoing that is, they unfolded in front of the participants, it was expected that they would describe the scene using grammatical markers that convey the unfolding events.

Even though the use of the progressive aspect was almost 100% across the three language contexts, it is interesting to note that in 37.3% of the cases, the progressive aspect was used alongside the mention of the motion events' endpoints. Such an occurrence aligns with and reinforces the argument that behaviour relating to motion endpoints reflects patterns of preference rather than absolute principles. Speakers of aspect languages do not always defocus endpoints just as speakers of non-aspect languages don't always encode endpoints (Bylund et al., 2013; von Stutterheim & Nüse, 2003). Under TFS, as was argued earlier, the obligatory grammatical category of aspect in Dholuo loosely restricts the viewing frame thereby allowing some instances of endpoint mentions, a probable indicator that such apparent violations of grammar are accompanied by corresponding conceptualization processes. The same can be said of the L1 Kiswahili participants who like their DEK counterparts used the progressive aspect almost 100% of the time irrespective of whether endpoints were mentioned or not.

A common observation relating to both the DEK and the Kiswahili L1 group needs to be noted and explained. Consider the example 55

55.

(a) L1-Kiswahili mode

A-na-tembe-a

a-ki-end-a

3SG-PROG-walk-IND

3SG-CNC-go-IND

'He is walking while going'

(b) Dholuo language mode

<i>Ò-wuó th-ó</i>	<i>k(a)-ò-dhí</i>	LH	LH
3SG-walk-INF/PROG	while-3SG-go-INF/PROG		
‘He is walking while going’			

Both sentences can be referred to as compound sentences in the sense that they both have two verbs. In Example 55(a), the first verb *anatembea* (he/she is walking) would be said to express the manner of motion as well as the temporal locus of the sentence that is, the present tense. The second verb *a-ki-enda* (while he/she is going) expresses a simultaneous action happening concurrently with the first. Whereas the formative morpheme *-ki-* in *a-KI-enda* is largely considered an aspectual marker of simultaneity which essentially subsumes progressivity, the morpheme *-na-* is quite difficult to place.

The formative morpheme *-na-* as in *a-NA-tembea* **can** be said to express both tense and progressivity. We say **can** because as explained in section 3.7.5, scholars do not agree on whether to regard the morpheme *-na-* as an aspectual marker or a tense marker or both. Consider only the first part of the sentence *anatembea* (he/she is walking). As has been stated, the morpheme *-na-* conflates both tense and aspect but only if it occurs in the simple present construction. *Anatembea* (he/she is walking) in the past tense would be *alikuwa anatembea* that is, *alikuwa* (he/she was) *anatembea* (walking). In the future the same would be expressed as *atakuwa anatembea* that is, *atakuwa* (he/she will be) *anatembea* (walking). Clearly, the formative morpheme *-na-* is stripped off its tense obligations when expressed in the past or in the future.

Despite these dynamics, since tense was not the focal point in our investigation but aspect, and because the aspectual value of *-na-* is not interfered with in the tense in which the descriptions were made (present tense), *-na-* is considered as an aspectual marker denoting progressivity. The above construction would therefore be regarded as a compound sentence with both verbs denoting progressivity.

Example 55(b) shows an almost similar case of double progressivity but unlike in Kiswahili, the tonal distinction between the progressive *ò-wuothó* (LH) (he/she is walking) and the perfective *ò-wuothò* (LL) (he/she has walked) is straightforward. The prefix *k(a)-* e.g. *KA-òdhí* in this context is used in a more or less similar manner to the Kiswahili *-ki-* morpheme.

Lastly, the single instance of the perfective aspect use in Dholuo is worthy of mention. Consider this Dholuo construction:

56.

Participant (P134): Twenty-six-year-old male DEK multilingual

Language context: Dholuo

Stimuli (tLwpB): two ladies are walking on a pavement

<i>Nyidende</i>	<i>ariyo-go</i>	<i>chalo</i>	<i>jo-ma</i>	
Ladies	two-DEM.PL	seem	people-REL	
<i>o-wuok</i>		<i>kamoro</i>	<i>gi-ting'-o</i>	<i>bag</i>
SUBJ-leave-INF/PFV		somewhere	SUBJ- carry-INF/NPROG	bag

‘Those two ladies seem to have left some place carrying a bag.’

The participant relates the immediate past to the present instead of focusing on the ongoing phase. He therefore uses the non-progressive construction. Since this is an isolated case, it would be deemed as being a case of individual variation having no bearing on the overall progressive pattern.

7.5.2. General discussion of verb types

Path as opposed to manner is obligatory in as far as motion events are concerned. In other words, no motion event is possible if in its expression, there is no path verb, a path satellite or any other path element (Slobin, 2004, p. 238). It is important therefore to discuss the manifestation of not only manner which was prevalently used but path and its elements as well in motion events description amongst DEK and L1-Kiswahili speakers. We should mention at the outset that Dholuo is considered in this dissertation as a split system (see section 2.5.1. for reasons) and Kiswahili as verb framing language (Luseku, 2008; Schaefer & Gaines, 1997).

In the discussion that follows, we will have these typological distinctions in mind but will not be restricted by them, the reason being that this is an active area of research in Dholuo and as such any position taken should be best treated as tentative. In Kiswahili, Luseku (2008) focusses more on the Kinyakyusa language and uses Kiswahili more for reference or comparison. Schaefer & Gaines (1997), on the other hand, give a language phylum description drawing examples from a number of Bantu languages and is therefore not specific to Kiswahili. Even if the typological distinction was definitive, our approach is to explore the dynamics involved in motion-manner, motion-path and motion-direction conflation in the two languages.

In most of the constructions across the DEK and L1 Kiswahili contexts, manner of motion is stated. Echoing Slobin (2004), in almost all these descriptions, a path or a path element is mentioned or inferred. In majority of the cases, endpoints are not mentioned. Such instances however have neither the direction verbs such as Dholuo's *ochíko*/Kiswahili's *anaelekea* (heading) nor the deictic verbs such as Dholuo's *ódhí*/Kiswahili's *anaenda* (going). However path elements such as Dholuo's adposition *e* or Kiswahili's *kwa* (on) are used to indicate that path are present e.g., Dholuo's *ng'ano wuóthó e ndara* "that person is walking on the road". Even in instances where the adposition are absent e.g., Kiswahili's *msichana anatembea* "a girl is walking", the path is inferred from the motion verb *walking* though it is not as defined as in the case where adpositions are used. Equally, there were descriptions where manner, path elements and endpoints were mentioned. Such instances involved the use of the directional morphemes mentioned above or deictic verbs or an adposition as explained in section 6.4

In the paragraphs that follow, three types of constructions where (i) direction verbs are used as main verbs (ii) manner verbs are used as main verbs and (iii) neutral/general verbs are used as main verbs are discussed. In all these three possibilities, endpoints are either mentioned or not.

First, the direction verbs were used as main verbs either combining with adpositions or without. For example, in the L1 Kiswahili construction; *wanaelekea kwa kanisa* (they are heading to the church) the directional morpheme *elekea* (head) conflates motion with direction. Since this happens in the main verb akin to the path and motion conflation ordinarily witnessed in verb framed languages, there is an implicit expression of path through the verb *elekea* (head). Additionally, the presence of the directional preposition *kwa* (to) further reinforces the direction of motion leaving the main verb to bear more path and motion attributes. This occurrence is not limited to Kiswahili. In Dholuo, when used as a main verb, the direction verb *chimo* (head) is prefixed by the pronominal *o-* as in *ochimo* (he is heading) thereby functioning as an independent verb. Like in Kiswahili, this verb conflates motion with direction and can take the direction adposition *e* (to). Similar to Kiswahili, path of motion is implicitly expressed through the verb.

Second, there was the use of manner verbs as the main verb in combination with any of the directional morpheme, the deictic verbs or the adpositions. The analysis of the verb types in section 6.4 reveals that there is no difference in the syntactic arrangement and semantic connotation between the deictic verbs and the directional morphemes when used as an auxiliary verb to the main manner verb. Both verbs do occupy the path satellite position in the sentence. By virtue of occupying a path satellite position both verbs more or less do express path in the

sentences. Besides, both verbs in a sense do express direction e.g., *owuotho kodhi dala* “he is walking while going home” and *owuotho kochimo dala* “he is walking while heading home”. In both cases, the subject is homebound.

Consider a manner-deictic verb-adposition combination, e.g., the L1 Kiswahili; *wanatembea wakienda kwenye nyumba* “they are walking while going to the house” as in *wanatembea* (manner) *wakienda* (deictic verb) *kwenye* (adposition) *nyumba* (goal). Similar to the compound sentence example previously given under the discussion on imperfectivity (see examples in 55), we are tempted to consider this combination as exhibiting verb compounding. Schaefer & Gaines (1997, p. 202) state that one of the strategies which most African languages use in describing motion events is by expressing path preceded by manner in a verb compounding order. Even though the imperfectivity demonstration may have been a bit convoluted, what was clear was that one verb expressed aspect and the other expressed tense almost in equal measure. Considered this way, in the present example, the manner verb would be deemed to be explicitly expressing manner and the deictic verb explicitly expressing path and direction. However, this does not seem to be the case. Whereas the verb *wanatembea* “they are walking” does indeed indicate manner of motion, the verb *wakienda* “while they are going” expresses path not explicitly, but only by virtue of occupying a path satellite position typical of S-language constructions. According to Bowerman et al. (1995), the deictic verb *wakienda* “while they are going” would be regarded as a path particle showing both path and direction. This way, Kiswahili behaves like an S-language, conflating motion with manner in the main verb and presenting path as a satellite. Slobin (2004, p. 242) refers to such a situation as a ‘V-language with an S-language flavour’

The other strategy suggested by Schaefer & Gaines (1997, p. 202) is that manner follows motion+direction (path) when the former(manner) occurs as a subordinate. It can be argued, against Schaefer & Gaines (1997) proposed bipartite manner/path (direction) sentence construction strategies, that the Dholuo and Kiswahili examples realized from our set of data can be explained differently. Path or path elements in the example *wanatembea wakienda* “they are walking while going” can be said to be de-ranked similar to the subordinate position taken by manner in Schaefer & Gaines's (ibid) second strategy. Treated as a subordinate, the satellite elements can be done away with and the sentences still remain meaningful as in the following examples; Dholuo's *owuotho kodhi* “he is walking while going”. The subordinate *kodhi* “while going” can be omitted and the resultant construction *owuotho* “he is walking” still remains meaningful.

This argument can as well be extended to the directional morphemes e.g., Dholuo's *oriembo ndiga kochiko kocha* "he is riding a bicycle while heading to that direction" where *kochiko kocha* "while heading to that direction" can be omitted giving rise to *oriembo ndiga* "he/she is riding a bicycle" which is still meaningful. The same can be said of Kiswahili's *yuatembea akielekea kazini* "he/she is walking while heading to work" where *yuatembea* "he/she is walking" remains as a meaningful unit in the absence of *akielekea kazini* "while heading to work"

In so much as the 'S-language flavour' comment by Slobin and the de-ranking of path and its element's proposal in the previous paragraphs would tend to portray these languages (Dholuo and Kiswahili) as typologically Satellite framed-leaning, as observed earlier, caution has to be taken. Unlike Slobin (1996, 2000, 2004) who mostly uses the *frog story*, novels and other *neutral* stimuli, the nature of the stimuli used for data elicitation for this dissertation largely foregrounds manner. As such, a bias for manner description was expected. Despite this, there were isolated cases of path verb use as a main verb. For instance, Dholuo's *ng'at moro be donjo kanyo* "someone is entering there". The verb *dònjó*, (enter) was used apparently because the participant perceived the motion events to be involving boundary crossing. Aside from the single instance of the path verb usage, there were a number of non-manner verbs in the descriptions across all the contexts. Cadierno (2010) and Slobin (2004) observe that V-languages tend to express motion using neutral motion verbs more often than Manner languages. Examples of such neutral English verbs include *go*, *come*, *pass* (though in some literature *pass* is considered a path verb (e.g., Slobin, 2004, p. 239))

The third out of the three types of constructions involved the use of the deictic verbs as the main verbs. For instance, the deictic verb *go* has been discussed in its role as a helping verb occupying the satellite positions in sentences. However, it was also used as a main verb across all the contexts. For example, Dholuo's *ma dhi ngiepo* "this (person) is going to do shopping". The other general verb *pass* was also used a number of times, e.g., Kiswahili's *gari lapita* "the car is passing". In almost all the instances where the neutral or general verbs were used, there was no mention of manner, not in form of a verb or an adverbial. These examples further emphasize that despite the skewed nature of the stimuli towards the use of manner verbs, two issues are apparent. First, there was no 100% manner verb usage in both DEK and L1-Kiswahili languages as the main verb even though the task condition favoured that. Second, despite the bias for manner description, a number of non-manner verbs were used as the main verbs, none of which was followed by a manner verb.

In an S-language, due to the ease of processing burden (Beavers et al., 2010; D. Slobin, 2004) the participants would have used manner verbs as a main verb in almost 100% of the time across the two languages. Further, no path usage would have been witnessed more especially because no boundary was crossed in the manner events stimuli. Lastly, in an S-language environment, were the general/neutral verbs to be used, the saliency of manner would have at least led to the usage of manner verbs outside the main clause.

Before concluding this section, let us briefly discuss the examples from the English context which have remained untouched thus far. Recall that we have argued that were the languages (Kiswahili and Dholuo) to be considered as an S-language, there ought to have been a near 100% manner usage in the main verb. It was observed that in the English context, there was a 91% of main manner verbs, as opposed to the 80%, 83%, and 71% in Dholuo, Kiswahili and L1-Kiswahili contexts, respectively. Further, the data revealed that in the English context, some of the manner and even the general/neutral verbs were more specific as compared to other contexts. So what was different? It has been documented that the English language prefers the use of manner verbs in motion events construal (Daller et al., 2011; Kersten et al., 2010; Papafragou et al., 2002; Slobin, 1996, 2000, 2004, 2005). Whereas the focus is not on the English language per se, it can be argued that the use of English context might have had a hand in the English-like behavior of DEK participants under the English context. Indeed, the literature does reveal the effect of language context on manner and path preference. Kersten et al. (2010) found that Spanish/English bilinguals tested in an English context attended more strongly to manner of motion than Spanish.

The preceding discussion gives a glimpse of the dynamics surrounding motion events construal amongst both DEK multilinguals and L1-Kiswahili speakers. What stands out is the finding that both Dholuo and Kiswahili do not neatly subscribe to Talmy's (2000) bipartite language typological distinction. This is not an isolated case as previous studies have revealed that a number of languages do exhibit both verb-framed and satellite-framed properties. (see Cadierno, 2010; Ji et al., 2011; Slobin, 2004, 2006; Wen & Shan, 2021). In an attempt to solve the problem of inconsistencies in Talmy's (2000) typology as well as quite a number of others, Slobin (2004, 2006) suggests a cline of manner salience classification where languages would be considered either as a low manner salient or high manner salient. He argues that the focus should shift from path to manner since in most investigations; it is the latter that has attracted a lot of attention. The concern with this proposed criterion is that as much as this categorization is based on manner, a feature of motion event that despite its prevalence in many languages is optional in

some, there is still the possibility that the dynamics unique to every language may not be satisfactorily accounted for.

7.6. Motion Event Categorization (Non-linguistic task)

Similar to the verbal motion events construal, the non-verbal categorization task was pegged on the grammatical aspect approach. Unlike in the verbal task, the findings in the non-verbal categorization task failed to support the grammatical aspect approach. The results were not consistent with what would be predicted for aspect languages. We seek to explain the possible reasons why the findings of both aspect languages (Dholuo and Kiswahili) would differ from those of other aspect languages in the non-verbal task.

First, it is important to highlight the predictions for this particular non-verbal task by placing it in the context of previous similar tasks. Bylund et al. (2013) investigated the relationship between grammatical aspect and motion events construal amongst bilingual Afrikaans speakers.

Afrikaans is a non-aspect language. The study found that the more frequently the participants used English (grammatical aspect) the more they behaved like English speakers, that is, by defocusing endpoints. Even though Afrikaans differs from Dholuo in aspectual distinction, the effect of frequency of use of English observed in Afrikaans could be expected in Dholuo, being that Dholuo like English is an aspect language. In fact, it was expected that Dholuo would, to a greater extent than the non-aspect language Afrikaans, exhibit endpoint categorization preferences similar to English.

A similar investigation which shares more contextual background with Dholuo than the Afrikaans study involved bilingual isiXhosa speakers. Bylund & Athanasopoulos (2014) investigation, much like the Afrikaans study revealed that the more frequently the participants used languages with grammatical aspect e.g., isiZulu, Sesotho, Setswana, English etc., the more they behaved like these speakers. Much like the case of Afrikaans before, it was argued that if aspect languages could influence speakers of isiXhosa (a non-aspect language) to behave like them, a similar behaviour could be expected in Dholuo particularly since Dholuo has the advantage of being an aspect language. As already stated, this was not the case.

Going beyond the aspectual distinction between Dholuo and isiXhosa, the aforementioned similar contextual background needs to be explored further. The similar linguistic context referred to is the multilingual setting in which speakers of both languages live and interact. A few similarities arise from such a multilingual context in which isiXhosa and Dholuo were

investigated. First, by virtue of being found in former colonies, both languages have been acquired in linguistic set ups where at least one European language is spoken as national or official languages (Oostendorp, 2012). In the case of isiXhosa, there is English and Afrikaans as official languages in South Africa. The same is true for Dholuo where English is the official language in Kenya. In both instances, English was used as a language of schooling. There was an effect of the medium of instruction in Primary school (English) in the IsiXhosa study that is, those participants who had greater exposure to English were less likely to show high endpoint preferences. Even though the same was not tested in the current study, the similar contextual background was enough ground to predict for an almost similar effect in Dholuo.

Second, both sets of participants knew multiple languages. For isiXhosa, the multilingual environment exposed them to both typologically non-aspect languages such as Afrikaans as well as the aspect languages such as siSwati, Setswana, Sesotho etc. For Dholuo speakers, all the major languages that the participants spoke were aspect languages such as Kiswahili, English etc. The argument informing our prediction was that if the knowledge of cross-typologically distinct languages did not impede the effects of English on the motion endpoint preferences for isiXhosa speakers, then knowledge of languages that all grammatically encode aspectual distinction should have maintained or even accentuated the defocusing of endpoints.

Besides these typological similarities and how they shaped our predictions, there were also interesting contrasting observations that may lay ground for explaining the non-aspect-like behavior of Dholuo. This observation relates to the effect of age of acquisition. Whereas there was a trending effect of this variable in the isiXhosa study, there was a statistically significant effect of the same in the current work. Bylund & Athanasopoulos (2014) argue that the lack of effect of age of acquisition on the isiXhosa speakers was possibly as a result of the context of learning of the additional language. It has been shown that the context of acquisition plays a role in age of acquisition effects. This particularly relates to the nature of acquisition/learning. Lenneberg (1967) suggests that a context where there is *automatic acquisition* through *mere exposure* would be ideal for understanding the Critical Period Hypothesis.

In the isiXhosa study, the distinction between formal and naturalistic learning context especially with regards to the use of English as a language of schooling posed a challenge. Bylund & Athanasopoulos (2004) argue that since English was used almost entirely during the participants' schooling, it was difficult to differentiate between the natural and learning context. Considering Muñoz's (2006) take that age of acquisition hardly influences the utmost attainment of

proficiency in foreign language contexts, it is difficult to tell whether the context appeared formal and foreign to the participants or that it seemed natural. The confusion surrounding the learning context might have led to the lack of age effects observed in the isiXhosa study.

Since the multilingual set up in schools in the Kenyan context mirrors that of the South Africa especially regarding English as a the language of schooling, it would be expected that the same challenge regarding the natural versus foreign contexts would equally be observed in the current study. However, unlike in the isiXhosa case, there was a significant effect of Dholuo speaker's age of acquisition for both Kiswahili and English. Subsequently, it would be expected that the age effects may influence cognitive behaviour through its impact on language proficiency (e.g., Bylund, 2009; Bylund & Athanasopoulos, 2014b). Meaning, the earlier the participants acquired Kiswahili and English, the more they would be proficient in them. Greater proficiency in Kiswahili and English would likely lead to cognitive restructuring which would be reflected in the eventual defocusing of endpoints. Ironically, the age effects of Kiswahili and English influenced the DEK multilinguals to encode more endpoints.

I attempt to explain the consistent non- aspect-like behaviour of Dholuo, and by extension L1-Kiswahili, in the following manner. The major difference between Dholuo and Kiswahili on the one hand and isiXhosa and Afrikaans on the other is that the former as opposed to the latter are aspect languages. The common denominator between the two groups is the L2-English. Whereas its effect is significantly felt by the non-aspect group, it fails to influence the apparently similar typologically aspectual group. CG explains that since grammatical aspect distinguishes between maximal and immediate viewing scope, its absence means such a distinction will be less prominent, leading to the construal of events as one whole bounded unit. For IsiXhosa and Afrikaans, the learning of and frequently using English and other aspect languages (in the case of the former) rectifies this supposed language's problem in the manner that has been explained in the preceding sections. What CG and most other research from the literature fail to explain is what happens when an L1 exhibits grammatical aspectual properties differently from an L2 and an L3.

Dholuo marks aspect tonally, distinguishing between the progressive and the perfective. Kiswahili marks aspect by inflection and compound construction resulting into about five different aspectual distinctions. English marks aspect using the auxiliary *be* plus the prefix *-ing*. Typologically, all three are classified as aspect languages but their individual aspectual

organizations are different. As Bylund et al. (2013) argues, each of these languages has different time schemas.

One possibility is that in the multilingual mind these time schemas are represented as a unified conceptual category that is completely different from the single distinct schemas – a process called conceptual convergence (Jarvis & Pavlenko, 2008; Pavlenko, 1999, 2005, 2014). In fact, Jarvis & Pavlenko (2008, p. 164) consider the process as more of divergence than convergence because of the completely different and almost opposite resultant cognitive category. Despite each time schema being responsible for differently foregrounding the immediate temporal viewing scope in their respective languages, when they join up, the resultant category differs considerably from the constituent categories. In this context, the difference must have been in the sense that the new time schema foregrounded the maximal viewing frame that led to a behaviour similar to that of non-aspect languages. As far as age effects are concerned, the new category seemed to be more salient with age hence the observed tendency to mention endpoints with increase in age. The reason for this is because the unified conceptual category must have been developed at some point during the participants' childhood. As they grew older, they were exposed more to the three languages either in school or other social and linguistic environments. More exposure meant more proficiency not only in Dholuo, English and Kiswahili, but in the unified conceptual category as well. Since proficiency correlates with frequency of use, the frequent and alternate use of these languages meant more saliency of the merged grammatical category.

The case of conceptual convergence amongst bilinguals within the domain of motion event has been evidenced elsewhere. In a study involving Spanish -Swedish bilinguals, Bylund (2011) reports an integrated pattern in events' segmentation for the L1 and L2 that fell in between the two monolingual groups, demonstrating a case of convergence.

Going by the argument advanced in the previous paragraphs, the relevant time schemas for Dholuo, English and Kiswahili converge to form a unified whole different from the individual ones. The same can be said to be true for the L1-Kiswahili that is, relevant time schemas from Kiswahili, English and any other third most probably local Bantu language closely related to Kiswahili would merge. The matter of concern from this argument would be why the same convergence effects were not manifested at the linguistic level. Admittedly, the contrasting findings between the two levels do go against the linguistic typology's motion events' prediction for Dholuo and Kiswahili, but this should not be surprising.

Notice that the position advanced in this dissertation has been of a clear divide between the linguistic and the non-linguistic level, a position that is supported by among others Athanasopoulos & Bylund (2013b), Daller et al. (2011), Lucy (1992, 1997) and Pavlenko (2011). This has informed the decision to use different theoretical approaches specific to each level. For instance, the TFS model has been used to interpret the linguistic findings of both the spatial frames and the motion encoding tasks. The complementary CG approach mentioned earlier was specific to interpreting the outcomes of the motion non-linguistic tasks. If, despite the different theoretical lenses applied to each level, the outcomes between the two levels tally, then we would infer evidence of linguistic relativity in the language (Lucy, 1997), contrary to which such evidence would be ruled out. As stated, it is possible for language specific effects on conceptualization to be evidenced at the linguistic level but not at the non-linguistic level, primarily because these are two different levels of mental representation (Athanasopoulos & Bylund, 2013b, p. 94).

Particularly for our case, the TFS interpretation of the motion events encoding as discussed previously has revealed proof of conceptualization at the time of speech which is evidence of relativity effects at the linguistic level. The CG interpretation of merged time schemas unified into a distinct category has revealed an outcome that goes against the expected behaviour. Failure of Dholuo and Kiswahili to align with the typological prediction of aspect languages most probably shows that the feature of the language tested (grammatical aspect) has no similar effects in Dholuo and Kiswahili like it does in other aspect languages. Such lack of effect of a language property on cognition reveals insufficient evidence of linguistic relativity at the non-linguistic level. On the basis that these two levels of representations must not necessarily ‘agree’, the question of lack of convergence effects at the linguistic level ceases to hold.

7.7. Effects of language context

The role of language mode was crucial to the findings of the spatial reference frame. Two sets of participants were tested using Dholuo for one set and English for the other. Besides the spatial reference frames investigation, the role of language context in the motion event categorization was equally tested. Here, the investigations were carried out across Dholuo, English and Kiswahili contexts.

In both the spatial frames and the motion events tasks, there was no significant effect of language context. In the case of spatial reference investigation, the multilingual setting in which the DEK participants interacted and schooled could be one of the factors that led to the lack of effect of

language context. This interaction took place from as early as age four; meaning Dholuo, English and Kiswahili were acquired almost simultaneously. Such a shared context of language acquisition coupled by an almost equal and alternate usage of the three languages may have significantly reduced the effects of language context. Were it that at such an early age, English-only restriction was imposed in the schooling environment as it happens in most boarding secondary and private schools in Kenya, the case could have been different. In that instance, the context for English acquisition and use would have differed from that of Dholuo and Kiswahili (Ameel et al., 2005; Kersten et al., 2010)

Second, as hinted to in the previous paragraph, not only was the acquisition context shared but the usage context as well. It is a common occurrence for all three languages to be used during a conversation through code switching, code mixing or both whether in school, home or other social contexts. When this happens from an early age, it is most likely carried on to adulthood. For instance, during the task administration exercise, despite prior instructions on which language to use, some of the participants occasionally drifted from the intended language and were only jolted back by the experimenter. It can be argued that if while speaking Dholuo, they would seamlessly and probably unconsciously drift to English and back then it might indicate that the language context divide has thinned rather considerably.

In the case of motion event construal, the lack of influence of language context might have been as a result of the grammatical aspectual distinction of the three languages. As previously stated, all three languages are aspect languages. Despite the unique way in which each of the three languages grammatically mark aspect, the denominator is that they all tend to foreground the ongoing phase of events. It is highly likely that this preference may not be altered with a change in context due to the similarity in the focus given to the immediate viewing frame of the event. In addition to the shared grammatical category, the social aspects of language use detailed for spatial frames in the previous paragraphs may as well be the reasons for the null effects of language context for the motion event construal.

7.8. Multilingual experience: Proficiency and frequency of use

As reported in the previous chapter, language proficiency and frequency of language use did not affect patterns of motion event construal and categorization. This was true for Dholuo, English and Kiswahili languages both at the linguistic and the non-linguistic levels of investigation. A possible reason for this would be because of the inadequacy of the self-report design. The participants used self-reports to approximate their language proficiency and frequency of use. It

has been argued that self-reports have the shortcoming of potential subjectivity by the participants (Bylund & Athanasopoulos, 2014a, 2014b). Such a limitation may render such responses unreliable.

The findings do indicate that there was a correlation between language use and language proficiency more so for the group that performed the non-linguistic motion event task. Since language proficiency correlated with the frequency of use it is possible that an unreliable response on proficiency means the same for frequency of use.

It can be further argued that since Dholuo, Kiswahili and English were possibly acquired simultaneously, they bear almost similar proficiencies and are used alternately (see section 7.4), null effects of the features of multilingual experience across all three languages were largely expected.

7.9. Conclusion

The chapter has discussed the findings that were analysed in chapters five for spatial frames and chapter six, for motion events. The highlights of for the spatial frames findings is the linguistic promiscuous state of Dholuo that accounts for the unrestricted availability of FoRs in the language and also explains the inconclusive results from the mirror images experiment. For the motion event, the failure of the non-linguistic tasks to reflect the findings on the linguistic tasks has been attributed to the possible conceptual convergence of the three languages' grammatical categories. These conclusions and a number of others have attempted to situate the investigation of spatial reference frames and motion event in DEK multilinguals within the current psycholinguistic research framework.

The next chapter provides a conclusion for the study in this dissertation.

CHAPTER 8

CONCLUSION

8.1 Chapter overview

This chapter begins (section 8.2), with a chapter by chapter recapitulation of the discussions within the study. Subsequently, section 8.3 provides an overall conclusion of the study as anchored on the three pillars of; levels of investigation, study design and theoretical frameworks. The section then spells out how the research questions have been addressed, before summing up the entire study in terms of whether there is proof or not of relativity effects in Dholuo. The penultimate section (8.4) highlights the study's limitations. The chapter concludes with section 8.5, in which recommendations for future studies are stated.

8.2 Summary

The study adopted a multifaceted approach aimed at investigating proof of relativity effects in multilingual Dholuo speakers. Broadly, the study sought to open up and shed light on the unexplored domain of multilingual cognition from not only amongst the non-WEIRD Dholuo population but other citizenry within the Kenyan linguistic sphere. These aims were concretized into four research questions hereby restated;

- i) What is the relationship between Dholuo verb aspect and motion event categorization in DEK multilinguals?
- ii) To what extent does language context influence DEK multilingual's choice of spatial frames of reference?
- iii) To what extent do features of multilingual experience such as proficiency and frequency of use influence patterns of construal and categorization
- iv) Do the domains investigated in Dholuo within this study yield the same results documented for other languages with similar linguistic categories?

The research questions reveal core features of the study such as grammatical aspect, spatial frames, the multicompetent mind as well as the umbrella concept of linguistic relativity. Specially, the study was configured into a two-pronged research enterprise involving spatial frames and motion event as the major points of investigation. The above mentioned core features and other related concepts were introduced and contextualized in chapter two. Here, the relevant background literature of these concepts was reviewed foregrounding the previous findings which form the basis for the prediction of the current study's outcomes. Particularly, the literature

revealed an interaction between linguistic relativity and multilingualism across a number of domains such as time, colour, object categorization, spatial frames, motion etc. Expectedly, these cross-domain studies were aligned with specific conceptual frameworks some of which were highlighted and analysed in chapter three.

The tenets of the theories that buttress the study were introduced, defined and explained in chapter three. Each theoretical framework was tied to the aforementioned core aspects of the study. For instance, through the lenses of TFS all the findings at the linguistic level across spatial frames and motion events extending through to multilingualism were interpreted and discussed in later chapters. Another approach expounded in chapter three was the grammatical aspect hypothesis, which provides a theoretical template for investigating the relationship between grammatical aspect and motion events, as echoed in the first research question. The conceptual underpinnings of linguistic relativity, spatial frames as well as multicompetence were also explained. Both the reviewed literature in chapter two and the theoretical framework in chapter three formed a backbone to the study modelling it into an empirical enterprise as expounded in chapter four.

A cross-sectional experimental design effected through comparison groups was presented and the rationale for its choice spelt out in chapter four. Details of the quantitative research methods were recorded in this chapter, especially regarding the two major investigation points of spatial frames and motion events. Both spatial frames and motion event investigations had experimental tasks unique to them which called for specific methodologies. Each of these tasks and the manner of their execution were described. Additionally, the details of the participants such as their linguistic background (L1 Kiswahili and the DEK groups), their number, the tasks they participated in and the reasons for their selection were also explained. The chapter also delineated the process of analysing and interpreting the findings, giving reasons for the choices of such processes, in order to arrive at meticulously collected and processed sets of data. Findings from these datasets were analysed, interpreted and discussed in the chapters that followed.

The findings in chapter five were specific to the spatial frames experiments. A two-tier analytic approach was adopted – a macro level and a micro level. The macro level approach focussed on the choice and usage of spatial reference frames by the DEK multilinguals across English and Dholuo contexts. Descriptive analysis was used both for the linguistic and the non-linguistic experiments. Through tables and graphs, the results of the choice of spatial frames from the experimental tasks were presented. Every finding was accompanied by relevant examples drawn

from the data set. For every example that backed up a finding, an interpretive explanation was given. The results were then interpreted via inferential testing using logit mixed statistical modelling techniques. Here, the statistical significance of the results was interpreted and explained. The chapter further detailed the findings at the micro level where the types of spatial frames of reference were analysed both descriptively and through inferential statistics. Similar to the macro level, these analyses were accompanied by relevant examples that gave context to the findings. Further interpretation and analyses were undertaken in chapter six

The results of the investigation from motion events were documented in chapter six. Here, data from both the verbal and the non-verbal tasks were presented and summarized descriptively through graphs and tables. Unlike in the spatial frames tasks which involved DEK participants across Dholuo and English contexts, the investigations of motion events included both DEK and L1-Kiswahili participants. Additionally, these investigations were carried out across Dholuo, Kiswahili and English contexts for the DEK group and in Kiswahili for the L1 Kiswahili group. Similar to the previous spatial frames analysis, examples were used to contextualize and explain the findings from the data set. Specifically, the chapter recorded exemplified illustrations of aspectual forms and usage of the verbs as well as the nature (manner or path) of motion verbs used. The results from both chapter five and six were discussed and further interpreted in chapter seven

In chapter seven, a discussion of all the interpreted findings from both the spatial frames and the motion events investigations was recorded. First, was a systematic discussion of the results from the photo-object linguistic task patterned along the UU, UF and FF categorization scheme. This was done across the location, figure orientation and ground orientation spatial platforms. The same line of discussion was extended to the findings of the spatial non-linguistic investigation (mirror image task). The section for the spatial frames was concluded by an in depth explication dubbed *general discussion* section where the current findings were contextualised in view of the TFS and the previous research findings.

Part two of chapter seven discussed the findings of the motion event categorization tasks. Results relating to the linguistic motion encoding tasks were discussed along both the tenets of TFS and grammatical aspect approach. Previous findings on aspect languages provided a background for situating the tendency of Dholuo and L1 Kiswahili to encode less endpoints. A further discussion on the aspectual properties of verbs and the manifestation of manner and path verbs of both L1 Kiswahili and Dholuo followed. The discussions revealed in part that more manner verb usage was evident but that was no indicator that both languages were S-languages. Following this was

a discussion of the findings of the non-verbal motion categorization tasks. It revealed a non-aspect language-like behaviour for Dholuo and L1 Kiswahili. Reasons for such an apparent *deviant* behaviour were suggested. The chapter concluded by a report detailing the possible reasons for the null effects of the language conditions and multilingual experience from both experimental tasks. The chapter ushered in the final chapter (8), where conclusions based on these discussions were drawn and tied to the research questions.

8.3. Conclusion

The desire to make meaning of the linguistic spatial environment of a Dholuo speaker ignited my drive to pursue research in linguistic relativity; first at the near monolingual level (Ogelo, 2017) and now at the multilingual level. The bipartite approach of stasis (spatial frames) and kinesis (motion) was intended to capture, in a broad and representative way, the spatial realm of Dholuo speakers. To achieve this, three interrelated issues were addressed.

First, the research was conducted at two levels of mental representation - the linguistic and the non-linguistic levels. The linguistic level investigation was important because it focussed on the conceptualisation process at the time of speech verbalization, as per the thinking for speaking hypothesis (Slobin, 1996, 2000, 2004, 2005). There was a need to understand what thought process a Dholuo multilingual speaker harboured at the time of either picture stimuli description or motion event description. Further, results at this level of investigation served as a template upon which the non-linguistic level findings would be interpreted. The reason for this is because however distinct these two levels of mental representations are; there is a connection between them by virtue of amongst other things, the language that the individual speaks. The non-linguistic level investigation was equally important as it was meant to reveal the effects of the linguistic attributes under investigation on cognitive processes. This, when successfully addressed, would be the clearest indication of evidence of relativity effects (Lucy, 1992a, 1992b, 1997).

Second, both levels of investigation were conducted through experiments. The photo-object task, the mirror image task, the verbal motion event encoding task as well as the non-linguistic motion event categorization tasks were sound empirically tested experimental approaches that had been successfully implemented elsewhere. Further, there was a leeway for task modification to suit the uniqueness of Dholuo language and Dholuo participants in what I would call the non-WEIRD modification. This latitude saw an enhancement of the photo-object task to incorporate local objects for the picture stimuli. Their design slightly differed from the design of picture stimuli in

previous studies. The new design added the UU and the FF categories to the traditionally used UF category, expanding the spatial frames research base to three up from one. The spatial platforms were equally increased from the location-only investigations to the location, the figure and the ground orientation investigations. These expansions meant more data, more interpretation dynamics and a deeper understanding of the DEK multilingual. A blend of the tried and tested empirically nuanced methodologies with the novel methodological enhancements provided a platform for understanding the multilingual Dholuo speaker from both an external (via comparisons with other languages) and internal perspective.

Lastly, the results were interpreted and discussed within the most current and relevant theoretical constructs in psycholinguistics studies. The application of the theories to the findings of the current work was most notable in the linguistic level investigation results. Particularly, the TFS was used to explain the conceptualization mechanisms that took place as a speaker described a picture stimulus in Dholuo or English. TFS posits that for a speaker to prefer a particular FoR, it has to be relevant and readily available. Such ready availability is believed to be as a result of saliency of that spatial frame in the mind of the speaker. This saliency is in turn tied to the frequency of use of the language that harbours that particular FoR.

The TFS lenses were extended to the linguistic motion event encoding tasks. Here, the saliency proposition accounted for the preference of the progressive aspect by Dholuo speakers. This in turn translated into the tendency to mention less endpoint. Another theoretical framework, the grammatical aspect hypothesis (Stutterheim, 2003; von Stutterheim et al., 2012; von Stutterheim & Nüse, 2003), was used to affirm the correlation between the saliency of the progressive aspect in Dholuo speakers and their increased likelihood to decode endpoints. As such, Dholuo exhibited traits similar to those of other aspect languages. Lastly, the cognitive grammar framework (Langacker, 1987, 2000, 2008) played a key role in interpreting the results of the non-linguistic motion events categorization. Through the theory, it was realized that the time schemas associated with Dholuo, Kiswahili and English which would ordinarily bear the immediate viewing scope, appeared to be merged, in a process of convergence. This led to the creation of a completely different time schema which showed behaviour similar to that of non-aspect languages. As such, Dholuo at the non-linguistic level failed to conform to the grammatical aspect hypothesis for motion event categorization.

Having addressed the three principal issues upon which the study is anchored, I seek to respond to the four research questions of the study as follows:

In response to research question one, Dholuo typologically falls under aspect languages. The reason for this is because Dholuo grammatically marks aspectual distinctions on an obligatory scale. It does so by way of tonally differentiating between the progressive and the perfective aspect (Okombo, 1997; Owino, 2003; Stafford, 1967). According to the already mentioned grammatical aspect hypothesis, languages that grammatically encode aspect tend to defocus motion event endpoints. Previous research involving typological aspect languages such as English (Athanasopoulos & Bylund, 2013a) and Arabic (von Stutterheim & Nüse, 2003) have reported results that support the grammatical aspect hypothesis. Since the current participants were multilinguals, there was need to consider the aspectual properties of the other languages. It was therefore expected that the DEK speaker would defocus endpoints in the linguistic motion event encoding task.

The findings and discussion from chapters six and seven reveal that indeed this was the case. I therefore conclude that within the domain of motion event, DEK multilingual speakers defocus endpoints at the linguistic level. The reason for this, as explained previously through TFS, is arguably due to the progressive aspect which tends to zoom in the viewing frame of the speaker on the ongoing phase. The saliency of the progressive aspect engraves it in the minds of the speakers thereby making it readily available for use whenever necessary. This behaviour aligns with the grammatical aspect hypothesis. Dholuo thus behaves like other typological aspect languages. In this regard, we confirm relativity effects in the domain of linguistic motion event in Dholuo. The study also confirms that L1-Kiswahili bilinguals defocus endpoints in motion event description at the linguistic level. As such, they exhibit traits similar to speakers of other aspect languages when describing motion event. I thus conclude that Kiswahili too foregrounds the immediate viewing frame during motion event description. As in the case of Dholuo, relativity effects are evidenced at the linguistic level.

The prediction that speakers of an aspect language would prefer to focus on the ongoing phase of a motion event was applied both at the linguistic and the non-linguistic level. However, the findings from this dissertation reveal that DEK multilinguals failed to conform to the predicted aspect language-like behaviour at the non-verbal level, instead showing traits of non-aspect languages. Specifically, both DEK multilinguals and L1-Kiswahili speakers categorized the tasks' target alternate to the [+endpoint] alternates more than a typical speaker of an aspect language would. An interpretation based on cognitive grammar (Langacker, 1987, 2000, 2008) revealed a possible case of convergence. That is to say, the distinct time schemas from Dholuo, English and Kiswahili might have formed a unitary time schema different from those of the

individual languages. This new time schema is so different from its constituents that it foregrounds a maximal viewing frame instead of an immediate viewing frame.

From the literature, relativity effects are considered to be present when a language feature exerts a measurable effect on a cognitive process. In the case of the current dissertation, a grammatical aspect restricting the speakers' viewing frames to the ongoing phase of a motion event would be an indicator of linguistic relativity. When this expectation is not met, no relativity effects are deemed to have been observed. I conclude therefore that despite a possible case of convergence as a result of the multicompetent mind, there was no sufficient evidence for relativity effects at the non-linguistic level of motion event categorization. This conclusion applies first to the DEK multilinguals in response to research question one, and secondly to the L1-Kiswahili participants.

In response to research question two, both the linguistic and the non-linguistic spatial reference tasks were carried out under two language conditions, Dholuo and English. Following the discussions in chapter seven, I conclude that there was no effect of language context on the choice of spatial frames of reference at the linguistic level. Similarly, language condition did not affect the mirror image categorization. The major reason for this ineffectual role of language context was possibly due to the multilingual social and schooling environment in which the DEK participants grew up in. Early exposure to all three (Dholuo, Kiswahili and English) languages meant they were almost acquired simultaneously. This means that the languages were not only acquired at the same time but used almost equally within their social circles. Such equal and alternate use of different languages might have led to breaking of the languages' contextual boundaries resulting into null effects such the ones witnessed in this case.

Besides language context, the spatial frame's investigation revealed the notion of referential promiscuity. This concept accounted for the availability of all types of spatial reference frames in Dholuo with no particular one as a default frame. Dholuo therefore is a linguistically promiscuous language, a state that the language presumably acquired over time. The multilingual state of the DEK participants only works to reinforce this state and cannot be authoritatively said to cause it. The referential promiscuous state allows Dholuo to choose from a variety of FoR, one that would fit the conceptualization of a spatial scene. The fact that Dholuo, unlike other languages such as Guugu Yimithirr, allows for unrestricted availability of FoR is indicator of evidence of linguistic relativity at the linguistic level. Further, according to TFS, there is a thinking that takes place at the time of describing a picture stimulus. This conceptualization subtly reveals relativity effects as it is defined by the obligatory categories of the language. On

this basis, I conclude that there is possible evidence of linguistic relativity at the linguistic level courtesy of the referential promiscuous state of Dholuo. I further affirm that the study attributes the inconclusive findings of the non-linguistic spatial frames' tasks to this referentially promiscuous state of Dholuo, a position that was similarly taken in the study of Yucatec (Bohnenmeyer, 2011).

In response to research question three; the study finds no influence of the features of multilingual experience (proficiency and frequency of use) on patterns of construal and categorization of motion event. The sole reason for this would be because of the potential subjective nature of the self-reports which renders them unreliable in gauging the accurate proficiency level of the participants. Since proficiency correlates with frequency of use, unreliability in the former may mean the same for the latter.

In response to research question four; the study investigates the domain of space. Specifically, the focus has been on the sub-domains of motion event construal and spatial frames. To start with, in the motion event task, previous studies involving aspect languages such as English (Athanasopoulos & Bylund, 2013a) and Modern Standard Arabic (Flecken et al., 2014) have shown results that are compatible with the grammatical aspect hypothesis. The same was true of Dholuo at the linguistic level. However, at the non-linguistic level, the results from the current study failed to compare with results from other aspect languages. I conclude therefore that the findings on Dholuo's linguistic categories in this study do compare with the findings on similar linguistic categories in other languages only in specific instances but not wholesomely.

For the linguistic spatial frames investigations, the use of the UU, UF and FF approach was unique to this study. Traditional research on spatial frames has mainly used the photo-photo *man and tree game (M&T)*. Most current research on spatial frames have used the *ball and chair task (B&C)* to investigate spatial frames. In both the M&T and the B&C tasks, the underlying design is that of a combination of an unfeatured (tree, ball) object and a featured (man, chair) object to form a (UF) stimulus. It means therefore that despite both the M&T and the B&C tasks being photo-photo tasks, they still do compare to our photo-object UF task.

Similar linguistic categories as stated in the research question were interpreted to mean the following; (a) the presence of a default spatial frame (b) the general presence of spatial frames. Regarding (a), an earlier research (Ogelo, 2017), had shown that Dholuo tends to prefer the intrinsic FoR. The current work has shown that the object centred frame (intrinsic) is only preferred in particular tasks but Dholuo utilizes other FoRs in performing other tasks. Similarly,

a previous study (Pederson et al., 1998) had classified Kilivila as exclusively intrinsic. However, a later study on the same language (Senft, 2001) revealed that Kilivila prefers the intrinsic frame in particular contexts but might as well utilize other FoRs in other contexts. It is from this perspective that both Dholuo studies and the Kilivila compare. Regarding (b), a number of studies, such as Báez (2011), Garza (2011), O'Meara & Báez (2011), Romero-Méndez (2011) and Soto (2011), that used the B&C tasks revealed the presence of more than one FoR as did Dholuo. Additionally, two specific studies (Bohnenmeyer, 2011; O'Meara, 2011) reported the evidence of referential promiscuity in Yucatec and Seri languages respectively as did Dholuo. As for the mirror image task, a similar investigation amongst the Mopan (Danziger, 2011) showed a connection between the intrinsic state of language and their categorization of mirror images as similar; this result differed with the results in the current work.

To sum, it is not lost on me that the study's title generally refers to investigating evidence of linguistic relativity in Dholuo. I have demonstrated that there are pockets of evidence of relativity effects in both spatial frames and motion events particularly at the linguistic level. That said, going by Lucy's (1997) and Levinson's (2003, 2004) assertion that evidence of linguistic relativity in a language is best demonstrated by proof from a non-verbal task, the domains investigated in the current study involving the DEK multilinguals do not show robust evidence of linguistic relativity.

8.4 The Limitations of the study

In this section, some of the major shortcomings observed particularly concerning the investigation involving spatial frames of reference are highlighted. First, the exploratory nature of the spatial frames' investigation was important as it exposed a rich array of linguistic descriptions within table top space which would otherwise have not been achieved with the traditional M&T game approach. However, its downside was that it may compromise the possibility to directly compare the current findings to findings from previous studies. This, in turn, can make it difficult to properly situate our findings within the larger spatial frames investigations.

Second, the majority of spatial frames investigations in the literature involve participants who use one language for their everyday interaction. Most of this population reside in the rural areas. Our study used multilingual college students. While this approach is equally productive, a credible comparison across dissimilar social backgrounds could not be possible.

Lastly, there is no empirically tested and proven approach in the literature that is specifically designed to investigate spatial frames at the non-linguistic level for languages that do not traditionally have a default system. The tasks available such the *mirror images task* (for default intrinsic uses) and the *new animal-in-a-row task* (for default extrinsic users) can only be used for exploratory purposes when used with languages with unrestricted availability of FoR. As such, the findings from the mirror images task employed in the current study were inconclusive. It is therefore not possible to prove with certainty if such languages exhibit evidence of linguistic relativity.

8.5 Recommendation for future research

This section proposes possible research areas that are connected to this study but have not been addressed. First, the study focussed on the sub-domains of spatial frames and motion event. A more complete investigation would include other spatial sub-domains such as topological relations and deictic expression. When considered in totality, the spatial sphere of the Dholuo speaker would be adequately addressed.

Second, the study reveals a rich system within the spatial domain. It would be interesting to explore other domains such as colour and time. More so, because most previous studies on space have yielded interesting related and unrelated results from the same languages in colour and time domains.

Third, the study is restricted to DEK college students which was important since the findings (for motion events) could easily be compared to other participants with similar educational backgrounds. An exploratory investigation involving individuals in rural areas who use Dholuo most of the time, akin to the Mesospace space project amongst the Mesoamericans, would be worth exploring especially for the frames of reference investigations

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APPENDIX A Tables and stimuli for spatial frames task**i) Summary of object Combination (photo-object task)***Summary of object combination*

		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	Sagittal placed net left of tree
	5	PFNFAP	pole	tree	Pole in front of net placed transversely
	6	TFNFAP	tree	net	Tree front of net placed transversely
Category 2		Stimuli			Featured- Unfeatured (FU)
	1	MFABFT	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
Category 4		Stimuli			Featured-Featured (FF)
	1	BATTA	ball	table	Ball on top of the table
		BOTTA	bottle	table	Bottle on top of the table

ii) Photo-object Picture Stimuli

BAFNV



BABT



BAFTFAF



NLTV



PFTFAF



TFNFAF



MFAFBT



MLTFAF



MFTFAR



MLTFAAFT



MRFAT



MRTFABA



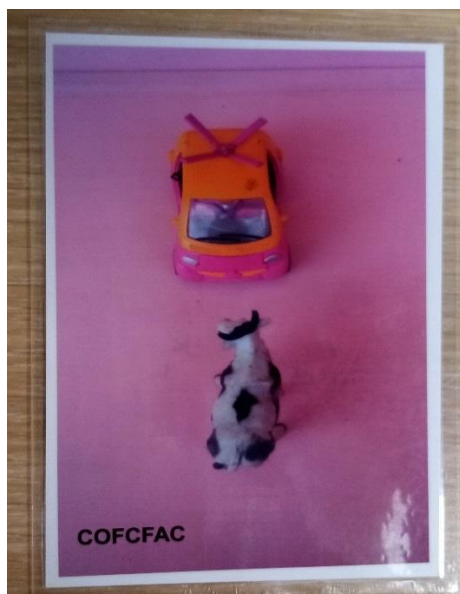
COBHFABA



BFAFRCFAR



COFCFAC



LAF AFLCOF AF



BFAFFCB



COFALHFABA



BATTA



BOTTA



APPENDIX B Mirror image procedure, templates and stimuli

i) 3D LEGO® toy plastic building bricks specification and detailed procedure

The bricks are of various colours. They have protuberances that have a standard diameter of 4.8mm. The blocks differ in sizes depending on the number of protuberances on each block. The number ranges from a single protuberance per block to a 4x2 block (see picture stimuli in part ii below).

The longest block we had in our sample was a rectangular 4x2 block which appeared too short, we therefore permanently joined two 3x2 blocks to form a single 6x2 block. We had two such red 6x2 long blocks. There were also two yellow and two blue 4x2 blocks, two yellow 3x2 blocks as well as six 2x2 blue blocks. Additionally, there was a large number 2x1 blue blocks. For the practice trial, we had two 4x2 green blocks and two 3x2 grey blocks plus four 2x2 black blocks.

NB: I am aware that the interpretation of the terms used to describe directions and arrangements of objects in space do differ. I choose therefore to define how these terms have been used in this study. Any interpretation arising from the description in the mirror image task should therefore be made in line with the meanings attached to these terms herein.

- Assume that you are seated on a chair with a table in front of you. The object manipulation takes place on the table in front of you.
- The left side or leftwards is the side that is aligned to the region of your body that is traditionally assigned left. Any object to the left is considered so from your perspective, that is, in reference to how you are seated.
- The right side or rightwards is the side that is aligned to the region of your body that is traditionally assigned right. Any object to the right is considered so from your perspective, that is, in reference to how you are seated.
- When an object is placed in a *sagittal position*, it means that it is directly aligned with your body such that one end of the object is closer to you while the other extreme is furthest away from you.
- When an object is placed in a transverse position, it means that it is placed across from you such that one end is to your left (with reference to how you are seated) and the other end is to your right (with reference to how you are seated)

Practice trial 1

- i) One 4x2 green piece of block placed on the sagittal plane. Two 2x2 black blocks piled together stuck at the extreme end (furthest end away from the investigator). On top of the black pile was placed a single grey 3x2 block so that it only covered two of the four protuberances of the top black square. The grey block atop the black pile is jutting rightwards.
- ii) The same as the first arrangement except that the 3x2 grey block extends leftwards

Practice trial 2

- i) One 4x2 green piece of block placed on the sagittal plane. Two 2x2 black blocks piled together stuck at the extreme end (furthest end away from the investigator). On top of the black pile was placed a single grey 3x2 block so that it only covered two of the four protuberances of the top black square. The grey block atop the black pile is jutting right wards.
- ii) The same as the first arrangement.

Practice trial 3

- i) One 4x2 green piece of block placed on the sagittal plane. A 3x2 grey block is placed on top of the green block covering the first 3x2 region of the green block extending from the investigator. On top of the grey block, a stack of two 2x2 black blocks is placed covering the first 2x2 area of the grey block from the investigator.
- ii) One 4x2 green piece of block placed on the sagittal plane. A 3x2 grey block is placed on top of the green block covering the first 2x2 region of the green block extending from the investigator so that it juts leftwards. On top of the grey block, a stack of two 2x2 black blocks is placed so that the right and the side facing the investigator of the three blocks all align smoothly with one another.

Practice trial 4

- i) One 4x2 green piece of block placed on the sagittal plane. A 3x2 grey block is placed on top of the green block covering the first 3x2 region of the green block extending from the investigator. On top of the grey block, a stack of two 2x2 black blocks is placed covering the first 2x2 area of the grey block from the investigator.
- ii) Same as in (i)

Actual trial 1

- i) One long 6x2 red piece placed in a sagittal position. A pile of three 2x2 blue blocks stacked together at the extreme end (furthest end away from the investigator)
- ii) Same as in (i)

Actual trial 2

- i) One long 6x2 red piece placed in a sagittal position. A yellow 4x2 piece of block placed transversely midway atop the red piece so that 2x2 area on the red piece are left uncovered from either end. On top of the yellow piece, a 2x2 blue piece is placed at the centre leaving out two yellow protuberances each on the left and on the right.
- ii) One long 6x2 red piece placed in a sagittal position. A yellow 4x2 piece of block is placed in a sagittal position on top of the red piece at the end (closest to the investigator) so that the end of the yellow piece aligns smoothly with end of the red piece. A blue 2x2 piece is centred atop the yellow piece.

Actual trial 3

- i) One long 6x2 red piece placed in a sagittal position. Four pairs of 2x1 blue blocks stacked together at the end (closest to the investigator) of the red piece. The stack of blue pile occupies a 2x2 area of the 6x2 red piece. A 4x2 yellow piece is placed on top of the blue pile so that it covers the entire top, while jutting leftwards.
- ii) A mirror image of (i)

Actual trial 4

- i) One 4x2 long blue piece of block place in a sagittal position. Another 4x2 yellow piece placed on top of the blue piece covering its entire top. A final 2x2 blue piece centred atop the yellow piece.
- ii) Two 2x2 blue pieces of blocks placed in a sagittal position with a space in between. One 4x2 yellow piece placed on top of the two blue pieces such that the two inner protuberances of the two blue blocks are covered with the yellow block preserving the space in between the blue blocks. A blue 2x2 piece is centred on top of the yellow block

Actual trial 5

- i) A 4x2 piece of blue block place in a sagittal position. Another 4x2 yellow piece placed on top of the blue piece in the same sagittal alignment covering its top entirely. A 2x2 blue piece is centred on top of the yellow piece.
- ii) The same as in (i)

Actual trial 6

- i) One long 6x2 red piece placed in a sagittal position. At the extreme end (furthest from the investigator) of the red piece, a stack of three pairs of 2x1 blue blocks is placed covering an area of 2x2 of the 6x2. At the end of the red piece closest to the investigator, a 4x2 yellow piece is placed atop such that both the a 2x2 area on the left and on the side closest to the investigator align smoothly with the yellow piece which juts to the right. A stack of two 2x2 blue blocks is placed on top of the yellow piece covering the 2x2 area of the yellow piece that aligns smoothly with the lower red piece.
- ii) The mirror image of (i)

Actual trial 7

- i) Three piles of three 2x1 blue blocks are arranged to form a 3x2 block. A 6x2 red piece is placed on top of the blue pile in a sagittal position such that the extreme 3x2 end (furthest away from the investigator) of the red piece covers the entire 3x2 top of the blue blocks. The red piece therefore extends towards the investigator. A 4x2 yellow piece is placed atop the red piece so that the 2x2 end of the red piece closest to the investigator is covered entirely and aligns smoothly with the yellow piece. The yellow piece extends to the right.
- ii) The same as in (i)

Actual trial 8

- i) One long 6x2 red piece placed in a sagittal position. A yellow 4x2 piece of block placed transversely midway atop the red piece so that four protuberances on the red piece are left uncovered from either end. On top of the yellow piece, a 2x2 blue piece is placed at the centre leaving out two yellow protuberances each on the left and on the right.
- ii) The same as in (i)

Actual trial 9

- i) A blue 3x2 block placed on a sagittal orientation. A 4x2 yellow piece is centred on top of the blue piece covering a 2x2 area leaving out a 2x1 region on the right. A 2x2 blue block is balanced on top of the yellow piece at the extreme 2x2 area (furthest away from the investigator).
- ii) Mirror image of (i)

Actual trial 10

- i) One long 6x2 red piece placed in a sagittal position. A pile of three 2x2 blue blocks stacked together at the extreme end (furthest end away from the investigator)
- ii) One long 6x2 red piece placed in a sagittal position. A pile of three 2x2 blue blocks stacked together at the centre of the red piece so that 2x2 area on the red piece are left uncovered from either end.

Actual trial 11

- i) One long 6x2 red piece placed in a sagittal position. Four pairs of 2x1 blue blocks stacked together at the end (closest to the investigator) of the red piece. The stack of blue pile occupies a 2x2 area of the 6x2 red piece. A 4x2 yellow piece is placed on top of the blue pile so that it covers the entire top, while jutting leftwards.
- ii) Same as in (i)

Actual trial 12

- i) One long 6x2 red piece placed in a sagittal position. One 2x2 blue block placed at the extreme 2x2 area furthest away from the investigator, of the red piece. A 4x2 yellow piece placed alongside the blue piece covering the subsequent 2x2 area of the red piece and jutting rightwards. The remaining 2x2 end closest to the investigator, of the red piece is left uncovered.
- ii) A mirror image of (i)

Actual trial 13

- i) A blue 3x2 block placed on a sagittal orientation. A 4x2 yellow piece is centred on top of the blue piece covering a 2x2 area leaving out a 2x1 region on the right. A 2x2 blue block is balanced on top of the yellow piece at the extreme 2x2 area (furthest away from the investigator).
- ii) Same as (i)

Actual trial 14

- i) Three piles of three 2x1 blue blocks are arranged to form a 3x2 block. A 6x2 red piece is placed on top of the blue pile in a sagittal position such that the extreme 3x2 end (furthest away from the investigator) of the red piece covers the entire 3x2 top of the blue blocks. The red piece therefore extends towards the investigator. A 4x2 yellow piece is placed atop the red piece so that the 2x2 end of the red piece closest to the investigator is covered entirely and aligns smoothly with the yellow piece. The yellow piece extends to the right.
- ii) Mirror image of (i)

ii) 3D LEGO® toy plastic building bricks (picture stimuli)



iii) Mirror Image Task Template

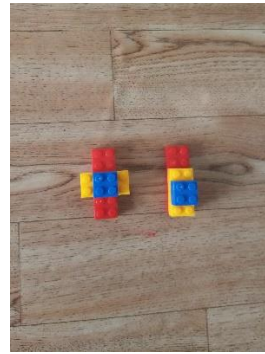
LM..... DATE.....

NAME.....

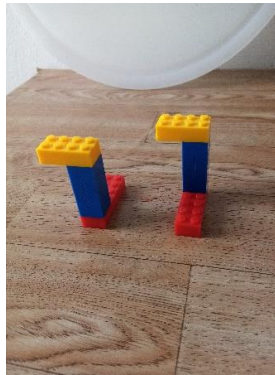
1.IRBra.....()



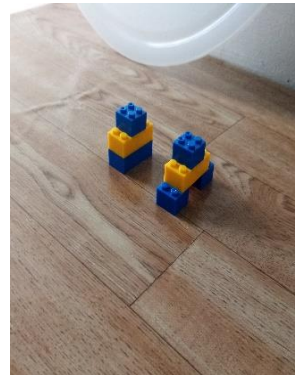
2. BRYBcr.....()



3.MRBYpd.....()



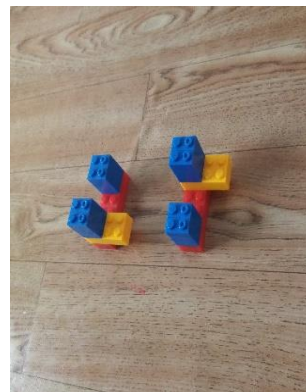
4.BBYcb.....()



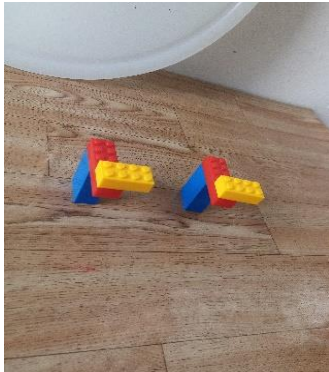
5. IBYcb.....()



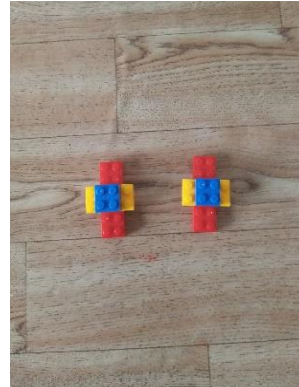
6.MRYBcn.....()



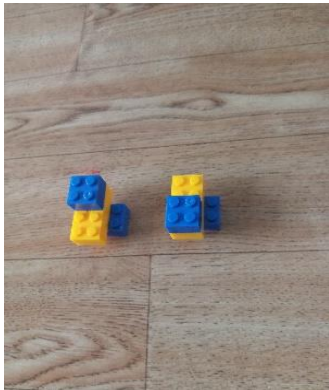
7.IBRYzg.....()



8.IRYBcr()



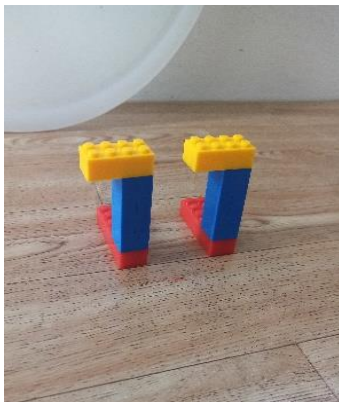
9.MBYub()



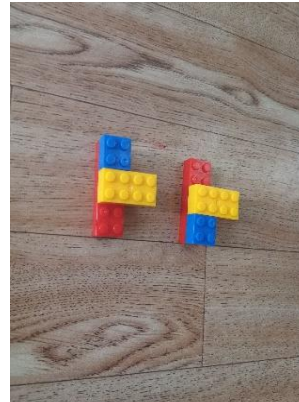
10.BRBra.....()



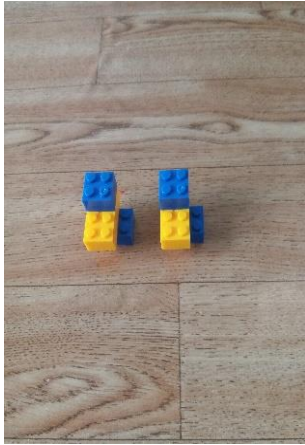
11.IRBYpd.....()



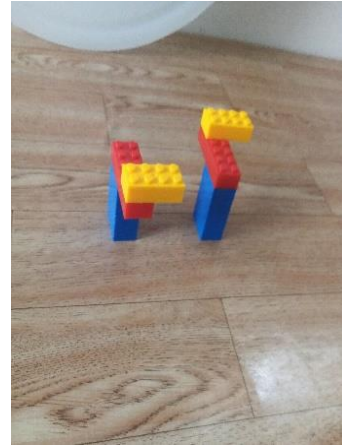
12. MRYBtj.....()



13. IBYub.....()



14. MBRYzg.....()



Bad match pairs -2, 4, 10

Identical image pairs- 1, 5, 7, 8, 11, 13

Mirror image pairs – 3, 6, 9, 12, 14

APPENDIX C

Motion event template and stimuli

i) Motion event non-verbal template

N.VERBAL ENCODING

Name -----

Randomized No. -----

Similarity to X		
Triad	A	B
1		
2		
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4		
5		
6		
7		
8		
9		
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11		
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13		
14		
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34		
35		
36		
37		
38		
39		

N.VERBAL ENCODING

Name -----

Randomized No. -----

Similarity to X		
Triad	A	B
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
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39		

N.VERBAL ENCODING

Name -----

Randomized No. -----

Similarity to X		
Triad	A	B
1		
2		
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8		
9		
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Debrief: Interim for gauging similarity:

ii) Motion Non Verbal Still Video Stimuli

Initial phase



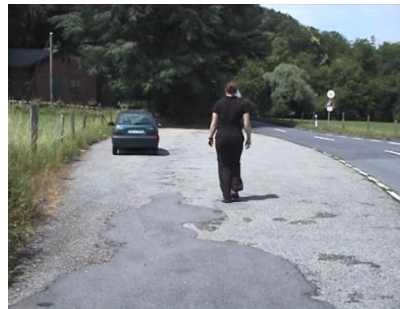
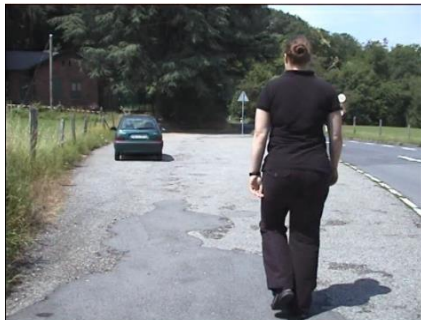
Middle phase



Final Phase



Low



Intermediate



High

APPENDIX D Consent forms

i) Consent for mirror image experiment



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STELLENBOSCH UNIVERSITY CONSENT TO PARTICIPATE IN RESEARCH

Dear Ms/Mr

My name is **Awino Ogelo**. I am a student of General Linguistics at Stellenbosch University in South Africa. As part of the requirement towards attaining my degree, I am expected to conduct a research study. It is in this line that I would like to invite you to participate in this research project. The title of the research project is **INVESTIGATING EVIDENCE OF LINGUISTIC RELATIVITY IN DHOLUO**.

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.

What is the project about?

This project investigates how a native speaker of Dholuo uses Dholuo or English to describe the position of objects around them in relation to other objects. This description involves a concept called *Frames of Reference*. We will, in the investigation, conduct experiments. You will be a participant in one of the experiments called **The Mirror Image Task**. You will be presented with pairs of 3D objects made from Duplo building blocks one after the other. You are expected to tell in Dholuo or English, whether each object within the pair is similar or different to the other. A total of fourteen such pairs will be presented to you randomly. Your responses will be recorded.

Are there any possible discomfort, stress or harm associated with the experiments?

You will not experience any harm be it physical or psychological from this exercise. In fact besides being an experiment, the exercise has been used as a game meant to relax the body. In case you feel tired or uncomfortable during the exercise, you are free to alert me so that you can have a break. If you feel like you do not want to continue with the experiment, you are at liberty to say so.

What benefits can I expect from this exercise?

Whereas there might not be direct benefits of this research to specific individuals, the analysed results of these experiments and their interpretations will be important in learning more about Dholuo.

Will I be paid for participating in this exercise?

Participation in this research is voluntary. There will be no compensation in cash or any other form.

How confidential will the information I give in this exercise be?

The information collected during this exercise will strictly be for this research project. Both audio and visual recordings, comments and any other information from you will be kept safely in locked folders on my computer and hard drives that only I have passwords to. Besides the examiners, supervisor and myself, no party will have access to the collected data.

Can I withdraw from this exercise?

If at any point before or during the exercise you feel like opting out, you have the right to do so. In case of such withdrawal, any data recorded during the time of your participation will be deleted unless you state otherwise.

Rights of research participants

You may withdraw your consent at any time and discontinue the participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research participant, contact Ms Malene Fouche [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development. You have right to receive a copy of the Information and Consent form.

If you have any questions or concerns about the research, please feel free to contact;

Investigator - **Awino Ogelo**

Tel. No. - +254 728571906

Email - 23440058@sun.ac.za

or

Supervisor - **Prof Emanuel Bylund**

Tel. No. – 021 808 2006

Email – mbylund@sun.ac.za

ii) **Consent for motion verbal experiment**



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**STELLENBOSCH UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH**

Dear Ms/Mr

My name is **Awino Ogelo**. I am a student of General Linguistics at Stellenbosch University in South Africa. As part of the requirement towards attaining my degree, I am expected to conduct a research study. It is in this line that I would like to invite you to participate in this research project. The title of the research project is **INVESTIGATING EVIDENCE OF LINGUISTIC RELATIVITY IN DHOLUO**.

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What is the project about?

This project investigates how a native speaker of Dholuo interprets events in motion. Investigation is in the form of experiments. You will be a participant in one of the experiments which is based on the concept of *Motion Event Cognition*. The experiment itself is called **Verbal endpoint encoding of goal-directed motion events**. In this experiment, eighteen (18) video clips will be shown to you through power point on a computer screen. You will then be asked in Dholuo to explain what you see happening in the clips. Your explanation/description will be recorded. These recordings will later be analysed and interpreted. Each clip is six seconds long and they will be presented to you randomly one after the other.

Are there any possible discomfort, stress or harm associated with the experiments?

You will not experience any harm be it physical or psychological from this exercise. In case you feel tired or uncomfortable during the exercise, you are free to alert me so that you can have a break. If you feel like you do not want to continue with the experiment, you are at liberty to say so.

What benefits can I expect from this exercise?

Whereas there might not be direct benefits of this research to specific individuals, the analysed results of these experiments and their interpretations will be important in learning more about Dholuo.

Will I be paid for participating in this exercise?

Since participation in this research is voluntary, there will be no compensation in cash or any other form.

How confidential will the information I give in this exercise be?

The information collected during this exercise will strictly be for this research project. Both audio and visual recordings, comments and any other information from you will be kept safely in locked folders on my computer and hard drives that only I have passwords to. Besides the examiners, supervisor and myself, no party will have access to the collected data.

Can I withdraw from this exercise?

Participation in this exercise is voluntary. If at any point before or during the exercise you feel like opting out, you have the right to do so. In case of such withdrawal, any data recorded during the time of your participation will be deleted unless you state otherwise.

Rights of research participants

You may withdraw your consent at any time and discontinue the participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research participant, contact Ms Malene Fouche [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development. You have right to receive a copy of the Information and Consent form.

If you have any questions or concerns about the research, please feel free to contact;

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Email - 23440058@sun.ac.za

or

Supervisor - **Prof Emanuel Bylund**

Tel. No. – 021 808 2006

Email – mbylund@sun.ac.za

iii) **Consent for motion non-verbal experiment**



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STELLENBOSCH UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Dear Ms/Mr

My name is **Awino Ogelo**. I am a student of General Linguistics at Stellenbosch University in South Africa. As part of the requirement towards attaining my degree, I am expected to conduct a research study. It is in this line that I would like to invite you to participate in this research project. The title of the research project is **INVESTIGATING EVIDENCE OF LINGUISTIC RELATIVITY IN DHOLUO**.

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.

What is the project about?

This project investigates how a native speaker of Dholuo interprets events in motion. The investigation is in the form of experiments. You will be a participant in the experiment called **Non-verbal similarity judgement of goal-directed motion event**. In this experiment, a group of three successive video clips(A, B and X) which are each six seconds long will be played on a computer screen. The video clips show people, vehicles, etc in motion. You will be expected to indicate whether the third video clip (X) is more similar to A or to B. Your response will then be recorded by the investigator. Nineteen (19) such different video clips in groups of three will be presented to you. The response will be analysed and later interpreted.

Are there any possible discomfort, stress or harm associated with the experiments?

You will not experience any harm be it physical or psychological from this exercise. In case you feel tired or uncomfortable during the exercise, you are free to alert me so that you can have a break. If you feel like you do not want to continue with the experiment, you are at liberty to say so.

What benefits can I expect from this exercise?

Whereas there might not be direct benefits of this research to specific individuals, the analysed results of these experiments and their interpretations will be important in learning more about Dholuo.

Will I be paid for participating in this exercise?

Since participation in this research is voluntary, there will be no compensation in cash or any other form.

How confidential will the information I give in this exercise be?

The information collected during this exercise will strictly be for this research project. Both audio and visual recordings, comments and any other information from you will be kept safely in locked folders on my computer and hard drives that only I have passwords to. Besides the examiners, supervisor and myself, no party will have access to the collected data.

Can I withdraw from this exercise?

Participation in this exercise is voluntary. If at any point before or during the exercise you feel like opting out, you have the right to do so. In case of such withdrawal, any data recorded during the time of your participation will be deleted unless you state otherwise.

Rights of research participants

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or

Supervisor - **Prof Emanuel Bylund**

Tel. No. – 021 808 2006

Email – mbylund@sun.ac.za

iv) **Consent for photo-object experiment**



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STELLENBOSCH UNIVERSITY

CONSENT TO PARTICIPATE IN RESEARCH

Dear Ms/Mr

My name is **Awino Ogelo**. I am a student of General Linguistics at Stellenbosch University in South Africa. As part of the requirement towards attaining my degree, I am expected to conduct a research study. It is in this line that I would like to invite you to participate in this research project. The title of the research project is INVESTIGATING EVIDENCE OF LINGUISTIC RELATIVITY IN DHOLUO.

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.

What is the project about?

This project investigates how a native speaker of Dholuo uses Dholuo or English to describe the position of objects around them in relation to other objects. This description involves a concept called *Frames of Reference*. We will, in the investigation, conduct experiments. You will be a participant in one of the experiments called ***The New Man and Tree game***. In this experiment, you will either take the role of a director or a recreator. As a director, you will be given twenty-five (25) photographs. You will be expected to describe (either in Dholuo or in English), the arrangements of the objects in each photograph exactly as they are to the recreator who will be seated next to you. As a recreator, you will be given a number of toys. You will be expected to arrange the toys exactly as the director seated next to you will describe them. Both the description by the director and the recreation by the recreator will be recorded audio-visually.

Are there any possible discomfort, stress or harm associated with the experiments?

You will not experience any harm be it physical or psychological from this exercise. In fact besides being an experiment, the exercise has been used as a game meant to relax the body. In case you feel tired or uncomfortable during the exercise, you are free to alert me so that you can

have a break. If you feel like you do not want to continue with the experiment, you are at liberty to say so.

What benefits can I expect from this exercise?

Whereas there might not be direct benefits of this research to specific individuals, the analysed results of these experiments and their interpretations will be important in learning more about Dholuo.

Will I be paid for participating in this exercise?

Participation in this research is voluntary. There will be no compensation in cash or any other form.

How confidential will the information I give in this exercise be?

The information collected during this exercise will strictly be for this research project. Both audio and visual recordings, comments and any other information from you will be kept safely in locked folders on my computer and hard drives that only I have passwords to. Besides the examiners, supervisor and myself, no party will have access to the **collected** data.

Can I withdraw from this exercise?

If at any point before or during the exercise you feel like opting out, you have the right to do so. In case of such withdrawal, any data recorded during the time of your participation will be deleted unless you state otherwise.

Rights of research participants

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Tel. No. – 021 808 2006

Email – mbylund@sun.ac.za

v) **Declaration page**

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 **Investigating Evidence Of Linguistic Relativity In Dholuo** and conducted by **Awino Ogelo** (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 pressurised to take part.
- I may choose to leave the study at any time and will not be penalised 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*] [*He/she*] was encouraged and given ample time to ask me any questions. This conversation was conducted in English/Dholuo and [*no translator was used*]/this conversation was translated into by.....

Signed on (Date).....

Signed by (investigator).....

Phone.....

APPENDIX E

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): _____

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 _____

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: _____

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 anonymised form, being used for research purposes.

Date and signature: _____

APPENDIX F : Ethical clearance forms and gatekeepers



UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

NOTICE OF APPROVAL

REC: Social, Behavioural and Education Research (SBER) - Initial Application Form

16 October 2019

Project number: 10415

Project Title: Investigating Evidence of Linguistic Relativity in Dholuo

Dear Mr Kelvin Ogelo

Your REC: Social, Behavioural and Education Research (SBER) - Initial Application Form submitted on 30 July 2019 was reviewed and approved by the REC: Humanities.

Please note the following for your approved submission:

Ethics approval period:

Protocol approval date (Humanities)	Protocol expiration date (Humanities)
16 October 2019	15 October 2022

GENERAL COMMENTS:

1) The researcher is reminded to submit to the REC the final permission letters from the four institutions he will seek permission from. [ACTION REQUIRED]

Please take note of the General Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

If the researcher deviates in any way from the proposal approved by the REC: Humanities, the researcher must notify the REC of these changes.

Please use your SU project number (10415) on any documents or correspondence with the REC concerning your project.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

FOR CONTINUATION OF PROJECTS AFTER REC APPROVAL PERIOD

Please note that a progress report should be submitted to the Research Ethics Committee: Humanities before the approval period has expired if a continuation of ethics approval is required. The Committee will then consider the continuation of the project for a further year (if necessary)

Included Documents:

Document Type	File Name	Date	Version
Research Protocol/Proposal	Doctoral Research Proposal - Awino	14/06/2019	DRAFT ONE
Budget	budget and funding	14/06/2019	DRAFT ONE
Recruitment material	poster recruitment	14/06/2019	1ST DRAFT
Informed Consent Form	Consent on Motion A	01/07/2019	1st draft
Informed Consent Form	Consent on Motion B	01/07/2019	1st draft
Informed Consent Form	Consent on Space	01/07/2019	1st draft
Informed Consent Form	Consent on Colour English A	01/07/2019	1st draft
Informed Consent Form	Consent on Colour English B	01/07/2019	1st draft
Informed Consent Form	Verbal Consent Script	01/07/2019	1st draft
Request for permission	Rachuonyo	01/07/2019	Letter 2
Request for permission	Mawego	01/07/2019	Letter 3

Page 1 of 3

Data collection tool	MOTION _ door woman	31/07/2019	1
Data collection tool	MOTION _ benches	31/07/2019	1
Data collection tool	MOTION _ cornfields	31/07/2019	1
Data collection tool	COLOUR _ munsell colour charts	31/07/2019	1
Data collection tool	SPACE _ animal toys- duplo objects	31/07/2019	1
Request for permission	Asumbi	31/07/2019	1
Request for permission	Rachuonyo	31/07/2019	1
Request for permission	Kisii University	31/07/2019	1
Request for permission	Rongo University	31/07/2019	1

If you have any questions or need further help, please contact the REC office at cgraham@sun.ac.za.

Sincerely,

Clarissa Graham

REC Coordinator: Research Ethics Committee: Human Research (Humanities)

National Health Research Ethics Committee (NHREC) registration number: REC-050411-032.
The Research Ethics Committee: Humanities complies with the SA National Health Act No.61 2003 as it pertains to health research. In addition, this committee is bound by the ethical norms and principles for research established by the Declaration of Helsinki (2013) and the Department of Health Guidelines for Ethical Research (2015). Annually a number of projects may be selected randomly for an external audit.



REPUBLIC OF KENYA



NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 201744

Date of Issue: 02/March/2021

RESEARCH LICENSE



This is to Certify that Mr.. Awino K Ogelo of Stellenbosch University, has been licensed to conduct research in Kisii, Kisumu, Migori, Mombasa, Siaya on the topic: Investigating Evidence Of Linguistic Relativity in Dholuo for the period ending : 02/March/2022.

License No: NACOSTI/P/21/9096

201744

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY &
INNOVATION

Verification QR Code



NOTE: This is a computer generated License. To verify the authenticity of this document,
Scan the QR Code using QR scanner application.



MINISTRY OF EDUCATION

STATE DEPARTMENT FOR EARLY LEARNING & BASIC EDUCATION

Telegrams: "SCHOOLING" Homa Bay

Telephone +

When replying please quote

cdehomabay@gmail.com

COUNTY DIRECTOR OF EDUCATION

HOMA BAY COUNTY

P.O BOX 710

HOMA BAY

DATE: 25TH OCTOBER, 2019

REF: MOEST/CDE/HBC/ADM/11/VOL. II/25

MR. AWINO OGELO
STELLENBOSCH UNIVERSITY
PRIVATE BAG XI
MATIELAND, 7602 SOUTH AFRICA

RE: RESEARCH AUTHORIZATION.

Following your application for authority to carry out research on
"Investigating Evidence of Linguistic Relativity in Dholuo" I am pleased to
inform you that you have been authorized to undertake research in Homa Bay
County for the period ending **23rd October, 2020.**

Kindly note that, as an applicant who has been licensed under the Science,
Technology and Innovation Act, 2013 to conduct research in Kenya, you shall
deposit a copy of the final research report to the County Director of Education
Office after completion both the soft copy and hard copy.

Thank you in advance.

MR. FREDRICK M. KIIRU
COUNTY DIRECTOR OF EDUCATION

Cc.

1. County Commissioner
Homa Bay County.

COUNTY DIRECTOR OF EDUCATION

HOMA BAY COUNTY

P.O BOX 710-40300, HOMA BAY

Email: cdehomabay@gmail.com





KISII UNIVERSITY

Telephone: +254 773452323

Email: research@kisiiversity.ac.ke

P O BOX 408 – 40200

KISII

www.kisiiversity.ac.ke

OFFICE OF THE REGISTRAR RESEARCH EXTENSION INNOVATION AND RESOURCE MOBILIZATION

REF: KSU/R &E/1/8/04

Date: 30th October, 2019

Mr. Kelvin Ogelo
Post Graduate Office
Stellenbosch University
Private Bag XI
Matieland, 7602
SOUTH AFRICA

Dear Mr. Ogelo

RE: REQUEST TO CONDUCT RESEARCH

This is to inform you that your request to conduct research for your project on ***“Investigating Evidence of Linguistic Relativity in Dholuo Speakers in Kenya”*** has been approved with effect from **1st November, 2019**.

You will be requested to acknowledge Kisii University in your write up and publication for this access.

Thank you.

Prof. Anakalo Shitandi, PhD
Registrar (REIRM)

Cc: Deputy Vice Chancellor (ARSA)
Dean, SASS

AS/nm



ICT Manager
Kindly assist Kelvin to
get contacts for the student
he worked with for his
PhD work.



Tel: 028 00 36 56

Fax: 020 802 92 08

Cell: 0770308255

Web: www.ruc.ac.ke

RU/DVCASA/VC/VOL.II/30

P.O. Box 103- 40404

RONGO,

KENYA

Email: dp-academic@ruc.ac.ke

6/11/2019

Mr. Awino Ogelo
Post Graduate Office
Stellenbosch University
Private Bag XI
MATIELAND, 7602
SOUTH AFRICA
Email : kelogel@gmail.com

Dear Mr. Ogelo,

SUBJECT: STUDENTS AS VOLUNTARY RESEARCH PARTICIPANTS

In response to your letter of 29th October 2019, we wish to inform you that your request to recruit some twenty five (25) Rongo University students as participants in your linguistics research has been granted.

Please note you are expected to abide by the conditions set out in your NACOSTI research permit in carrying out your research.

Prof. Augustino Onkware
Deputy Vice-Chancellor

CC. Vice-Chancellor
Dean of Students
Chief Security Officer

Telegrams: "MEDTRAIN" Nairobi
TELEPHONE: NAIROBI 2725191, 2725711/14
Fax: 2722907 Email: info@kmtc.ac.ke
Please address all correspondence to:
The Director
When replying please quote



KENYA MEDICAL TRAINING COLLEGE
P.O. BOX 30195-00100
NAIROBI

Ref: No.

30th October, 2019

To: The Principal,
KMTC Rachuonyo Campus,

Dear Madam,

RE: LETTER OF INTRODUCTION

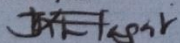
The bearer of this letter, Mr. Kelvin Awino Ogello is a PHD student at Stellenbosch University, South Africa and is currently working on his doctoral study titled *"Investigating Evidence of Linguistic Relativity in Dholuo"*.

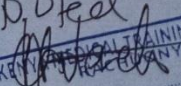
His study proposal has been reviewed by the College Research and Ethics Review Committee (CRERC) which is satisfied that no ethical issues shall be violated among the respondents in the process of data collection.
The study has also received the relevant clearance from his institution as well as a research license from NACOSTI.

The investigator has requested to collect data in your institution and is seeking your permission and support for this process.

Kindly accord him necessary support; should any unanticipated issues arise in the process, please contact the research office.

Thank you.


EGLAH KIPLAGAT
DEPUTY REGISTRAR RESEARCH

31/10/19
D. O. Ogello

KENYA MEDICAL TRAINING COLLEGE
RACHUONYO
DATE: 31/10/19
P. O. BOX 148-40222, OYUGIS

KENYA MEDICAL TRAINING COLLEGE
RACHUONYO
★ 31 OCT 2019 ★
RECEIVED
P. O. Box 148-40222, OYUGIS

Telegrams: "MEDTRAIN" Nairobi
TELEPHONE: NAIROBI 2725191, 2725711/14
Fax: 2722907 Email: info@kmtc.ac.ke
Please address all correspondence to:
The Director
When replying please quote



KENYA MEDICAL TRAINING COLLEGE
P.O. BOX 30195-00100
NAIROBI

Ref: No. KMTC/ADM/74/VOL.V

Date.....
30th October, 2019

Awino Ogelo,
Post Graduate Office,
Stellenbosch University,
Private Bag XI
MATIELAND, 7602 SOUTH AFRICA

Dear Sir,

RE: PERMISSION TO CONDUCT RESEARCH STUDY AT RACHUONYO KMTC

Reference is made to your letter dated 23rd October, 2019 requesting for permission to conduct research in KMTC Rachuonyo campus for your PHD thesis.

Your proposal titled "*Investigating Evidence of Linguistic Relativity in Dholuo*" has been reviewed and we are satisfied that no ethical issues will be violated among the respondents during the data collection process.

It is also noted that your study has received the relevant ethical clearance from your institution and the required research license by NACOSTI.

Permission is therefore granted for data collection; should any unanticipated issues arise, please contact the research office.

Upon completion of the study, you are requested to submit one (1) hard copy and soft copy of the research report to the KMTC Director's office.

Thank you.

EGLAH J. KIPLAGAT
For: CHIEF EXECUTIVE OFFICER



THE KISUMU NATIONAL POLYTECHNIC

P.O. Box 143 - 40100, Tel: 057-2501501 / 2501502 / 2501503 / 020-2046190
Cellphone: 0723 446 773, 0732 058378, KISUMU - KENYA
Email: info@kisumupoly.ac.ke

KP/HRA/R/OP/62/R/001/VOL.1/35

Our Ref:.....

Your Ref:.....

19/3/2021

Date:.....

Mr. Awino Ogelo,
PhD student,
STELLENBOSCH UNIVERSITY

RE: PERMISSION TO UNDERTAKE RESEARCH

This is to confirm to you that you have been given permission by The Kisumu National Polytechnic Management to undertake your research at the Institution.

You have also been permitted to interview students as part of the research,

Thank you.

CATHERINE KELONYE
CHIEF PRINCIPAL/COUNCIL SECRETARY

/mi

AN ISO 9001:2015 CERTIFIED INSTITUTION



All correspondence must be addressed to the Principal