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Abstract

Cross-linguistic variation is incredibly prevalent and has led to various questions regarding human language and cognition. Such variation predominantly reflects differences in lexicalization strategies across languages, and investigating these patterns is a useful tool for researchers to examine what is possible in the languages of the world, i.e., 'thinking for speaking' patterns. An interesting avenue to explore these topics is through the study of human locomotion. Talmy proposed a typological classification of motion events, separating languages in terms of where the element of Path is encoded in a language's structure. However, many authors criticized this typology, including Vulchanova and colleagues who suggested that languages should instead be addressed through a set of parameters and conceptual features. Further, cross-linguistic variation begs the question of how the acquisition of second languages may be impacted, for which there is no current consensus. The present thesis reviews some of the most prevailing research surrounding these issues and assesses their validity with a behavioural free naming task. The aim of the present study is to determine (i) whether speakers employ the naming patterns predicted in previous research, and (ii) to what extent different encoding strategies between the L1 and L2 impact second language acquisition. Six L1 Norwegian speakers of beginner-intermediate L2 French were recruited and asked to describe 20 videos of human locomotion in both languages. L2 descriptions were compared to labels provided by six native French speakers. L1 Norwegian descriptions were compared to those provided by two native Norwegian pilot participants. Results from both native speaking control groups indicated that speakers primarily employed patterns predicted by previous research. No evidence of transfer was confirmed amongst L2 speakers, perhaps attributed to the L1's more complex lexical inventory relevant to the patterns of motion in this study. L2 speakers tended to behave similar to native speakers in basic patterns of human locomotion; however, when presented with more complex patterns, L2 labels displayed more errors, and significantly more variation in general. Those with higher L2 proficiency levels performed closer to L1 speakers overall, indicating that some lexicalization patterns in this domain may be acquired in later stages of second language acquisition.

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Table of Contents

1. Introduction 1
   1.1. Research Questions 3
   1.2. Thesis Structure 3
2. Cross-linguistic conceptualization and categorization 4
   2.1. Language and cognition 4
   2.2. Verbs of human locomotion 6
      2.2.1. Why study verbs of human locomotion? 7
   2.3. Categorizing motion event components: Talmy's typology 8
   2.4. Criticisms and revisions to the typology 11
      2.4.1. Definition issues 11
      2.4.2. Intralinguistic variation and proposing universals 13
      2.4.3. Conceptual granularity 15
   2.5. Concluding remarks and the present study 18
3. Language acquisition and motion 20
   3.1. Second language acquisition 21
   3.2. Linguistic transfer 22
      3.2.1. Linguistic transfer and spatial language 22
      3.2.2. Transfer hypotheses 24
   3.3. The present study 25
      3.3.1. Motion in French 25
      3.3.2. Motion in Norwegian 27
      3.3.3. Concluding remarks and the present study 28
4. Eye tracking and human locomotion 29
   4.1. The evolution of eye tracking 29
   4.2. Eye tracking and motion 30
   4.3. The present study 33

5. The present study: Hypotheses 34
6. Methods 36
6.1. Materials 36
6.2. Participants 39
6.3. Procedure 39
6.4. Data analysis 41
7. Results and discussion 43
7.1. French descriptions 45
7.1.1. Pilot control group 45
7.1.2. Experimental group 52
7.1.3. Comparing the two groups 59
7.1.4. Summary of French descriptions 63
7.2. Norwegian descriptions 64
7.2.1. Pilot control group 64
7.2.2. Experimental group 65
7.3. General discussion 66
7.4. Limitations and future research 70
8. Conclusion 72
References 73
Appendices 83

1. Introduction

Human categorization and conceptualization of sensory input are thought to reflect similarities and differences across languages, as well as cognition in general. Most current views agree that cross-linguistic variation, however, lies mainly in the lexical items and encoding strategies in each language, rather than the human conceptual system. For instance, Slobin (1987) argued for a concept which he called 'thinking for speaking', claiming that individuals determine which structures to use based on what is available in a given language. Such linguistic variation may impact second language acquisition (henceforth SLA), particularly when the learner is in the beginning stages. Human locomotion events are a fascinating avenue in which to gain further insight into these topics, as this domain is imperative to, and relatable across, all language communities.

Talmy's work has been highly discussed within the field of cross-linguistic differences in motion constructions. He developed an influential typology differentiating between satellite-framing and verb-framing languages (Talmy, 1983). These two categories reflect how and where linguistic elements are encoded within the syntactic structure of a language. Such a typology, however, has proven to be too confining; languages, in all their complexity, do not fit into a neat and tidy two-way system, but are in fact incredibly multi-faceted. As such, several authors have expanded on Talmy's original ideas to provide for arguably more appropriate discussions of the everchanging and complicated nature of our languages. Some of the most prominent criticisms and revisions involve:

(i) Redefining vague terminology
(ii) Prevalent variation observed within individual languages; formulating universals within languages is thus proposed
(iii) Conceptual Granularity; an idea that aspects of motion can be broken down further and categorized in terms of refined parameters and conceptual features

In addition, differences across languages may lead to linguistic transfer (i.e. influence from one language to another), when learning a second language. There are a vast number of theories as to how, why, and to what extent such influence may occur. An overarching theme in

the studies regarding transfer of motion constructions indicates a tendency of heightened transfer in the beginning stages of acquisition. Higher proficiency levels, in contrast, may result in less transfer effects. Robinson and Ellis (2008) called the latter phenomenon 'rethinking for speaking', further drawing on Slobin's hypothesis. Nevertheless, languages must be intricately assessed before judgments can be made on whether transfer may occur (Dimitrova-Vulchanova et al., 2012).

Several researchers have studied the relationship between motion event conceptualizations and constructions across languages, or, how cross-linguistic variation in this domain impacts SLA. However, relatively few studies have combined these two concepts. Additionally, many studies involved languages which have already been extensively researched in the past, e.g., English. The present study peers into lexicalization patterns in a lesser-studied language, i.e., Norwegian, compared with French (i.e. a typological opposite), and looks at whether transfer occurs between them. These topics were investigated through a behavioural free naming task involving these two languages.

This thesis begins with an extensive discussion of the theoretical background surrounding human conceptualization, cross-linguistic variation, motion encoding and SLA, followed by an analysis of the two languages of study. An experiment was conducted, involving L1 Norwegian and L2 French speakers labelling motion video clips in both languages. L2 labels were compared to native French speaker labels provided by a pilot control group. This task aimed to determine both whether, or to what extent: (i) language naming tendencies align with previous research, and (ii) transfer occurs between the L1 and L2 when describing patterns of human locomotion. If languages are as complex as many have argued, lexicalization patterns observed in the current study should reflect this. Furthermore, if language interference decreases in more advanced stages of acquisition, transfer should be observed, as the participants in this study are in the beginner-intermediate stages of their learning.

An additional component of the present study involved tracking gaze patterns during the motion descriptions. Eye tracking research indicates that subjects tend to fixate on more salient aspects of stimuli. As such, gaze patterns in the present study may give insight into which features are deterministic in lexicalization patterns. Unfortunately, due to the COVID-19 outbreak, the eye tracking data was not used. However, the theoretical background regarding

previous eye tracking research remains in this thesis, in order to demonstrate why it was chosen as a methodology as well as to indicate how it can be used in further research.

1.1. Research Questions

This thesis aims to answer the following research questions:

1. Do speakers make use of the patterns predicted by previous research?
2. To what extent does cross-linguistic variation in encoding of verbs of human locomotion impact second language acquisition?
3. Where do participants direct their gaze when observing human locomotion events?

1.2. Thesis Structure

Section 2 provides the theoretical background behind cross-linguistic conceptualization and categorization. Concepts such as the relationship between language and cognition are discussed, as well as why the study of verbs of human locomotion is important to understanding such a relationship. Specific motion event components are discussed regarding Talmy's typology, followed by numerous adaptations to this typology. Section 3 discusses motion and language acquisition, with a focus on second language acquisition. Theories of transfer are also discussed, followed by an analysis of the motion inventories of the languages relevant to the present study: French and Norwegian. Section 4 explains the progression of eye tracking research, and why it is useful in this domain. In Section 5, the hypotheses and predictions of the present study are presented. Next, section 6 examines the methods in the present study, including the materials, participants, experiment procedure and data analysis. Section 7 explores the data from all the groups involved in the present study and provides a discussion and analysis of results. Limitations and suggested future research are also discussed in this section. Finally, section 8 includes a summary and conclusion of this master's thesis. Following this, references and appendices are provided at the end of this thesis.

2. Cross-linguistic conceptualization and categorization

2.1. Language and cognition

With each passing moment, there is an enormous amount of sensory information being put out by the world. As far as we know, humans are the only species capable of interpreting and expressing this information through such a complex linguistic system.

Imagine, for a moment, that you are taking a walk in the forest. The presence of a mossy green forest floor and the sweet scent of wildflowers in bloom are ever-present. As these experiences occur, thoughts similar to the following may arise: '*what a beautiful day!*' or '*what is that lovely smell?*'. These phrases may even be uttered aloud to a passerby or typed in a message to a friend. Malt and Wolff's (2010) 'language-thought interface' peers into this unique human experience of formulating perceptions and thoughts into language, one that is said to be significant in explaining the structure of basic human cognition.

Malt and Wolff (2010) proposed that each language may reflect a unique viewpoint on the world, due to differences in the lexicons and encoding strategies. Through translation, for instance, it is possible to take messages from one language and transform them into another. However, it is well known that translated messages often produce slightly different meanings across distinct languages. It is even argued that there may be minimal, or possibly even no domains of human language, which exhibit identical mappings from one language to another. Such distinctions may indicate variability in learning amongst the different language communities of the world. Importantly, however, word meanings are arguably more likely to vary, than are entire conceptual meanings (Malt & Wolff, 2010).

In regard to the human conceptual system, the languages of the world share many commonalities. For instance, there is a clear distinction between walking and running gaits across languages, as well as shared naming tendencies between body parts (see e.g. Malt et al., 2008). According to Malt et al. (2008), such tendencies are related to the following two constraints: the input presented to the individual through the world, and the individual perceiving and interpreting this input. Nevertheless, there are also many cross-linguistic differences with regard to encoding strategies and breadth of vocabulary (Malt & Wolff, 2010). To name a few,

Fulga (2012) pointed out how languages often differ in how they represent temporal reasoning, as well as spatial terms including motion events, the latter of which is the focus of this thesis.

Several hypotheses have been formulated, regarding the implications of such a dichotomy between cross-linguistic similarities and differences. As Soroli, Hickmann and Hendriks (2019) pointed out, these ideas have been discussed since the time of Plato, who suggested that "thought and language stem from abstract definitions or concepts called 'forms' in which all the entities and qualities designated thereby can be subsumed" (Gill, 1997, p. 132). The linguistic relativity principle, proposed by Whorf (1956), extended Plato's idea, claiming that an individual's language influences their thoughts. According to Whorf, cross-linguistic variation may lead to distinct language communities perceiving the world differently. In contrast, the universalist theory views humans as having one common cognitive structure. The latter view sees language as merely a way to communicate universal conceptualizations, and thus cross-linguistic differences occur simply by chance (Pinker, 1994).

Nevertheless, most current researchers in the field agree that such extreme views are improbable, and that the truth is likely somewhere in the middle. Slobin (1987, 1996), for instance, proposed a more moderate approach; his concept of 'thinking for speaking' refers to the on-line processing of thought which takes place during speech. According to this view, speech is not a direct reflection of perceived reality, evidenced by the fact that the same situation can be described in various ways even within individual languages. Simply put, thinking for speaking is the process by which speakers extract structures that are available in their respective languages, to fit to a conceptualization of a particular event or situation (Slobin, 1987). In the domain of spatial language, Slobin argued that some motion event components are frequently present across languages, i.e., Path, whereas others are less-so, i.e., Manner. Further, Berman and Slobin (1994) found evidence suggesting that speakers of different languages exhibit distinct thinking for speaking patterns in terms of motion lexicalization. Crucially, however, many current researchers agree that languages differ not in their entirety, but rather in their lexical items and encoding strategies (see e.g. Berman & Slobin, 1994; Malt et al., 2014; Stringer, 2011).

2.2. Verbs of human locomotion

Cross-linguistic variation in the encoding of spatial verbs, and specifically, verbs of human locomotion, has been a particularly interesting area of research. Before a discussion of this can take place, it is useful to begin with some definitions. Firstly, human locomotion falls within the general domain of *spatial language*, the latter of which Vulchanova and van der Zee (2013) defined as: "those parts of natural language that describe aspects of perceived space" (p. 2). As Aurnague and Stosic (2019) pointed out, descriptions surrounding spatial language are often comprised of at least three parts:

> (i) a located entity, called a *target* by Vandeloise (1986/1991), a *trajector* by Langacker (1987), or a *figure* by Talmy (1983)
> (ii) a locating entity, called a *landmark* by Langacker (1987) and Vandeloise (1986/1991), or *ground* by Talmy (1983)
> (iii) a spatial relation between such entities

The specific domain of *spatial semantics* emerged in the 80's, and according to Aurnague and Stosic (2019), all of the research in this field has been designed with the same aim in mind: forming connections between human cognition and linguistic expression. Spatial descriptions can be further broken down into two major categories: static and dynamic. The former refers to fixed positions, whereas the latter refer to postural changes, displacements and motion.

The domain of motion[1] has received a significant amount of attention in the past 30 years, and within this discipline are *motion events*, defined by Talmy (1985), as "situation[s] containing movement or the maintenance of a stationary location alike" (p. 60), or by Frawley (1992), as "a situation that implies movement in space and during a time interval" (p. 170). Examples of motion events include anything from rotating, orbiting and floating, to crawling, slithering and hopping. More specifically, *biological motion* indicates motion with respect to all biological organisms, and finally, *human locomotion*, the focus of this thesis and a subtype of biological

[1] Aurnague and Stosic (2019) pointed out that there is a common distinction between *movement* (e.g. *s'asseoir* 'to sit down', *s'étirer* 'to stretch') and *motion* (e.g. *arriver* 'to arrive', *marcher* 'to walk'), particularly in French. This may be due to the prominence of Path encoding in this language (see more on Path encoding in the following sections). This thesis focuses on *motion*.

motion, is defined by Malt et al. (2014), as "upright human movement across a solid substrate by characteristic movement of the limbs" (p. 109). Human locomotion is bi-pedal, with the head at the top, the latter of which has been demonstrated in studies using inverted point-light displays. Such displays were processed by participants at very slow rates, and sometimes even not at all, indicating how ingrained the concept is in the human mind (see e.g. Shipley, 2003; Reed et al., 2003). Examples of human locomotion include running, jumping, skipping, swimming and climbing, among countless others.

2.2.1. Why study verbs of human locomotion?

Given that cross-linguistic variation in naming patterns is so pervasive, it begs the question of how such patterns arise at all. Malt et al. (2014) outlined three key issues related to: (i) the role of structure in the world and whether it grounds meaning, (ii) how cognition shapes mappings from input to lexicalization patterns, and (iii) how such significant variation occurs despite clear constraints in the natural world. In order to address these issues, naming patterns across lexical categories must be researched in depth. Although a significant amount of work has been done with regard to spatial language (see e.g. Talmy 1983, 1985, 1991, 2000; Jackendoff, 1983; Slobin, 2001, 2003, 2004; etc.), this domain is incredibly complex. As a result, before these issues can be addressed in their entirety, more specific subdomains of spatial language, i.e., human locomotion, must be studied (Vulchanova & Martinez, 2013).

Humans are capable of motion recognition from early on, with some research even claiming that it is innate. Simion et al. (2008), for instance, found that newborn babies preferred biological over non-biological motion, possibly suggesting that its recognition is "an intrinsic capacity of the visual system … predisposing animals to preferentially attend to other animals" (p. 809). Humans are also incredibly skilled at recognizing and differentiating between types of biological motion, even when the stimuli is extremely impoverished, such as in point-light displays (see Johansson, 1973).

Furthermore, recognizing and expressing biological motion in language is both socially and cognitively imperative to humans (Vulchanova & van der Zee, 2013). For instance, the recognition of motion events is advantageous in the anticipation of actions and navigation capacities used in daily life. Take sports, for example; team players must be aware of which gait

and pace to use in order to keep up with others, or to get out of the way when necessary. Moreover, any means of transportation requires a keen understanding and predictability capacity of those around, to avoid collisions. Such an awareness is also useful in determining a person's general demeanour, such as whether an individual is skipping vs. stomping, likely implicating a positive vs. negative demeanour, respectively. Historically, these intuitions would have also been crucial to an individual's survival, for instance, when avoiding predators, or determining whether another individual is wanting to fight vs. become acquainted.

Notably, the idea of motion encoding as imperative to human cognition and linguistic functioning is accepted in several domains of research, including: Conceptual Semantics (see e.g. Jackendoff, 1983), Cognitive Linguistics (see e.g. Lakoff, 1987), as well as in the field of Psychology in general (see e.g. Zacks & Tversky, 2013). This domain is also widely variable cross-linguistically, even though human locomotion is relatable across all cultures (Montero-Melis et al., 2017). Finally, the meanings of verbs in general are contextually more complex than are nouns, making the former a richer area of study (Malt et al., 2014).

The following sections look specifically at how motion verbs are categorized across languages, according to various researchers in the field. A classic view by Talmy is discussed, followed by an exploration of numerous corresponding criticisms and revisions made with the aim of more contextually realistic approaches.

2.3. Categorizing motion event components: Talmy's typology

Schematization, a process widely accepted to play a significant role in translating input to language, involves selecting semantic components to describe whole objects and events (Vulchanova, Martinez & Vulchanov, 2013; Talmy, 2000). Talmy's scheme, for instance, suggested that motion events are comprised of the semantic components in (1).

(1) i. **Figure** - the entity that is moving or is located at a specific place.
ii. **Ground** - the entity which acts as a spatial reference point for the motion/location of the figure.
iii. **Path**: the path of motion of the figure.
iv. **Manner**: the manner of motion by which the figure moves along the path.
(Talmy, 1985)

Two of the most commonly discussed components of motion include *Path* and *Manner*, and it should be noted that these terms and their asymmetry are interpreted and described differently according to various authors. In an attempt to maintain both clarity and simplicity in this thesis, the above definitions will be assumed.

According to Talmy (1985), Manner verbs include those referring to biological motion (e.g. walk, run) combining motion with Manner. Path verbs refer to those combining motion with Path (e.g. enter, exit). Although verbs are typically the main items encoding motion in language, there is cross-linguistic variation in terms of which semantic components these verbs encode. As such, Talmy proposed a typology wherein languages can be separated into two categories: satellite-framed and verb-framed[2]. *Satellite-framed languages* (s-languages) include Germanic languages such as English and Norwegian, as well as Slavic languages such as Bulgarian. S-languages encode Manner in the main verb, and Path in a so-called satellite outside of the main verb. Talmy (1985) originally[3] defined a satellite as an "immediate constituent of a verb root" (p. 102). This can either be an affix or a free word, such as in *the ball rolled in,* with the free word *in* as the satellite encoding Path. In contrast, *verb-framed languages* (v-languages) include Romance languages such as Spanish and French, Semitic languages such as Hebrew, and others including Japanese and Turkish. V-languages lexicalize Path in the main verb, and Manner, if present at all, in a separate lexical item (e.g. a gerund in languages such as Spanish and French).

In the following two examples, (2) displays a satellite-framing (s-framing) pattern in English, and (3) a verb-framing (v-framing) pattern in French. Manner is expressed in the main

[2] Talmy's original classification in fact distinguished 3 types of languages: manner-incorporating, path-incorporating and ground-incorporating. However, in 2000, the typology based on satellite-framing and verb-framing, the one which is most well-known, was introduced.

[3] Notably, however, as pointed out by Croft et al. (2010), the definition of satellite narrowed in later classifications, where Talmy (2000) states that a satellite consists of "any constituent other than a nominal or prepositional phrase complement" (p. 222), thus excluding English prepositions, for instance. This will be further discussed in 2.4.1.

verb *ran* and Path in the satellite *into* in (2), whereas in (3), Path is expressed in the main verb *entrer* 'to enter', and Manner is expressed in the gerund *en courant* 'running'.

(2) He *ran into* the cave.
(3) Il *est entré* dans la cave *en courant*.
'He entered the cave running.'
(Talmy, 1985)

In addition, Soroli et al.'s (2019) examples in (4) and (5), clearly demonstrate the complete function of each part of the sentence, according to Talmy's original scheme. Example (4) uses an s-framing pattern in English, where Manner is expressed in the main verb and Path outside of the verb. Contrarily, (5) is an example of v-framing in French, with Path expressed in the main verb and Manner omitted; however, Manner is sometimes expressed in an optional modifier (e.g. a gerund), as shown in parentheses below.

(4) *A woman is walking across the street.*
FIGURE MANNER PATH GROUND
(5) *Un homme traverse la rue. (en marchant)*
FIGURE PATH GROUND (MANNER)
'A man crosses the street (by walking)'.
(Soroli et al., 2019)

Evidence for Talmy's typology was found in several studies, some of the most notable by Slobin and colleagues (see e.g. Berman & Slobin, 1994; Slobin 1996, 2004; Slobin & Hoiting, 1994; Özçalışkan & Slobin, 2000). Using the Frog Story picture books[4], these studies tested the validity of Talmy's typology through motion event descriptions given by speakers of 21 different languages. As the typology predicted, speakers of Romance languages preferentially expressed Path whilst minimally or not at all expressing Manner, in contrast with Germanic speakers who primarily lexicalized Manner in the main verb with one or several Path satellites. A study by

[4] The Frog story picture book is wordless and consists of a 24-page story of a boy and his dog in search of an escaped pet frog.

Hickmann (2003) provided further evidence, with native French speakers displaying a preference for Path lexicalizations (in contrast with speakers of English, German and Chinese) from as early as four years of age. Additionally, results from both Hickmann (2006) and Hickmann, Taranne and Bonnet (2008) showed that Path expressions were encoded to a similar extent by English and French speakers, however, Manner was encoded more frequently by English speakers. Finally, Slobin (2000, 2003) found that language classification affects more than Path or Manner encoding in language production, but also with respect to a speaker's mental imagery. Results from these studies showed that English speakers' recall of recently read texts displayed significantly more Manner-rich mental imagery than their Spanish speaking counterparts, whose attention was directed more toward Path information.

Despite all the evidence in favour of this typology, it is widely argued to be too narrowly defining. The languages of the world are much more complex than Talmy originally suggested. Highlighting this point, three criticisms with adaptations to this classical view are reviewed in the following sections.

2.4. Criticisms and revisions to the typology

2.4.1. Definition issues

Croft et al. (2010) suggested that there are issues with the general concept of a verb, as well as Talmy's definition of a satellite. First, linguists' definitions of a verb seem to differ in that they often employ language-specific phenomena and are not comparable across languages. Secondly, Dimitrova-Vulchanova et al. (2012) argued that Talmy's claim of verb prefixes as satellites breaks down with affixes that are bound morphemes and cannot be separated from the verb, as seen in Bulgarian. Moreover, in Talmy's (2000) later definition of a satellite, English prepositions were excluded, whereas verb particles were not:

> The satellite to the verb … is the grammatical category of any constituent other than a nominal or prepositional phrase ... The satellite, which can be either a bound affix or a free word, is thus intended to encompass … English verb particles … [5] (p. 222)

This adapted definition is not so crucial in the original typology, as it mainly emphasized whether Manner or Path was encoded in the main verb, without any focus on other sentence components. However, Talmy's (2000) more recent classification system focused on which grammatical element (i.e. main verb or satellite) encodes the framing event, and as such, prepositions as satellites is an important issue. There is, for instance, no semantic difference in encoding motion events between a structure acting only as a preposition, and one acting both as a verb particle and a preposition (Croft et al., 2010). In the examples below, both (a) structures encode Path in the italicized prepositions, regardless of whether they can be used alone or not, i.e., prepositional phrases vs. verb particles[6]. However, Croft et al. (2010) argued that this becomes problematic in Talmy (2000), since *into* in (6a) would no longer be considered a satellite, despite the typology stating Path is expressed in a satellite in s-languages.

(6) a. The man walked *into* the store.
    b. *The man walked *into*.
(7) a. The man walked *over* to the store.
    b. The man walked *over.*

As a result of these issues, Croft et al. (2010) suggested adopting criteria that are valid across all languages, thus redefining the two terms in the following ways: a *verb root* as "a morpho-syntactic element … [that] can occur as a predicate on its own with the same meaning"

[5] Talmy (2000) mentions several other grammatical forms in other languages as well, which were not mentioned due to a lack of relevance, including "German separable and inseparable verb prefixes, Latin or Russian verb prefixes, Chinese verb complements, Lahu nonhead "versatile verbs", Caddo incorporated nouns and Atsugewi polysynthetic affixes around the verb root" (p. 222).

[6] In a prepositional phrase, the preposition is attached to another grammatical item, such as 'the man walked into the store', in (6a). Thus, it cannot occur alone (6b). A verb particle, on the other hand, may occur either with another grammatical item (i.e. the man walked *over to the store*) or without (i.e. the man walked *over*).

(p. 206), and a *satellite* as "[a]nything that is not a verb root but encodes an event component" (p. 206). These reformulated definitions are argued[7] to be more applicable cross-linguistically; the latter, for instance, solves the problem of English prepositions which can thus be defined as satellites (i.e. since they cannot occur as predicates on their own). Similarly, Path expressions in English are not verb roots as they cannot occur alone as predicates either. In (8), for instance, the Path expression *into* cannot function as a predicate on its own and is thus a satellite. Additionally, in (9), the Spanish *flotando* 'floating' cannot occur alone, and is therefore also a satellite (Croft et al., 2010).

(8) *The bottle *into* the cave.

(9) *La botella *flotando.*
'the bottle floating'
(Croft et al. 2010)

Croft et al. (2010) also argued that the use of verbs vs. satellites as categorization criteria allows for a *symmetric* classification of event and frame encoding. This contrasts with Talmy's v-framing vs. s-framing classification, which these authors argued to be *asymmetric* since it proposes that one aspect of meaning is expressed by a verb or predicate, and one is expressed by an element which cannot function alone as a verb or predicate. This asymmetric approach is argued to be problematic as several languages employ constructions where both Path and Manner can occur as individual predicates. Croft et al. (2010) thus developed a set of symmetric criteria; as the full criteria is not relevant to the present study, however, it will not be further discussed[8].

2.4.2. Intralinguistic variation and proposing universals

As previously discussed, numerous authors have argued that the basic units of comparison, and ultimately the differences amongst languages, are seen in individual constructions rather than in entire languages. Moving beyond interlinguistic differences, a further

[7] See Beavers (2008) for a similar analysis of satellites.
[8] See Croft et al. (p. 206-208, 2010) for a summary of the proposed adaptation.

issue with the typology is that it does not explain variation within individual languages themselves, i.e., intralinguistic variation (Dimitrova-Vulchanova et al., 2012).

The studies by Slobin and colleagues discussed in 2.3 do in fact show some evidence for Talmy's typology, however, they also found intralinguistic variation to be widespread. As a result, it has been determined that both language types (i.e. v- or s-languages) may exhibit lexicalization patterns of the opposite type. For instance, Soroli et al. (2019) pointed out that in French, expressions using Manner verbs such as *voler* 'to fly' with a Path adjunct exist, e.g., *voler jusqu'à l'arbre* 'to fly to the tree'. Similarly, English holds Path encoding verbs such as *descend* and *arrive*[9]. Crucially, however, there is significant variation in the frequency of such patterns, depending both on context as well as the specific language.

Croft et al. (2010) provided evidence for intralinguistic variation in several languages. For instance, English is a so-called s-language, however, several examples of v-framing have been observed. Take the following sentences, which both express the same situation type, yet (10a) is an example of s-framing, while (10b) is one of v-framing.

(10) a. I wiped the table *clean*.
b. I *cleaned* the table (by wiping it).
(Croft et al., 2010)

According to Croft et al. (2010), similar patterns of variation are seen in Icelandic, Bulgarian and Japanese. In Bulgarian, s-framing patterns are observed in sentences such as (11), with *v* 'in' as the satellite. However, *double-framing*, where the motion component is expressed in both a verb and satellite (Croft et al., 2010), is also used in certain conventional expressions, as in (12). Finally, the English sentence: 'the bottle floated into the cave' most naturally translates into the v-framing construction *butilkata vleze v pešterata* 'the bottle entered the cave' in Bulgarian, as seen in (13) (Croft et al., 2010).

[9] Notably, many of the Path verbs existing in English, including those mentioned here, were in fact borrowed from French.

(11) Iz- tŭrkaljax varela *v* mazeto.
PF- roll.IMPF barrel:the *in* basement:the
'I rolled the barrel into the basement.'

(12) Toj me *iz-* vede *ot* zatrudnenieto .
he me PF- lead.AOR *out.of* difficulty:the
'He led me out of difficulty.'

(13) Butilkata *vleze* v pešterata.
bottle:the *enter*.PR.AOR in cave:the
'The bottle entered the cave.'
(Croft et al., 2010)

A similar occurrence of typological overlap is seen in Spanish, another so-called v-language. Aske (1989) pointed out that if a Path expression is atelic[10] in Spanish, s-framing is possible. Further cases are seen in both French, which Talmy classifies as a v-language, as well as Norwegian, a so-called s-language. The latter two languages will be discussed in further sections.

Given all of these examples of intralinguistic variation, classifying them into such a strict typology is evidently problematic. Instead, Croft et al. (2010) claimed that universals should be proposed where there are general patterns. Using the aforementioned example with Spanish to demonstrate this idea, Croft et al. (2010) suggested the following: "if a telic path of motion is encoded by a satellite framing construction, then an atelic path of motion is also encoded by a satellite framing construction" (p. 211). Universals, simply put, are not about languages themselves, but rather about specific constructions within languages.

2.4.3. Conceptual granularity

Vulchanova et al. (2013) discussed how Talmy's definitions of Manner and Path may be problematic as they may be represented in different ways, and can even converge if not carefully defined. For instance, so-called Manner verbs such as the Norwegian *å klatre* 'to climb', encode

[10] Atelic refers to an event that "does not imply arrival at the destination" (Croft et al., 2010).

elements of both Manner and Path. As a result, Vulchanova and Martinez (2013) argued that both Manner and Path can be further broken down. For instance, Manner can be decomposed into parameters such as terrain/medium (e.g. walk vs. swim) and speed (e.g. jog vs. run). Vulchanova and van der Zee (2013) and Vulchanova and Martinez (2013) thus proposed (14), a wide set of fine-grained parameters linked to categorizing biological motion across languages.

(14)
a. ***Locomotion medium*** (e.g. terrestrial vs. aquatic vs. air)
b. ***Gait phase*** (e.g. suspended vs. supported vs. aerial)
c. ***Posture and stance*** (e.g. upright vs. low body; erect vs. sprawling legs)
d. ***Temporal spacing of footfalls*** (symmetrical vs. asymmetrical)
e. ***Figure orientation*** (front-forward vs. front-backwards; head-up vs. head-down)
f. ***Velocity*** (fast vs. normal vs. slow)
g. ***Method of propulsion*** - the use of body and limbs (no limbs/body undulation vs. bipedal vs. quadrupedal)
h. ***Species*** (human vs. non-human)
i. ***Path*** (presence vs. absence of translational motion)
    i. ***Reference object*** (type of relation to reference object)
    ii. ***Vector orientation*** (horizontal: toward vs. away from vs. left-to-right vs. right-to-left; vertical: up vs. down)
    iii. ***Path shape*** (circular, zigzag)

In order to investigate whether lexicalization patterns depend on the above parameters, Vulchanova et al. (2013) examined the following five languages: Bulgarian, Russian, English, Norwegian and Italian. According to Talmy's typology, Italian is a v-language, whereas the remaining are considered s-languages. Interestingly, although four are said to be s-framed, there are differences between them in terms of how they describe motion events. The results of this study demonstrated that despite the existence of similarities within languages, there are differences which cannot simply be explained by v and s-framing tendencies. They can, however, be linked to the conceptual features described above. These authors argued that shared tendencies across languages are seen in overt discontinuities in nature, such as between distinctive gait phases (e.g. walking vs. running), whereas there is more variability across languages in less overt discontinuities (e.g. subtypes of supported motion). These results are in accordance with Malt et al. (2014), who claimed that mapping conceptual structure to language is constrained by the natural world but is also flexible and language-specific.

Extending these parameters, Vulchanova and van der Zee (2013) suggested that the lexicon be addressed through a more refined system of conceptual granularity. In this system, three levels of verbs have been proposed to reflect the encoding of locomotion: a basic level, a specific level, and a superordinate level. The *basic level* verbs are hypothesized to be universally perceived across languages, and they include verbs such as 'walk', 'run', and 'jump'. The *specific level* refers to subtypes below the basic level, such as 'strut', 'stroll' and 'sprint'. Finally, the *superordinate level* includes verbs such as 'go', 'come', and 'move'. Most basic level verbs are said to combine Manner and Path, whereas specific level verbs only encode Manner, and finally, superordinate level verbs never encode Manner of motion but can encode Path (e.g. 'come', 'ascend', 'descend'). Interestingly, languages differ in the quantity of verbs they have at each level, as well as in the weighting of features encoded at these levels (Öztürk et al., 2011). Typically, so-called s-languages are associated with higher inventories of specific level verbs, since they often encode Manner. In contrast, so-called v-languages tend to have lower numbers of specific verbs and higher numbers of superordinate verbs.

Evidence for these three levels is provided in a study by Öztürk et al. (2011), where similarity sorting tasks were conducted. It was determined that humans rely on varying features, differing in degrees of granularity (i.e. basic vs. specific), to categorize the world. Further evidence is provided in Vulchanova and Martinez (2013), which looked at whether participants resorted to basic level verbs when naming basic patterns of locomotion. These authors demonstrated that the most salient terrestrial biological motion types correspond to the parameters in (14), which aid in differentiating between basic and specific verb types. Simply put, a basic and specific form of a related motion type (e.g. basic 'walk' and specific 'stroll') would share so-called 'default' parameters such as *locomotion medium* (terrestrial), *gait phase* (supported) and *figure orientation* (front-forwards). However, they differ in *velocity*, e.g., 'stroll' is a slower pace than 'walk'.

Results from the studies mentioned in this section demonstrated clear distinctions between basic and specific lexical items, in regard to the most salient forms of terrestrial biological motion. These parameters and conceptual features are argued to predict lexicalization patterns in language more accurately than the typology, and are further explored in the present study.

2.5. Concluding remarks and the present study

In order to peer into the workings of human language and cognition, it is important to take a cross-linguistic approach. Research in this domain, including Slobin's concept of thinking for speaking, provides some groundwork to understand why differences in lexicalization patterns are present.

Talmy's work has provided a foundation for which much of the modern research in spatial cognition relies upon to this day. However, the original typology is limiting, and thus many useful revisions have been made. It is certainly important to consider the typology, as there are some incredibly prominent patterns and tendencies that exist; however, it is equally imperative to acknowledge that languages are complicated and there are many exceptions to the rule. The present study considers general tendencies found in Talmy's typology (i.e. the focus on Path in the main verb in v-languages, e.g., French, and the focus of Manner in Germanic languages, e.g., Norwegian), while also considering the adaptations proposed in section 2.4. Special attention is paid to the conceptual levels of motion.

In regard to terrestrial biological motion, there are three basic types that can be distinguished in the current study. These types correspond to the English 'walk', 'run' and 'jump'. According to Vulchanova and Martinez (2013), *walking* refers to a supported gait, i.e., there is, at minimum, one foot which is always on the ground, with a normal or slow speed. *Running* refers to quick suspended motion, i.e., there are some points where neither foot touches the ground (Vulchanova & Martinez, 2013). Finally, *jumping* refers to freely pushing oneself off the ground (Jumping, n.d.), a more prolonged suspended motion than running. Additional motion types involved in this study include modifications of these basic patterns, where a default pattern is cancelled. Vulchanova and Martinez (2013) called this the *non-default explication function*, i.e., "the use of modifying phrases to explicate how the motion occurring in the scene differs from the default" (p. 167). *Walking in place*, or *walking backwards*, for instance, both cancel the default parameter of forward motion. For simplicity in this thesis, this category of events is referred to as *basic + modifiers*. Finally, the majority of the stimuli in the present study involve specific patterns of human locomotion, where default parameters remain the same as in the related basic type, however, certain parameters are modified. All patterns of human locomotion involved in the current study are discussed further in section 6.

Through experimental work in the present study, the naming patterns of these motion events are analyzed in French and Norwegian. Thinking for speaking patterns reflected in the respective languages, as well as tendencies toward s-framing and v-framing are noted, along with how these patterns correspond with the parameters and conceptual levels of motion discussed in the previous subsections.

3. Language acquisition and motion

This section explores a variety of concepts including general definitions in language acquisition, and how cross-linguistic variation in motion verbs may impact this process. In addition, there is an examination of linguistic transfer, including different hypotheses proposed in the literature. Finally, motion encoding patterns in the languages specifically relevant to this thesis are discussed.

Spatial language develops early on in first language acquisition (henceforth FLA), possibly even before the child begins producing language (Mandler, 1998). Regardless of the first language (L1), children appear to follow similar patterns in their spatial language development (Johnston & Slobin, 1979). In contrast, acquiring a second language (L2) is impacted by both biological and environmental factors, as well as differences between the L1 and L2. Before a more in-depth discussion of SLA and motion verbs can occur, it is useful to first provide some background information regarding language acquisition in general.

According to Karmiloff and Karmiloff-Smith (2001), acquiring language is a complex process involving various stages in development. FLA begins even before a child is born, with fetuses processing language sounds as early as 20 weeks gestation. Acquisition of the L1 continues throughout infancy (e.g. processing of phonetic sounds and prosody), childhood (e.g. processing and production of lexical items, and morphosyntax) and even into adulthood (e.g. continuous acquisition of lexical items). Such stages of acquisition are agreed upon by many researchers in the field; however, exactly *how* language is acquired has been a source of debate. Some researchers have argued for language as innate and influenced by biological factors, and others for language as influenced primarily by environmental factors; this is called the nature-nurture debate.

The most prominent of nature approaches was proposed by Chomsky in the 1950s and 1960s. Chomsky (1956) developed the concept of Universal Grammar (UG): the idea that children are born with a set of universal principles and parameters which underlie all the world's languages. This innate system is suggested to merely be triggered by environmental factors, i.e., linguistic input, and ultimately prepares children for the process of language acquisition. Furthermore, this view sees brain mechanisms involved in language acquisition as domain-specific, in other words, assigned only to the processes of learning language. The opposing view,

the nurture approach, argues that there is nothing unique about language acquisition, as it involves the same mechanisms used to learn any other cognitive task i.e. domain-general (Karmiloff & Karmiloff-Smith, 2001). In recent years, however, it is widely acknowledged that language acquisition is in fact a dynamic interplay between both nature and nurture (see e.g. Karmiloff & Karmiloff-Smith, 2001; Hoff & Shatz, 2007).

3.1. Second language acquisition

Second[11] language acquisition is defined in various ways according to different authors; however, the following is assumed for the purposes of this thesis: SLA involves acquiring another language at or after approximately three or four years of age (Klein, 1986). Moreover, it involves acquiring the morphological, syntactic, phonological and lexical systems of the new language, and is a complicated, continuous, and dynamic process (Larsen-Freeman, 1991). Some authors also argue that SLA is influenced by the same principles and parameters of UG as in FLA (White, 1989).

Several additional factors are suggested to influence the course of SLA, including maturational constraints (Lenneberg, 1967) as well as cognitive capacities of the learner (Newport, 1990). Furthermore, Coventry, Guijarro-Fuentes, and Valdés (2012) argued that the age and length of immersion in the L2 are crucial factors, with particular regard to spatial language development in SLA. For instance, Munnich and Landau (2010) found that the age of L2 immersion predicted accuracy in Spanish and Korean learners of English, in both their comprehension and production of spatial relations. Other factors[12] argued to impact SLA include individual variation regarding foreign language aptitude, language learning strategies, learning styles, motivation, attention, memory, and language processing capacities (Dörnyei & Skehan, 2003; Robinson, 2003; Pienemann, 2003).

SLA is undeniably challenging for the learner, and due to the amount of cross-linguistic variation present in spatial lexicalization patterns, acquiring language in this domain is argued to

[11] Note that 'second' does not necessarily literally mean so, which is particularly relevant to the present study. Chronologically, French is in fact the third language for most of the participants in this study and some authors would thus refer to this as an L3. For the purpose of simplicity in the present study, however, the term second language (L2) will be used.

[12] It should be noted that some of these factors are controversial, and not all authors agree on the role they may or may not play in SLA.

be particularly so (Coventry et al., 2012). For instance, native speakers of s-languages exhibit higher degrees of granularity in Manner of motion naming patterns than do speakers of v-languages. As such, the former typically provide more detailed descriptions of Manner than the latter (Cadierno & Robinson, 2009). In contrast, v-language speakers tend to use more neutral verbs of motion, and only provide descriptions of Manner when it is essential to a particular context (Slobin, 2004). This variation has led some researchers to view the process of SLA as learning new ways of thinking for speaking, and in fact, Robinson and Ellis (2008) called this 'rethinking-for-speaking'. However, thinking for speaking patterns learned during FLA may be resistant to restructuring during SLA in adulthood, causing instances of linguistic transfer between the L1 and the L2 (Cadierno & Robinson, 2009).

3.2. Linguistic transfer

A speaker's initial state is an important consideration in language acquisition. During FLA, the learner has no prior knowledge of any language, whereas there is at least one language, i.e., the L1, that has already been acquired at the onset of SLA (Schwartz & Eubank, 1996). This initial state of L2 may impact the course of SLA through so-called linguistic transfer, a process in which L1 constructions 'transfer' over to L2 production (or vice versa). Though differentiated by some, the terms *linguistic transfer* and *linguistic influence* are used interchangeably throughout this thesis; the former is used more often, however, as it appears more frequently in the literature.

Transfer may be caused by similarities or differences in lexicalization patterns between the L1 and L2 (Cadierno & Robinson, 2009; Ringbom, 2007), and there are two types of transfer that must first be distinguished. *Positive transfer*, also referred to as *facilitative transfer*, occurs when correct cross-linguistic assumptions arise from similarities between languages. whereas *negative transfer* occurs when incorrect assumptions result either in L2 production errors, or simply inhibit the learner from acquiring new structures (Ringbom, 2007).

3.2.1. Linguistic transfer and spatial language

According to Cadierno and Robinson (2009), although both intermediate and advanced L2 learners are typically able to develop appropriate thinking for speaking patterns in the L2, negative transfer effects have still been observed. Cadierno (2004), and Navarro and Nicoladis

(2005), for instance, found higher degrees of granularity in event descriptions provided by Danish and English learners of Spanish, than by native Spanish speakers. In addition, Cadierno (2004) and Cadierno and Ruiz (2006) found that intermediate Danish learners of Spanish used satellites to encode Path in the L2, the correct patterning in s-framing (Danish), but not in v-framing (Spanish). In the same study, L1 Spanish speakers described a particular motion event with Path encoded in the main verb, using the following construction: *El niño se subió a una roca* 'the boy self went-up a rock'. In contrast, Danish learners of Spanish described the same event with constructions such as: **El niño fue arriba de una roca* 'the boy went on top of a rock', with Path encoded outside of the main verb, in the particle *arriba*. Cadierno and Ruiz (2006) suggested that these results are attributed to learners using L1 constructions where their L2 knowledge was lacking, a clear indication of linguistic influence. Crucially, these authors reported that future studies should focus on beginner-intermediate stages of acquisition, as does the present study, to determine whether L1 naming patterns are stronger than in advanced levels.

Further evidence is seen in Cadierno (2008), where Spanish (v-language) learners of Danish exhibited less granularity in Manner of motion as compared with Danish, German and Russian native speakers (all the latter three of which are s-languages). Moreover, Harley (1989), and Harley and King (1989), found that English learners of French used Manner encoding verbs (e.g. *courir* 'run', *sauter* 'jump', *marcher* 'walk') more often than French native speakers, who used verbs encoding Path (e.g. *monter* 'go up', *descendre* 'go down', *sortir* 'go out') more frequently. Such results are argued to be explained by Slobin (2004), who claimed that s-languages are more Manner-salient. Thus, native s-language speakers are suggested to make finer distinctions and pay more attention to Manner than native v-language speakers.

In contrast, no substantial differences were found regarding the number of Manner verbs used between Danish and Italian learners of Spanish in the study by Cadierno and Ruiz (2006) discussed above. A study by Cadierno (2004) also failed to provide evidence of L1 influence in advanced learners of Spanish. Furthermore, Dimitrova-Vulchanova et al. (2012) found minimal evidence of transfer in advanced Bulgarian learners of Norwegian. The latter study found that L2 Norwegian responses provided by L1 Bulgarian speakers converged on the proper Norwegian encoding strategies, i.e., appropriate thinking for speaking, however, they contained some errors. Nevertheless, the authors attributed these errors to a lack of lexical knowledge, rather than a lack of L2 thinking for speaking patterns (Dimitrova-Vulchanova et al., 2012).

The research reviewed here has led to claims that linguistic transfer in this domain is apparent in the beginning stages of learning. However, there is a limited role of the L1 during SLA in general, and particularly in advanced learners. The transfer of L1 thinking for speaking patterns are thus suggested to be stronger in the beginning and intermediate stages of SLA, and with increased exposure to the L2, learners gradually acquire the appropriate lexicalization patterns (Cadierno, 2008). Consequently, thinking for speaking strategies in the L2 appear to correlate with the level of L2 acquisition (Dimitrova-Vulchanova et al., 2012).

3.2.2. Transfer hypotheses

Several hypotheses have been proposed regarding the extent to which transfer may occur. An exhaustive analysis of hypotheses is not included here, as this is not within the scope of this thesis. As such, this section provides some of the most influential ideas relevant to the present study.

According to Schwartz and Sprouse's (1994) full transfer/full access hypothesis, the initial state of SLA includes the entire set of principles and parameters belonging to the L1 (*full transfer*), however, these parameters can be restructured through *full access* to UG. In contrast, the minimal trees hypothesis (Vainikka & Young-Scholten, 1994; 1996a; 1996b) suggests partial transfer between languages; lexical categories positively transfer from the L1 in early stages, whereas functional categories are only transferred during later stages of SLA.

In regard to the specific nature of transfer in spatial language, Ringbom (1987) claimed that the similarities of spatial terms between the L1 and the L2 increase the likelihood of positive transfer occurring. This corresponds with the contrastive analysis hypothesis (Lado, 1957, 1964; Gass & Selinker, 1983), which predicted that SLA is easier when the L2 functions similarly to the L1. However, even languages with similar spatial terms may differ in detail and as a result, L2 patterns may be hindered by those of the L1 (Coventry et al., 2012). In contrast, Kellerman (1979) argued that the perceived distance between the L1 and the L2 will prevent negative transfer. Finally, Cadierno (2008) suggested that learners whose L1 has a less elaborate spatial system than the L2 will more likely exhibit signs of negative transfer, and the reverse is also true in that learners with an L1 that is more elaborate than the L2 will have less difficulty.

Evidently, there is currently no consensus to fully capture transfer in the domain of spatial lexicalization patterns, and research of this topic remains limited. Nevertheless, as

Dimitrova-Vulchanova et al. (2012) pointed out, the hypotheses all seemed to indicate that both the L1 and L2 must be compared and examined in depth in order to predict potential influence. As such, the following sections take a closer look at motion encoding in the two languages relevant to the present study.

3.3. The present study

The present study involves basic, basic + modifiers, and specific patterns of human locomotion. Such patterns are described by different verb types depending on a given language's lexicalization strategies. As previously explained, the three main basic motion events distinguished in this study are expressed by the English 'walk', 'run', 'jump', and the corresponding verb inventories differ according to the language. Motion verb inventories and encoding strategies in French and Norwegian are discussed in the following subsections.

3.3.1. Motion in French

According to Talmy's typology, French is a v-language with Path of motion typically lexicalized within the verb, and Manner outside of the verb. However, Croft et al. (2010) pointed out that double-framing exists in French, and Kopecka (2006) argued that French is a hybrid system, combining attributes of both language types. Regarding the latter, there are approximately 15 verbs which lexicalize Path in French, some of which include *arriver* 'to arrive', *descendre* 'to go down' and *monter* 'to go up'. Path may also be encoded in a prefix which allows the verb root to encode Manner, typically an s-language characteristic. This is seen in the following example: *les abeilles se sont en**v**olées de la ruche,* 'the bees *flew* away from the hive' (Kopecka, 2006). Finally, Path and Manner may both be encoded in the main verb of the sentence, according to Soroli et al. (2019). The following examples show three different patterns in French: v-framing (15a), s-framing (15b) and hybrid patterning (15c), respectively.

(15) a. *Le petit garçon est parti en courant.*
FIGURE PATH (verb) MANNER (gerund)
'The little boy left by running.'

b. *Un oiseau s'est envolé.*
FIGURE PATH prefix + MANNER root
'The bird away.flew.'

c. *Un ours a grimpé sur un arbre.*
FIGURE PATH + MANNER
'A bear climbed.up on a tree.'

(Soroli et al., 2019)

Nevertheless, French does fit Talmy's typology in that speakers generally use fewer Manner verbs (i.e. a v-frame characteristic). However, they do exist; some examples of motion verbs encoding Manner in French include *rouler* 'to roll' and *ramper* 'to crawl'. Notably, though, these verbs are not used as frequently or in as diverse cases as an s-language. For instance, *le bébé rampe dans la chambre* 'the baby crawls/is crawling *in* the room' can only be used if there is no boundary crossing, in contrast with English, where 'the baby is crawling *into* the room*'* is completely acceptable (Hickmann, 2003).

The three basic motion types distinguished in this study (walk, run, jump) are expressed by the French *marcher*, *courir* and *sauter* respectively. Though French does contain specific verbs, there are far fewer in comparison to most Germanic languages. However, they do exist, and those relevant to this study include *jogging* 'to jog', *gambader* 'to gambol', *sprinter* 'to sprint', and *trottiner* 'to trot about'. As Soroli and Verkerk (2017) explained, though most languages have equivalents of both Manner and Path verbs, their frequency of use is quite variable depending on their typology and tendencies. Perhaps this same explanation can be applied to basic and specific verb types; although the latter may exist in French, there appears to be a general tendency toward the use of basic verb types with further specifications outside of the verb. It is also possible that French speakers only use specific verbs in particular contexts.

The use of *faire expressions* is another common way to express specific motion types in French. The verb *faire* translates directly to both 'to do' and 'to make' in English, however, it is also used in many common expressions including some specific motion events such as *faire de la randonnée* 'to hike', and *faire du surplace* (lit. 'to do some on/in place'), for 'walk in place'.

In such cases, *faire* is often considered a light verb, serving only as a predicate without much semantic content at all (Riegel, Pellat & Rioul, 2018). Further, *faire* does not directly encode Path or Manner.

3.3.2. Motion in Norwegian

Norwegian is classically viewed as an s-language, primarily encoding Manner in the main verb, and using prepositional phrases outside of the main verb to encode Path. There is a wide array of transitive and intransitive prepositions which encode location vs. directed motion in Norwegian (e.g. *inne* 'inside' vs. *inn* 'into', *ute* 'out(side)', vs. *ut* 'to-out'), and the compounding of several prepositions is also allowed (Faarlund et al., 1997; Dimitrova-Vulchanova et al., 2012). Interestingly, however, Norwegian also allows some v-framing tendencies. For instance, Path encoding in verbs of directed motion such as in *å komme* 'to come', *å dra* 'to leave/travel away from', and *å forlate* 'to leave' (Dimitrova-Vulchanova et al., 2012).

The three basic motion types distinguished in this study (walk, run, jump) are represented by the Norwegian verbs *å gå*, *å løpe*, and *å hoppe*, respectively. It should be noted that *å ga* also translates to the English 'to go' or 'to move by foot/change location'. As such, this verb has the capacity to function above the basic level in certain contexts. In addition, *å springe* is an alternative verb conveying 'to run', and the distinction between the two expressions lies in the register; *å løpe* comes from Bokmål, the formal variety of Norwegian, whereas *å springe* is used in certain informal dialects (Vulchanova & Martinez, 2013).

Germanic languages tend to employ rich systems of specific verbs to describe motion, and the differences between each of these verbs are not always so apparent (Öztürk et al., 2011). Norwegian is no exception to this, thus containing a vast set of specific verbs encoding Manner, including: (i) specific subtypes of walking such as *å marsjere* 'to march', *å rusle* 'to stroll/relaxed walking', *å spasere* 'to stroll', *å tusle* 'to shuffle', *å spankulere* 'to walk with a proud, stiff bearing', *å sprade* 'to strut', *å vralte* 'to wadle', *å subbe* 'shamble' (a slow, shuffling gait), *å trampe* 'to stomp', *å lunte* 'to trot/stroll' *å luske* 'to sneak/slink', *å stavre* 'to totter', (ii) specific subtypes of running such as *å pile* 'to scurry', *å jogge* 'to jog', *å sprinte* 'to sprint', *å spurte* 'to spurt', *å flykte* 'to flee', and finally, (iii) specific subtypes of jumping such as *å galoppere* 'to gallop' (Vulchanova et al., 2013).

In general, the literature surrounding motion in Norwegian is limited. This is precisely why it is imperative for research to incorporate a diverse range of languages, particularly those which have been less discussed in the past.

3.3.3. Concluding remarks and the present study

The two languages in this thesis both have complex inventories, exhibiting distinct patterns, though also overlapping in some aspects. The different patterns in these two languages, i.e., French as primarily v-framing and Norwegian as primarily s-framing with a rich system of specific verbs, make them ideal languages to be studied together.

4. Eye tracking and human locomotion

4.1. The evolution of eye tracking

In the late 1800's, the French ophthalmologist Louis Émile Javal found that the human eye does not move fluidly over a written text during reading. It is not possible for the eyes to process an entire line of text with equal amounts of accuracy, and thus instead, they move in stops and starts (Kaiser, 2013). This is due to anatomical reasons, as the portion of the eye responsible for formulating visual images, the *fovea*, is incredibly small, measuring approximately 1.5 mm in diameter (Remington, 2012). As Kaiser (2013) explained, this delicate and light-sensitive layer at the back of the eye, contained within the retina, produces the sharpest images. Humans are also capable of sight in the regions around the fovea, including the parafoveal and peripheral regions, however, with significantly less clarity. Take this thesis right now, for instance. Surrounding these words may be foggy images of a cup of coffee, a desk, or a lamp. These objects may still be recognizable; however, they are not as clear as are the words currently being read. Essentially, humans move their eyes with the subconscious intention of bringing visual input into the foveal region, in order to perceive it clearly.

The rapid movements from one object/word/etc. to another are called *saccades*, whereas the regions in which the eyes pause to focus and fixate are called *fixations* (Kaiser, 2013). During a saccade, there is essentially no visual input, and therefore the duration of a fixation gives insight into the time it takes individuals to obtain and process input (Kaiser, 2013; see e.g. Rayner, 1998; Juhasz & Rayner, 2007). As a result, fixations provide researchers with the most useful data in eye tracking experiments. According to Rayner, psychologist and pioneer in the field of eye tracking, this methodology was created in order to provide researchers with the ability to look into the mind of participants (Rayner, 1978). Though this initial viewpoint was arguably overly optimistic, there remains rich data that can be obtained through eye tracking.

From the beginning, eye tracking was focused on "saccadic latency, suppressed vision during a saccade, and average fixation duration time" (Rayner, 1978, p. 618; see e.g. Huey, 1968; Woodworth, 1938). It was also used as a means of improving reading, primarily in the field of education (Rayner, 1978). The early days of eye tracking methods were also rather time-consuming, since much of the work was done by hand (see e.g. Mackworth, 1967; 1968). It was

not until the late seventies when computers were paired with eye tracking devices, allowing for the use of on-line techniques of eye movement recordings. On-line methods refer to those measuring language processing in real-time, which is useful in psycholinguistic research as the majority of language processing is both rapid and brief (Kaiser, 2013). Such a technological advancement provided many advantages over previous models, including superior fixation accuracy, as well as the capacity to restrain stimuli presentation in relation to eye location (Rayner, 1978).

Many eye tracking studies today revolve around reading or the visual world paradigm. Those involving reading typically measure the duration of fixations, whereas visual world eye tracking typically measures the location of the fixation. Many studies have provided evidence leading to the hypothesis that individuals tend to direct their gaze to critical information (Kaiser, 2013). It is thus safe to assume that the same is true when using video stimuli in the domain of motion, as is the case in the present study.

4.2. Eye tracking and motion

According to Soroli et al. (2019), the combination of both non-linguistic (i.e. visual) and linguistic data provides researchers with the opportunity to address conceptualization more extensively, as it includes elements of both a linguistic and cognitive nature. Combining these aspects aids researchers in finding whether language affects on-line processing, and on-line measures may shed more light on linguistic variation. Some studies in the domain of motion have incorporated such a consolidation of experimental data, some of which are discussed here.

Crucially, spatial language has been shown to impact gaze patterns, even with a lack of visual stimuli. For instance, two studies by Spivey and colleagues looked at gaze patterns of participants listening to stories involving a spatial extension along an axis (e.g. a train going past), while staring at a blank screen or with their eyes closed. Interestingly, they found that subjects directed their eyes along a path consistent with what was described in the story, despite the lack of visual stimuli (Spivey et al., 2000; Spivey & Geng, 2001).

Furthermore, even figurative language input in the domain of motion is thought to influence gaze patterns. A study by Matlock and Richardson (2004) looked at eye movements while participants were presented with fictive motion sentences (e.g. the palm trees run along the highway) in contrast with non-fictive motion sentences (e.g. the palm trees are next to the

highway). The authors reported that participants' gaze patterns were influenced by figurative motion sentences in a similar way to literal motion sentences (e.g. the man is running along the highway). The authors argued that these results suggest a “dynamic mental simulation, and that this simulation determines how the visual system interprets and inspects the world” (Matlock & Richardson, 2004, p. 913).

Moreover, a study by Griffin and Bock (2000) involved participants observing and describing event scenes in line drawings. Researchers predicted that if language affects the processing of visual input, there should be a correlation between early fixations (i.e. the first 300 ms of stimuli presentation) and which figure is described first. If there is no such interaction, conceptualization was thought to depend initially on other sensory processes, with language only playing a role later on. The results of this study showed a correlation, however, only after the first 300 ms. In contrast, Gleitman et al. (2007) observed a language effect during the first 200 ms in their study involving motion event descriptions of picture scenes. However, these studies were both limited in that they used static motion event stimuli, and they did not compare results across languages (Soroli et al., 2019). To better simulate realistic motion scenes, some of the more recent eye tracking studies have used video stimuli, including the present study.

Papafragou, Hulbert and Trueswell (2008) explored descriptions of motion events in video animations by speakers of English and Greek. They looked at gaze patterns during a description task, while subjects observed motion events with and without a final endpoint (e.g. a wolf roller-skating [into a cage]). Results from this study indicated a preference for more frequent usage of Manner amongst English speakers, in contrast with Greek speakers who preferred Path. The visual information data showed an overall Path-bias for both speech communities. Nevertheless, English speakers often first visually attended to areas of Manner, whereas Greek speakers focused more on Path, i.e., endpoints, overall. Interestingly, after the video clips finished playing, participants often focused on motion components not typically encoded in their respective languages. The authors concluded that visual processing is not dependent upon language, since specific language characteristics did not affect general attention allocation. However, the order in which they were attended to was impacted by the language type. Soroli et al. (2019) criticized this study, however, with the following points: (i) the choice of languages to compare were not adequate, as English is s-framing and Greek is widely

acknowledged to be hybrid-framing, (ii) the videos involved unnatural events (e.g. a roller-skating wolf), and (iii) the major components of motion were not equally salient in some cases.

Soroli (2011a) conducted a study which looked at gaze patterns of s- and v-framing language speakers during dynamic motion event descriptions. Results from this study showed distinct verbalizations and eye movements relative to the specific languages involved; English speakers primarily encoded Manner in the main verb and Path in a satellite, French speakers encoded Path in the main verb with some instances of Manner in a gerund, and Greek speakers employed v- and s-framing structures equally. Eye movements indicated that French speakers focused on Path-only areas, whereas English and Greek speakers showed no preference for areas of Path combined with Manner, over Path-only areas.

Finally, Soroli (2011b) and Soroli and Hickmann (2011), looked at motion event descriptions by native French and English speakers in two contexts, one involving video clips of real people, and another with animated cartoons. Once again, English speakers tended to use more Manner verbs with Path in a satellite. In contrast, French speakers focused on Path, particularly in scenes involving boundaries and no instruments; in scenes without boundaries involving instruments, more variation was reported. Eye tracking evidence showed a preference for Path in both language groups, and no differences between languages were reported in fixation duration. However, French speakers tended to fixate more on broad Path areas, i.e., beginning, middle and end parts of the event, whereas they ignored Manner, i.e., body parts. In contrast, English speakers allocated their attention to the middle part of Path scenes, however, less so than French speakers. Authors concluded that there was some evidence for typological differences in gaze patterns in that both groups paid attention to Path, but to varying extents.

Research in the area of eye tracking and motion have provided evidence for a relationship between language and the visual system. Gaze patterns have been shown to reflect patterns in motion event processing, even when there is a lack of visual stimuli or when figurative language is used. Further, eye tracking in the specific domain of motion using video stimuli shows some evidence for s- and v-framing tendencies. However, flexibility and variation across languages were also observed. The present study builds on previous research by looking at gaze patterns using video stimuli of authentic human locomotion events.

4.3. The present study

The eye tracking portion of this study involved recording gaze patterns while participants watched video clips of human locomotion events. The aim was to determine where participants' gaze was directed (Manner vs. Path, and even finer grained within Manner: upper vs. lower body), and how this may be related to lexicalization patterns. As previous research has shown that subjects tend to pay attention to critical information, gaze patterns in the present study may provide insight into which aspects of language, and which parts of the body, are most critical in naming patterns related to verbs of human locomotion.

5. The present study: Hypotheses

To expand on the research questions mentioned in section 1.1, this thesis aims to answer the following:

1. To what extent do speakers use the patterns predicted by previous research, i.e., v-frame/s-frame/other framing tendencies, basic/specific verb type patterns, tendencies related to conceptual parameters?
2. To what extent does cross-linguistic variation in the encoding of verbs of human locomotion impact second language acquisition, i.e., are L2 learners capable of rethinking for speaking, or are transfer effects present, and if so, to what extent?
3. Do participants primarily direct their gaze to the body (Manner), or its trajectory of motion (Path)? If the former, do subjects pay attention to the upper or lower body?

To answer the first research question, responses from both the control and experimental groups will be assessed. In alignment with pre-existing research, I predict that native French speakers will tend toward verb-framing constructions with little or no encoding of Manner in the main verb, i.e., a low use of specific verbs. In contrast, I hypothesize that native Norwegian speakers will tend to use more specific verbs incorporating Manner in their Norwegian descriptions. In the L2 French descriptions, I predict that participants will resort to using basic verbs with Manner in a satellite, as proficiency levels are in the lower-intermediate range and French tends to have fewer specific verbs in general. I expect to also see shared tendencies in distinctive gait phases. However, I also expect to see variation outside of the typical patterns, for instance, regarding subtypes of motion (e.g. how to express specific patterns of motion). These predictions are in alignment with the research reviewed above including Talmy (1985), Dimitrova-Vulchanova et al. (2012), Croft et al. (2010), and Vulchanova & Martinez (2013).

Regarding the second research question, as reviewed above, Norwegian and French are both quite complex when it comes to motion encoding. Norwegian holds a larger set of specific verbs than does French, and though classically viewed as s- and v-languages, respectively, they both show some tendencies of the other language type. Based on the general conclusions reviewed in previous sections, I predict that there will be some transfer effects from the L1 as the

participants in this study are primarily beginner-intermediate learners of French. However, some appropriate L2 thinking for speaking patterns may be observed in more advanced learners. Moreover, as French holds a less elaborate spatial system, i.e., less specific verbs, Norwegian learners may resort to using basic verbs when they are unsure of the appropriate lexical item(s). Such a strategy may inadvertently produce results closer to the native speakers, as it represents the lexicalization patterns of motion in French. These predictions align with Dimitrova-Vulchanova et al. (2012) and Cadierno (2008), respectively.

Regarding the final research question, as gaze patterns tend to reflect critical information, I would expect to see a focus on aspects of motion which are encoded in the speaker's L1. As the experimental group consists of native Norwegian speakers, I would expect them to pay more attention to the body, i.e., Manner, than the Path trajectory. This contrasts with French; though native French speaker's gaze patterns were not recorded due to lack of time and resources; I would have expected them to instead focus on the trajectory of motion (i.e. Path). Regarding upper vs. lower body parts, however, as this portion is exploratory, a complete hypothesis cannot be made.

6. Methods

In the past, a large amount of psycholinguistic research has focused on language comprehension and language processing (Kaiser, 2013). It is thus important for more work to be done in the area of language production. The present study involves a behavioural free naming task combined with eye tracking[13] to answer the research questions outlined in the previous section. The naming task was used following previous research done in the field (see Malt et al., 2014). Such a task allows participants the freedom to express language in a naturalistic setting, and video stimuli were used in order to provide both a rich and authentic context. The following subsections discuss the materials, participants, procedures and analysis used in the present study.

6.1. Materials

The stimuli used in this experiment consisted of video clips from a study by Malt et al. (2014), which looked at constraints and variation in lexicalization patterns across languages. The videos portray an American college student, trained in dance, acting out a series of motion events. She is filmed on a sidewalk, moving from a fixed starting point to a fixed end point. The original set of stimuli contained 36 videos, and according to Malt et al. (2014), were checked and labelled by five volunteers to determine both relevance and clarity.

For the present study, the set was reduced to 20 videos, as others in the original set were irrelevant to the current context (e.g. Argentinean and Japanese dance). Four volunteers (L2 French speakers) assisted with labelling and reducing the number of videos, by determining some to be unclear or too similar to others in the set. This lowered number of videos was also determined to be a reasonable amount to keep the experiment relatively short for participants. Furthermore, before the experiment took place, pilot control groups consisting of two native Norwegian speakers and six native French speakers labelled the videos in their respective L1s. This was completed in order to determine a baseline for the descriptions, and to be used for comparison with the experimental group.

The video clips used in the present study display basic, basic + modifier and specific patterns of locomotion. The basic level motion events include ‘walk’, ‘run’, and ‘jump’. Recall

[13] Recall that the eye tracking data was unused. Due to the COVID-19 outbreak, it was no longer possible to access the software for analysis.

that basic level verbs typically encode both Manner and Path. Further, four videos reflect modified versions of these basic patterns, including ‘run in place’, ‘jump in place’, ‘walk in place’, and ‘walk backwards’. The basic verbs here encode Path, however, the addition of a modifier such as ‘in place’ or ‘backwards’ cancels the default parameters of figure orientation or Path. Finally, below the basic level, the specific motion events include: ‘trudge’, ‘hop’, ‘jog’, ‘march’, ‘march in place’ ‘stride’, ‘stomp’, ‘sidestep’, ‘skip’, ‘stroll’, ‘sneak’, ‘swagger’, and ‘tiptoe’. These events contain patterns with overlapping default parameters; however, they differ in regard to specific parameters. See Table 1 below, for a list of these locomotion labels in English, portrayed by the 20 videos in the current study. See also Figure 1 on the following page, which includes sample images from four different video clips with their respective labels in English. Still images from all videos can be seen in Appendix D.

Table 1

List of locomotion events used in the present study

Basic level	Basic level + modifiers	Specific level
walk	walk in place	trudge
run	run in place	hop
jump	jump in place	jog
	walk backwards	march
		march in place
		stride
		stomp
		sidestep
		skip
		stroll
		sneak
		swagger
		tiptoe

Figure 1. Sample frames from four video clips: Row 1: tiptoe, jump in place; Row 2: sidestep, walk backwards.

The videos were uploaded into E-Prime 3.0, a software program used in behavioural research and one which is compatible with the eye tracking software used in the present study. Originally 2-5 seconds in length, videos were set to play in a continuous loop to allow participants the opportunity to view them as many times as necessary. This provided for a comfortable environment and an adequate amount of time to type their descriptions. Videos were also played at random, so each participant would view them in a distinct order. Furthermore, this meant that each subject's two rounds of participation would show a different order of videos. Unfortunately, again due to the COVID-19 outbreak, the majority of the second part of this experiment (Norwegian labels) did not take place; only one participant completed part two.

The eye tracking portion of this experiment involved the Tobii Pro 3.0. This program is simple and efficient, tolerating a range of head movements and reliably calibrating eye movements. Furthermore, participants do not need to rest their head on any equipment, nor worry about wearing makeup, contact lenses or eyeglasses, in contrast with other models. Finally, minimal data is lost when the participant blinks, or if there's ambient lighting. As a result, this eye tracker allows for a relatively naturalistic and comfortable context, likely leading to more accurate results (Tobii pro, 2020).

6.2. Participants

This experiment involved a total of six participants. Five subjects were recruited from French classes at NTNU Dragvoll, and another through a colleague at NTNU. There were two males and four females, with a mean age of 23. Participants were all native Norwegian speakers. French proficiency varied, with one participant having learned before the age of 5, and others who began learning between 13-15 years of age. Through measures of self-assessed proficiency and vocabulary/grammar testing, participants tended to perform within a beginner-intermediate level, ranging from A1 to B2 based on the Common European Framework of Reference for language (CEFR). All participants were fluent in English, and French would in fact be considered the third chronological language for the majority of them. Furthermore, all participants reported having stayed at least one week in a French speaking region anywhere from 1-5 weeks. One participant lived in a French speaking region for several years. Finally, all subjects reported using French often in their day-to-day lives, and in a variety of settings. For instance, they all reported regular use of French at school, five reported frequently watching TV and movies in French with subtitles, three reported watching TV and movies in French without subtitles, three reported using French while talking to friends/family members, five reported listening to French music regularly, and five reported reading French books not including those required for their studies.

6.3. Procedure

During recruitment, potential subjects were provided with all necessary information regarding the experiment, including their participation being completely voluntary, what the requirements of participation included, what to expect during the experiment, as well as how their information would be treated. Subjects were also informed that after both parts of the experiment were complete, they would receive a 150 kr cinema gift card as a thank you. The entire experiment was completed by a pilot participant prior to testing, to ensure instructions were clear, and in order for the experiment to run smoothly overall.

Participants were told that the study would consist of two rounds of testing, which would take place approximately one week apart. It was explained that they would be asked to describe the video scenes in the L2 (French) during the first round, and in the L1 (Norwegian) during the

second. The reason for conducting these tests separately was to avoid priming for transfer effects. A few days prior to experimentation, participants were sent an email with information explaining, once again, what requirements of the study included, as well as what to expect during the experiment. They were reminded of tasks and duration, that their participation was voluntary, and that they could withdraw at any time. Finally, participants were asked to come in having adequate rest.

When subjects arrived at the lab, they were provided with a more detailed information letter and consent form explaining that any personal information would be kept completely confidential, and then destroyed after thesis completion. They were provided with contact information for both the master's student, the main supervisor as well as the officer at the Norwegian Data Protection Board (NSD), if they had further questions or concerns. This information and consent letter was sent in and approved by NSD in August 2019, and is provided in Appendix A. Once they had read and understood the information, if willing to give consent, subjects were asked to sign and date the form.

Participants also completed a background questionnaire, to determine whether they had impairments, to give information regarding their age, gender, self-assessed proficiency, staying in a French speaking area for prolonged amounts of time, as well as current language use. This test was given as a general measure of homogeneity in the group and was completed by peers ahead of the experiment, in order to ensure both clarity and time efficiency. A copy of this background questionnaire is provided in Appendix B.

In order to test French vocabulary levels, the MultiPic dataset (Duñabeitia et al., 2018), was used, from which 20 target vocabulary items were chosen based on a percentage modal name of 95% or higher. This number indicates the percentage of native speakers whose responses matched with the target name. The test was multiple choice; participants were given a vocabulary item in French and were provided with four images to select from. One image was the correct answer, 1-2 were distractors from the same conceptual category, and 1-2 were unrelated. Participants' receptive vocabulary was tested here, as opposed to their productive vocabulary, in order to avoid spelling errors or complete avoidance. The results of this test were used to indicate the distribution in the group. Moreover, this test was used to determine how many of the 20 words participants understood, i.e., how close to native proficiency they were. Five participants correctly answered 100% of the vocabulary questions, whereas one participant

correctly answered 83.3% of the questions. The 20 target vocabulary words and corresponding images, including both correct answers as well as distractors, are provided in Appendix C.

To assess overall proficiency particularly related to grammar, subjects completed an online test using 'Kwiziq' (2020), an educational tool which practitioners (i.e., teachers) are currently using. This assessment consists of 77 questions, some of which are multiple choice and others which are fill-in-the-blank. Questions in this test become progressively more challenging, and test takers are informed to skip questions they are unsure of, and to submit their answers once they become too difficult. Once participants completed the test, they were given a score indicating where they lie on the CEFR, an international standard indicating an individual's language proficiency. Three participants were determined to be A1, two were B1 and one was B2.

During the experiment, instructions were provided in written form in the native language (Norwegian), as well as verbally in English (as I do not speak fluent Norwegian). Participants were also given time to ask any clarification questions. Specific instructions were provided to calibrate the eye tracker, where participants were directed to follow a dot with their eyes. They were then prompted to begin watching and describing the videos while their eyes were tracked. Participants were told that there were no correct or incorrect answers, and they must simply use their intuitions to freely describe the events. As they viewed the videos, a space was provided on the bottom of the screen, directly below the video, with a prompt in the target language, e.g., *elle...* in French, translating to the English 'she… '. Participants typed in the remaining part of the sentence to match the action taking place. Videos automatically repeated until participants completed their descriptions and pressed enter to move on to the next video. Part one of the experiment took between 45 minutes to one hour and 15 minutes.

6.4. Data analysis

A quantitative analysis was originally intended for this thesis. Due to both a low number of participants as well as the variation in participants' proficiency levels, a qualitative analysis was more suitable. As Davis (1995) pointed out, there is a perception that quantitative research produces more reliable or interesting results than does qualitative. However, the latter can in fact produce equally informative results, simply in a different way. Qualitative studies, for instance, tend to offer a more holistic approach to analyzing the data.

In the present study, all video description responses were recorded onto a spreadsheet and coded for comparison. Responses were organized in terms of whether they used a basic verb, basic verb + modifier(s), specific verb, an expression using *faire*, or another construction. The analysis was initially intended to be a comparison between the experimental group's (native Norwegian speakers) responses in the L1 (Norwegian) and the L2 (French), while also comparing the L2 responses back to the native French speaker's labels. As part two of the experiment was not fully completed, the analysis instead focuses on comparing French descriptions between the native (pilot control) and non-native (experimental) groups. There is also a short section comparing the data collected for Norwegian labels. The following section includes an in-depth analysis and discussion of the descriptions provided by participants. The results and discussion have been combined due to the qualitative nature.

7. Results and discussion

In this section, trends characterizing the descriptions across all participant groups are presented and discussed. The first subsection provides an overview of French descriptions given by both the pilot and experimental groups, including comparisons between them. Following this, Norwegian descriptions provided by both the pilot and experimental groups are presented. A summary and discussion of all results is then presented. The final subsection contains an outline of the limitations of the present study, along with suggestions for future research.

The results of the current study provide further evidence for shared tendencies when distinguishing between the basic level motion types across languages. Simply put, the majority of participants expressed both basic level and basic level + modifier(s) patterns of human locomotion in similar ways. With regard to specific patterns of locomotion, there was more variation observed; nevertheless, participants typically agreed upon salient parameters such as gait phase (supported vs. temporarily suspended), figure orientation (frontward vs. backwards), and velocity (fast vs. normal vs. slow). Take the English label 'stride', for example, which all participants in the experimental group described using *marcher* 'to walk', or some variation of it, e.g., *se promener* 'to go for a walk', or *marcher avec des pas longs* (lit. 'to walk with long steps/strides'). Similarly, the L1 French pilot control group used *marcher* either on its own, or with a modifier accentuating the altered movement (e.g. *marcher en exagérant ses mouvements*, lit. 'to walk with exaggerated movements'). Finally, the L1 Norwegian pilot control group wrote either the basic verb: *å gå* 'to walk', or, a specific form of walking, i.e., *å rusle* 'to stroll'. These results indicate a common biomechanical gait distinction, conforming with previous research by Malt et al. (2008) and Malt et al. (2014). They also provide further evidence for the parameters of biological motion developed by Vulchanova and van der Zee (2013) and Vulchanova and Martinez (2013).

Despite these shared tendencies, the specific lexicalization strategies used to modify distinct patterns of human locomotion varied across the groups. Regarding naming patterns in French, both the pilot control group and the experimental group mostly used phrases including a basic verb followed by a type of modifier. These modifiers typically altered some default parameters, and often highlighted the Manner of the action. The Norwegian pilot control group used various basic verbs with modifiers as well, however, they used an even higher number of

specific verbs, and significantly more specific verbs than any other group. These findings also align with previous research, i.e., the focus of Manner in the main verb in so-called s-languages as discussed in Talmy's work. Further, the results conform with Vulchanova and van der Zee's (2013) refined system of conceptual granularity, associating s-languages with higher numbers of specific verb inventories in contrast with v-languages.

Regarding French descriptions specifically, both the experimental and French pilot control group most commonly used basic verbs (e.g. *marcher* 'to walk') followed by a structure to modify or specify the action. Such a modifier often encoded the Manner of the action, such as *marcher sur la pointe des pieds* (lit. 'to walk on the tiptoes') for 'tiptoe'. The distribution and range of modifiers, however, varied between the two groups. For instance, the French pilot control group displayed a clear preference for basic verb + prepositional phrase (PP) structures, whereas the experimental group exhibited much more variation; some preferred using basic verbs + PPs, where others tended toward basic verb + adverbial phrase (ADVP) constructions, for instance. Another relatively common structure across both groups included constructions using *faire* (e.g. *faire des pas chassés,* for 'sidestep'), though the groups used entirely different expressions. Lastly, basic verbs were more commonly used by the experimental group, particularly *marcher,* whereas specific verbs, though infrequent, were more common in the pilot control group. A few other naming strategies occasionally arose (e.g. states of being) and are discussed in further sections.

In regard to the Norwegian descriptions, the Norwegian pilot control group used specific verbs more frequently than any other structure. Only one participant in the experimental group completed part two of the experiment; interestingly, this participant used a significant number of basic verbs + modifier(s) and very few specific verbs, in contrast with the Norwegian pilot control group.

The following subsections explore specific results of each group in detail, followed by a general discussion. Distributions across the groups are provided in tables; where distinct patterns exist, columns are highlighted in blue. In addition, specific examples of the main patterns are provided. Note that various verb forms (e.g. unconjugated vs. conjugated) were provided in participant descriptions, however, the infinitive form is used here for consistency. Further, some minor grammatical errors were produced (e.g. incorrect prepositions, agreement errors, etc.), which have been corrected here for clarity. Due to the nature of these errors, the corrections do

not interfere with event naming/classification, i.e., the meaning doesn't change. Any significant errors (e.g. non-words, etc.) are left in their ungrammatical forms, and mentioned in a footnote.

7.1. French descriptions

7.1.1. Pilot control group

Recall that this group consisted of six native French speakers. Most motion scenes were labelled using similar structure types by all or most members of this group, varying at times by one or two structure types. For instance, 'stroll' was described with a basic verb + modifier(s) (e.g. *marcher calmement,* lit. 'to walk calmly') by five participants, and the stand-alone basic verb *marcher* by one participant. As a whole, this group used basic verbs with modifier(s) significantly more than any other structure. Some *faire* expressions, basic verbs (without modifiers), and specific verbs were used. The low number of the latter was predicted, as French has a lower inventory of specific verbs encoding Manner. As a result, in order to describe specific patterns of human locomotion, the L1 speakers here simply modified existing basic verbs. See Table 2 for the distribution of this group's responses, recalling that each participant provided a total of 20 responses[14].

Table 2

French pilot control group: distribution of naming patterns

Participant	Basic verb + modifier(s)	Basic verbs (stand-alone)	*Faire* constructions	Specific verbs	Other constructions
FPC1	13	0	3	2	2
FPC2	13	1	1	3	2
FPC3	9	5	2	3	1
FPC4	12	0	4	0	4
FPC5	15	0	2	3	0
FPC6	11	2	1	1	5

[14] Note that some subjects provided several descriptions for a given label; however, only their first description is indicated in the numbers.

The following subsections break each of these categories down, providing concrete examples of the constructions used by this group.

Basic verb + modifier

Few stand-alone basic verbs were observed in this group's descriptions. Three instances of *sauter* 'to jump' were observed, as well as four of *marcher* 'to walk' and one of *courir* 'to run'. This low number is reflective of most of the videos depicting specific motion scenes. As French generally contains a low number of specific verbs, the addition of a modifier (e.g., a prepositional phrase, a gerund, or an adverbial), to a basic verb has the capacity to express elements lacking in the main verb (e.g. Manner).

The three main structures observed in this category include: (i) basic verb + PP, (ii) basic verb + gerund, and (iii) basic verb + ADVP, and were often used to describe the specific patterns of locomotion. They incorporate the same default parameters of the basic level verbs, with the outside modifiers simply adding, and occasionally altering, parameters. Note that some other modifying structures were used, albeit infrequently, generally consisting of very literal labels, e.g., *marcher comme un soldat* (lit. 'to walk like a soldier') for the English label 'march'. See Table 3 for the distribution of the prominent basic verb + modifier constructions in this group. A further analysis of each structure type follows below.

Table 3

French pilot control group: distribution of basic verb + modifier labels

Participant	Basic verb + PP	Basic verb + gerund	Basic verb + ADVP
FPC1	8	4	3
FPC2	8	2	1
FPC3	7	2	0
FPC4	9	1	0
FPC5	9	3	1
FPC6	7	3	3

i. Basic verb + PP

The basic verb + PP structure was the most prominent pattern observed in this group. The prepositions used in these structures include: *à* 'to/at/in', *sur* 'on', *avec* 'with', *sans* 'without' and *de* 'of/from'. Note that these prepositions occasionally translate differently in certain contexts (e.g. *marcher sur place*, 'to walk on/in place'). Prepositions were often followed by a description of Manner (i.e. how the body parts are moving). Some PPs, however, did not encode Manner, and were instead used to modify the Path. Recall that when a modifier such as *sur place* is added to certain verbs (e.g. *marcher, courir, sauter*), the default parameter of Path is cancelled. Similarly, with *marcher en arrière* (to walk backwards), the default figure orientation for 'walk' is forward, so the backwards motion cancels this. These cases thus still encode Manner in the main verb, but the Path is removed[15]. Similar patterns exist in both Norwegian and English. See Table 4 on the following page, for the basic verb + PP responses observed in this group. The numbers in parentheses indicate the number of times the expression was observed.

[15] See more on these phenomena in Vulchanova and Martinez (2013).

Table 4

French pilot control group: basic verb + PP labels

Locomotion pattern	English label	Basic verb + PP	Translation
Basic level	walk	a. marcher à un rythme normal avec une posture droite (1) b. marcher avec assurance (1)	a. walk in a normal rhythm with a straight posture b. walk with confidence
	run	courir à grandes enjambées (1)	run in big strides
	jump	sauter à pieds joints (2)	jump with joint feet
Basic + mod	walk in place	marcher sur place (1)	walk in/on place
	run in place	courir sur place (2)	run in/on place
	jump in place	a. sauter sur place (2) b. sauter à pieds joints (1)	a. jump on/in place b. bunny hop
	march in place	a. marcher (au pas) sur place (4)	a. walk in place
	walk backwards	a. marcher (doucement) à reculons (4) b. marcher en arrière (1)	a. walk (softly) backwards b. walk backwards
Specific level	trudge	a. marcher à grandes enjambées (1) b. marcher de manière énervée/nonchalante (2) c. marcher avec de mouvements longs (1)	a. walk in big strides b. walk in an irritated/nonchalant manner c. walk with long movements
	march	marcher au pas militaire/de l'oie (3)	walk with military/goose steps
	jog	a. courir avec un rhythm modéré (1) b. courir avec une foulée avant pied (1)	a. run with a moderate rhythm b. run with a stride at the front of the foot
	stride	marcher avec de longs mouvements (1)	walk with long movements
	stomp	marcher d'un pas décidé (1)	walk with a decisive foot/step
	hop	a. sauter à cloche-pied (6) b. sauter sur un pied (1)	a. hop b. jump on one foot
	stroll	marcher de maniere normal (1)	walk in a normal manner
	sneak	a. marcher sur des oeufs (1) b. marcher sans bruit (2) c. marcher sur la pointe des pieds (2) d. marcher à pas de loup (1)	a. walk on eggs b. walk without noise c. walk on tiptoes d. walk with a wolf's pace (stealthily)
	tiptoe	a. marcher sur la pointe des pieds (5) b. marcher sur un fil (1)	a. walk on tiptoes b. walk on a thread

ii. Basic verb + gerund

Importantly, the use of a gerund (i.e. a verbal noun), as a satellite in specific motion events is a typical pattern in French, described in Talmy's work (see Talmy, 1985). Gerunds in these contexts typically encode Manner. In this group, this structure was used to describe specific patterns of locomotion such as 'stomp' and 'stride', and examples observed in the present study are provided in Table 5. Note that gerunds are also quite common in English, however, less so in Norwegian.

Table 5

French pilot control group: basic verb + gerund labels

Locomotion pattern	English label	Basic verb + gerund	Translation
Basic level	run	courir vite en faisant de grandes enjambées (1)	run fast while making big steps
Specific level			
	trudge	marcher en traînant les pieds (1)	walk while dragging the feet
	march	marcher en relevant les genoux et en levant le bras inverse (1)	walk while lifting the knees and lifting the opposite arm
	stride	a. marcher en balançant des bras (3) b. marcher en exagérant les mouvements (1)	a. walk while swinging the arms b. walk while exaggerating movements
	stomp	marcher en tapant des pieds, taper des pieds en marchant (3)	walk while tapping/hitting the feet, tap/hit the feet while walking
	swagger	a. marcher en se dandinant (1) b. marcher en balançant les épaules (1) c. marcher en se déhanchant (1)	a. walk while swaying b. walk while swinging the shoulders c. walk while swaying the hips

iii. Basic verb + ADVP

See Table 6 for the third and least frequent pattern in this category, involving basic verbs and adverbials. Similar to the previous structures, the adverbials here encode Manner. The main parameter which is altered by these modifiers is velocity (e.g. *marcher lentement*, lit. 'to walk slowly'). The remaining modifications perhaps imply a change in velocity; however, these cases more explicitly describe changes in demeanour, e.g., the addition of *tranquillement* 'tranquilly', or *calmement*, 'calmly', etc.

Table 6

French pilot control group: basic verb + ADVP labels

Locomotion pattern	English label	Basic verb + ADVP	Translation
Basic level	walk	marcher tranquillement (1)	walk tranquilly
Basic level + modifier	walk backwards	marcher lentement/doucement (à reculons) (2)	walk slowly/softly (backwards)
Specific level	jog	courir légèrement (1)	run lightly/slowly
	stroll	marcher calmement/tranquillement (3)	walk calmly/tranquilly

Faire constructions

The following most frequent construction observed in this group was expressions with *faire*. Interestingly, even when a specific verb exists, e.g., *bondir* (to leap/jump/spring), some native French speakers used expressions such as *faire des bonds en avant* (lit. 'to make jumps forward') or *faire de grands sauts vers l'avant* (lit. 'to make big jumps forward'). In addition, for 'run in place', while some subjects wrote *courir sur place* (to run in place), others used *faire des montées de genoux* (lit. 'to do lifts of the knees'). For the English 'walk in place', half of the group wrote *faire du surplace* (lit. 'to do some on/in place'), a common expression in French. Finally, the majority of the group described 'sidestep' with the conventional construction, *faire des pas chassés.*

Specific verbs

Though specific verbs were not a common description type in this group, there were a few occurrences. *Trottiner* (to trot around/scamper), for instance, was used by half of the group to describe the English label 'jog'. One participant also used *sprinter* (to sprint) to describe 'run', and another used *bondir* (to leap/spring/jump) for 'jump in place'. For 'skip', *sautiller* (to hop about/skip) was used by two participants, and *gambader* (to gambol) by an additional two. Finally, *se dandiner* (to prance about) was used by two participants in their descriptions of 'swagger'. These are all interesting cases, as clearly there are specific verbs existing to describe these actions; however, typically less than half of the subjects chose to use them. Perhaps as French speakers are less accustomed to the use of specific verbs in general, the tendency is to use other structures.

Other constructions

A few instances of specific verbs + modifier(s) were observed in this group. For instance, three participants wrote *traîner des pieds* (to shuffle/shuffle along/drag one's feet) for the video labelled 'trudge', and one participant wrote *piétiner en avançant* (lit. 'to stamp while advancing') for the English 'stomp', as well as *piétiner tranquillement et balancer les bras* (lit. 'to stamp tranquilly and swing the arms') for 'walk in place'.

Furthermore, a few instances of pure Path verbs were observed in this group. For example, one participant used *reculer* (to go/move backwards) for 'walk backwards', and for 'march', one participant used *soulever un pied après l'autre* (lit. 'to lift up one foot after another'), while another used *monter les genoux et balancer les bras* (lit. 'to raise/lift up the knees and swing the arms'). These expressions all encode Path within the main verb, a clear v-framing tendency. At first glance, it is perhaps surprising how few of these verbs were observed, although, it is likely due to the nature of the videos (i.e. Manner as the most salient feature). For instance, if the person in the video was climbing up a rock wall, or walking into a house, Path verbs would likely be much more prevalent.

7.1.2. Experimental group

Recall that the experimental group consisted of six native Norwegian speakers of French. There was typically not much consensus in this group's descriptions, and significantly more variation was observed in contrast with L1 French descriptions. Moreover, L2 descriptions rarely matched native speakers', although participants with higher proficiency levels exhibited slightly more native-like patterns. These results are likely due to the following two factors: (i) varying L2 proficiency levels, and (ii) participants were only in the beginner to intermediate stages of acquisition, thus lacking much of the appropriate human locomotion vocabulary in their lexicons.

Nevertheless, some patterns are observable. For instance, the majority of this group used basic verbs + modifier(s) most frequently, similar to the native speakers. Furthermore, the higher CEFR results seem to correlate with a higher usage of basic verbs + modifier(s) overall, whereas the lower levels of proficiency do not seem to correlate with any particular naming pattern. It should be noted that one participant in the lower-proficiency group produced a high number of basic verbs + modifiers; however, responses were simpler (sometimes even incorrect), and less varied than those with higher proficiency levels. See Table 7 for the total distribution of participant responses in this group, relative to their CEFR scores.

Table 7

Experimental group: CEFR scores and distribution of L2 French labels

Participant CEFR score	Basic verb + modifier	Basic verbs (stand-alone)	*Faire* constructions	Specific verbs	State of being	Other constructions
A1	7	7	2	0	0	2
A1	4	1	3	0	8	3
A1	6	6	0	4	2	1
B1	8	4	3	1	1	3
B1	17	2	1	0	0	0
B2	15	1	4	0	0	0

Basic verb + modifiers

As with the native French speakers, the most commonly observed pattern in the experimental group was basic verb + modifier(s). However, the modifiers in this group differed from the native speakers. Only one occurrence of basic verb + gerund (*marcher en sautant*, lit. 'walk while jumping', for the English 'skip') was observed, notably by a participant with higher proficiency. This is not surprising, as gerunds are complex and typically not acquired until later stages of L2 acquisition. Furthermore, they are not commonly used in the L1 (Norwegian), and as a result, this structure may be particularly challenging for these learners.

The experimental group overall used basic verb + PPs and basic verb + ADVPs the most. Specifically, participants with higher proficiency levels tended to use more basic verb + PPs than any other structure. This is similar to what was seen amongst the native French control group, a possible indication of more appropriate rethinking for speaking amongst the more advanced speakers. See Table 8 for the distribution of basic verb + modifiers in this group. Note the columns highlighted in blue, indicating higher usage of basic verb + PPs amongst participants with higher proficiency.

Table 8

Experimental group: CEFR scores and distribution of basic verb + modifier labels

Participant CEFR score	Basic verb + PP	Basic verb + AP	Basic verb + other modifier(s)
A1	2	5	0
A1	0	1	3
A1	4	2	0
B1	5	2	1
B1	8	7	2
B2	8	4	3

i. Basic verb + PP

This naming pattern was the most frequent in this group overall, however, it was generally produced more by those at a more advanced intermediate level. Similar to the native speakers, this structure was primarily used for the corresponding basic level + modifying, and specific level patterns of human locomotion. See Table 9 for a list of the responses observed. It should be noted that descriptions carrying the same meaning (i.e. *courir en place* and *courir sur place)* are included under the same response.

Table 9

Experimental group: basic verb + PP labels

Locomotion pattern	English label	Basic verb + PP	Translation
Basic level	run	courir pour sa vie (1)	run for her life
	jump	sauter dehors (1)	jump outside
Basic level + modifier	walk backwards	a. marcher à reculons, marcher à l'envers, marcher derrière (3) b. marcher à travers (1)	a. walk backwards, behind b. walk across
	walk in place	a. marcher sur place (3) b. marcher sans avancer (1)	a. walk in place b. walk without advancing
	run in place	courir sur place (3)	run in place
Specific level	march	a. marcher avec des jambes élevées (1) b. marcher comme des gens dans l'armée/le militaire (1)	a. walk with the legs lifted b. walk like people in the army/military
	stride	marcher avec des pas longs (2)	walk with long steps
	sneak	marcher d'une façon bizarre (1)	walk in a strange way
	sidestep	sauter avec le visage contre (1)	jump with the face against
	hop	a. sauter avec le pied gauche (2) b. sauter sur un pied (1)	a. jump with the left foot b. jump on one foot
	skip	sauter comme une fille/fillette (2)	jump like a girl/little girl

There was significant variation in terms of the specific modifiers used in this group. Those with the most consensus included simpler but more common expressions such as *marcher/courir/sauter sur place* 'to walk/run/jump in place'. This may be a result of these expressions also existing in both Norwegian (the L1), as well as English (also spoken by all participants). In contrast, although it was commonly used amongst L1 French speakers, only one L2 subject wrote *marcher sur la pointe des pieds* 'tiptoe'. Notably, this description was provided by the participant with the highest proficiency. Other participants in this group lacked this vocabulary knowledge, as demonstrated by the fact that other descriptions for this label were very literal, e.g., *essayer d'être silencieuse,* (lit. 'to try to be silent'). Many other responses in this category were highly descriptive and literal as well, including structures such as *marcher avec des jambes élevées* (lit 'to walk with the legs lifted') and *marcher comme les gens dans l'armée* (lit. 'to walk like people in the army/military'), both for the English 'march', and *marcher d'un façon bizarre* (lit. 'to walk in a strange way') for the English 'sneak'. Interestingly, *sauter comme une fille/fillette* (lit. 'to jump like a girl/little girl') was a description provided by both male participants to describe the English 'skip'. Such literal descriptions appeared frequently in this group, though not in consensus, as there are nearly infinite ways to combine words. These structures appeared often when describing the more specific and complex actions, a possible indication that such descriptions are strategically used when the learner lacks the appropriate lexical knowledge.

ii. Basic verb + ADVP

This structure was used nearly as often as basic verb + PPs by this group. However, there does not appear to be any relationship between the production of basic verb + ADVPs and speakers' proficiency levels. Responses observed in this group for 'run' and 'stroll' were very similar to those produced by native speakers, perhaps since *courir* (to run) is likely learned early on, and the native French speakers in this study did not use any complex expressions for 'stroll'.

In general, this group used the basic verb + ADVP structure significantly more than the native speakers. The remaining responses did not match the native speakers' and were instead often used to describe motion events that have more conventional expressions in French. This indicates that perhaps the non-native speakers simply do not hold such forms in their lexicons. For instance, some participants used *marcher lentement* (lit. 'to walk slowly') for 'tiptoe', where

there is a clear expression existing in French: *marcher sur la pointe des pieds*. See Table 10 for the basic verb + ADVP responses observed in this group.

Table 10

Experimental group: basic verb + ADVP labels

Locomotion pattern	English label	Basic verb + ADVP	Translation
Basic level	walk	a. marcher confidentement[16] (1) b. marcher rapide[17] (1) c. marcher tranquillement (1)	a. walk confidently b. walk quickly c. walk tranquilly
Specific level	trudge	a. marcher lentement (1) b. marcher tristement (1)	a. walk slowly b. walk sadly
	stride	marcher (un peu) bizarre (1)	walk (a bit) strange
	stomp	marcher lourd (1)	walk heavy
	sidestep	sauter lateralement (en pieds chasses) (1)	jump sideways
	stroll	a. marcher normale (1) b. marcher lentement (2) c. marcher tranquillement (1) d. marcher calmement (1)	a. normal walk b. walk slowly c. walk tranquilly d. walk calmly
	sneak	a. marcher doucement (1) b. marcher lentement (1) c. courir lentement (1)	a. walk softly b. walk slowly c. run slowly
	tiptoe	marcher lentement (2)	walk slowly

[16] It should be noted that *confidentment* is a non-word. This is likely an overgeneralization error, as '-ment' is the typical ending for the English equivalent of '-ly' . The participant probably intended to say *avec assurance/ confiance* 'with confidence/confidently'.

[17] *Rapide* is an adjective and is not in fact grammatical here. Instead, the use of either *vite* or *rapidement* 'quickly/rapidly' would be grammatical here. Note that *lourd, bizarre* and *normale* are also adjectives, and thus are ungrammatical in these contexts. These errors do not alter the results in any way; they simply indicate a general lack of lexical diversity.

Faire constructions

Expressions using *faire* are learned early on by those studying French in Norway. Similar expressions exist in Norwegian[18], however, they are infrequent. The quantity of such expressions in this group was similar to native speakers' responses, however, the expressions themselves differed. In general, the faire expressions observed in this group were much simpler, and sometimes more literal than those produced by the native speakers. Nevertheless, L2 speakers appear to have acquired the general structure.

One speaker in this group described the English 'jump' with *faire des exercices* (lit. 'to do exercises'), two described 'run in place' with *faire du jogging* (jog), three described 'jog' with *faire du jogging,* and one with *faire une promenade* (to go for walk). In addition, 'march in place' was described by one participant as *faire l'aérobic* (to do aerobics), and another as *faire une marche militaire sur place* (lit. 'to do a military march in place'). Two other descriptions were used with *faire,* including one participant who described 'sidestep' with *faire une mouvement drôle* (lit. 'to do a funny movement'), as well as *faire une caricature de la marche allemande de la second guerre mondiale* (lit. 'to make a caricature of a German march in the second world war') for the English 'march'.

Basic verbs

Relatively few stand-alone basic verbs were observed in this group overall. Three instances of *sauter* were used to describe the English 'jump', 'run in place', and 'jump in place'. Further, there were three instances of *courir:* two to describe 'jog', and one to describe 'run'. *Marcher,* however, was used to a significantly larger extent than by the native speakers. Thirteen instances of *marcher* were observed in this group, to describe 'trudge' (2), 'march' (2), 'march in place' (2), 'walk' (2), 'stride' (1), 'stomp' (1), 'walk backwards' (1), 'sneak' (1) and 'swagger' (1). Some of these descriptions are appropriate, such as 'walk', and 'stride'. Some others, e.g., 'walk backwards', 'sneak' and 'stomp', however, perhaps imply that the participant does not hold the lexical items to appropriately describe these events.

[18] In Norwegian, *å gjøre* 'to do' is sometimes used in constructions resembling *faire* constructions, e.g., *å gjøre aerobic* 'to do aerobics'.

States of being

Interestingly, there were several descriptions involving the state of the woman in the video, often highlighting her emotions. With the example of 'trudge', for instance, one participant wrote *être triste* (to be sad) and another wrote *être un peu fatiguée* (lit. 'to be a little tired'). Similarly, for 'stomp', three participants used either *être en colère* (to be angry) or *être fâchée* (to be mad). Finally, one participant described 'skip' with *être heureuse* (to be happy). This finding was mostly unique to this group, and perhaps a further indicator of limited motion vocabulary.

Other constructions

Some other constructions were used in this group, sometimes without the use of motion verbs at all. The latter was unique to this group. For instance, one participant described the English 'hop' with *utiliser un pied seulement* (lit. 'to use only one foot'). Similarly, 'tiptoe' was described by one participant with *essayer d'être silencieuse* (lit. 'to try to be silent'), another used *veut cacher* (lit. 'to want to hide'), and another with *on fait ça quand on joue au foot* (lit. 'one does this when playing football'). These responses again seem to point toward a general lack of complex and appropriate vocabulary in the domain of human locomotion.

A few additional structures were observed, wherein motion was once again expressed. For instance, one participant described 'skip' with *danser* (to dance), a pure Manner verb. Crucially, this participant's proficiency level was within the lowest (i.e. A1) in this group, indicating a smaller inventory of complex motion structures. Interestingly, one participant also used two Path encoding verbs, e.g., *avancer sans faire bruit* (lit. 'to advance without making any sound') for 'tiptoe', and *se déplacer de gauche à droite* (lit.'to displace oneselves from left to right') for 'sidestep'. Notably, these two labels fit the v-framing tendency, and were provided by a participant with higher proficiency (i.e. B1).

7.1.3. Comparing the two groups

This section reviews the three overarching patterns of human locomotion (i.e. basic, basic + modifiers, and specific patterns) displayed in the videos, and compares French responses between the pilot control group and the experimental group. A short discussion is provided for each pattern, along with a table displaying the most common description types for each group, indicating the number of times it was used in parentheses. Note that some description types were used an equal number of times (e.g. 'jump' was described by the control group using an equal number of basic verbs + modifiers, basic verbs, and *faire* constructions), and as such, some labels display more than one prominent structure.

Basic patterns of locomotion

The three basic patterns of locomotion in this study were described most similarly across the two groups. Both 'walk' and 'run' saw a relatively equal mix of basic verbs and basic verb + modifiers across the groups. The modifiers used were also similar across the groups. For instance, *marcher tranquillement* (lit. 'to walk tranquilly'), and variations of *marcher avec assurance* (lit. 'to walk with confidence') were provided by both groups. Finally, descriptions for 'jump' varied, however, they varied to a similar extent in both groups. The similarities observed in these basic patterns likely reflects the basic nature of these concepts, as they tend to be perceived universally across languages in general (Vulchanova & Martinez, 2013). They are presumably also learned earlier on in SLA. See Table 11 for the most common response type(s) for each group.

Table 11

Most frequent structures used in basic patterns of locomotion: pilot control vs. experimental group

Basic locomotion pattern	Pilot control group	Experimental group
walk	basic verb + modifier (3), basic verb (3)	basic verb + modifier (5)
run	basic verb + modifier (5)	basic verb + modifier (5)
jump	basic verb + modifier (2), basic verb (2), faire construction (2)	basic verb + modifier (2), basic verb (2)

Basic patterns of locomotion with modifiers

The descriptions observed in this category were similar across the two groups, though slightly more variation was observed as compared with the previous category. Responses for 'walk backwards' were very similar; both groups primarily used the basic verb *marcher* with the addition of *à reculons*, *en arrière*, or similar lexical items representative of backwards motion. Perhaps this label is simpler for L2 speakers as similar structures exist in both Norwegian and English. Regarding 'run in place', the general response types across the groups were comparable as well; it was mainly only the *faire* expressions which differed, as the control group used *faire des montées de genoux* (lit. 'to lift the knees'), while the experimental group used *faire du jogging* (jog).

Descriptions for 'jump in place' were more varied than the previous two labels. The L1 responses all involved a variation of *sauter*, whether stand-alone, with a modifier (e.g. *sur place*), or, the specific form *bondir* (leap/jump). Three members of the experimental group used variations of *sauter*. In contrast, the remaining three responses were either related to physical training (e.g. *faire un exercice*, lit. 'to do an exercise', and *traîner* 'train') or a state of being (e.g. *ne pas être fatiguée déjà*, lit. 'to not be tired yet'). Notably, the latter three examples were all provided by those with lower proficiency levels. Participants with higher levels of proficiency thus performed closer to the native speakers for this label.

Finally, the label showing the most distinct responses between the groups in this category was 'walk in place'. Most native speakers used *faire du surplace, a* more advanced expression presumably learned in later stages of SLA. In contrast, the L2 speakers resorted to the same basic verb + modifier strategy as for other expressions involving 'in place', i.e., *marcher sur place/sans avancer* (lit. 'to walk in place/without advancing'). These expressions accurately depict the motion scene; however, the conventional expression has clearly not been acquired. See Table 12 for the most frequent response types in the two groups.

Table 12

Most frequent structures used in basic verb + modifier patterns of locomotion: pilot control vs. experimental group

Basic verb + modifier locomotion pattern	Pilot control group	Experimental group
walk in place	faire construction (3)	basic verb + modifier (4)
walk backwards	basic verb + modifier (5)	basic verb + modifier (4)
run in place	basic verb + modifier (3), faire construction (2)	basic verb + modifier (3), faire construction (2)
jump in place	basic verb + modifier (6)	basic verb + modifier (2), basic verb (2)

Specific patterns of locomotion

Descriptions for the specific patterns of human locomotion in this study were undoubtedly the most varied, both within the groups and across them. Some variation was certainly expected, since the same events can be described in different ways even within individual languages (Slobin, 1987). Perhaps this is particularly true for specific event descriptions in languages with smaller inventories of specific verbs (i.e. French). The most significant variation was observed in L2 responses, as well as between the two groups (i.e. less variation in L1 responses).

The native speakers provided some varied responses; however, they were overall less divergent than L2 speakers. L1 descriptions for a given label typically only differed by one or two structure types, if any, and responses were generally quite similar overall. In contrast, L2 descriptions often differed by three or four structure types, and sometimes even expressed vastly different meanings. Such variation may perhaps be attributed to the complex nature of specific patterns of motion, which are likely acquired at more advanced stages of learning. In general, however, basic verbs + modifiers were used by both groups to a significant extent when describing these events. Notably, where specific verbs were used by L1 speakers, the experimental group generally used basic verbs + modifiers.

When comparing specific labels across the groups, L2 descriptions rarely matched those of L1 speakers. For instance, regarding responses for 'sidestep', 'hop' and 'tiptoe', there was near consensus amongst the native speakers. This is likely a result of conventional expressions existing for these terms (i.e. *faire des pas chassés*, *sauter à cloche-pieds* and *marcher sur la pointe de pieds,* respectively). With regard to the same motion events, the experimental group displayed significantly more variation, and did not use any of the aforementioned expressions. For example, 'sidestep' was labelled by the experimental group in the following distinct ways: *faire une mouvement drôle* (lit. 'to do a funny movement'), *sauter avec le visage contre moi* (lit. 'to jump with the face toward me), *sauter latéralement en pieds chassés* (lit. 'to jump laterally while sidestepping'), *on fait ça quand on joue au foot* (lit. 'one does this when playing soccer'), *se déplacer de gauche à droite* (lit. 'to move from left to right') and finally, *traîner* ('to train').

Many of the other labels in the category displayed similar degrees of variation between the groups, and these results are likely reflective of beginner-intermediate proficiency levels (i.e. not advanced), as well as the variation within these levels (i.e. A1, B1, B2). The results also indicate that the appropriate vocabulary has not yet been acquired by many of the L2 speakers. However, it should be noted that learners at this stage of acquisition employ an array of strategies to express concepts not in their lexicons. Although responses were typically not as concise as native speakers', oftentimes L2 descriptions nevertheless accurately reflected the motion events.

A few specific patterns were labelled similarly across the groups. Descriptions for 'stroll' were most similar, with *marcher lentement/calmement* as the primary label. Interestingly, there are specific verbs (e.g. *se balader* 'stroll', *se promener* 'take a walk', and *flâner* 'stroll/saunter') which exist in French to correspond to the English 'stroll', however, none of the L1 (nor L2) speakers used any of these terms. Descriptions for 'stride' were somewhat similar across the groups as well; they typically involved *marcher* with the addition of a modifier accentuating the longer movements (e.g. *marcher avec de longs mouvements*, lit. 'to walk with long movements'). Interestingly, some of the native French speakers focused on the exaggerated arm movements (e.g. *marcher en balançant les bras*, lit. 'to walk while swinging the arms'), while the experimental group focused primarily on the footsteps (e.g. *marcher avec des pas longs,* lit. 'to walk with long steps/strides'). See Table 13 for the breakdown of the primary naming patterns across the groups in this category.

Table 13

Most frequent structures used in specific patterns of locomotion: pilot control vs. experimental group

Specific locomotion pattern	Control group	Experimental group
trudge	basic verb + modifier (3)	basic verb + modifier (2), basic verb (2), state of being (2)
march	basic verb + modifier (5)	basic verb + modifier (2), basic verb (2)
march in place	basic verb + modifier (4)	basic verb + modifier (2), basic verb (2), faire construction (2)
jog	basic verb + modifier (3), specific verb (3)	faire construction (4)
stride	basic verb + modifier (4)	basic verb + modifier (4)
stomp	basic verb + modifier (3)	state of being (3)
sidestep	faire construction (5)	basic verb + modifier (2)
hop	basic verb + modifier (6)	basic verb + modifier (3)
skip	specific verb (4)	basic verb + modifier (3)
stroll	basic verb + modifier (5)	basic verb + modifier (5)
sneak	basic verb + modifier (5)	basic verb + modifier (4)
swagger	specific verb (3)	basic verb + modifier (2)
tiptoe	basic verb + modifier (6)	basic verb + modifier (3)

7.1.4. Summary of French descriptions

The L2 speakers' responses were most similar to the L1 responses in regard to the basic patterns of locomotion. Descriptions for basic patterns with modifiers were also similar across the groups, though they displayed a bit more variation. Finally, human locomotion patterns of a more complex and specific nature exhibited the most varied responses. Some participants in the experimental group, however, behaved more similarly to the pilot control group overall, sometimes even with regard to specific patterns of locomotion. Such cases typically reflected higher proficiency levels of L2 speakers. In general, it appeared that the experimental group had acquired some appropriate rethinking for speaking strategies in the L2; however, many of the concepts appeared simply too advanced for their level. In the latter cases, speakers used

strategies such as literal descriptions, states of being or simply providing the most closely related basic level verb. The following sections look at descriptions in Norwegian provided by the pilot control group, and one participant in the experimental group.

7.2. Norwegian descriptions

As the majority of part two of the experiment did not take place, the data provided in this section is quite limited. Results for both the pilot and experimental group are nevertheless presented here, serving as a foundation for further analyzing patterns of human locomotion in Norwegian.

7.2.1. Pilot control group

Recall that two native Norwegian speakers labelled the 20 videos in Norwegian[19] prior to the experiment. The speakers generally used the same structure type for each label. Crucially, specific verbs were the most common description type provided by this group. Some of the specific verbs observed include: *å marsjere* (to march), *å jogge* (to jog), å *rusle* (to stroll/stride), *å trampe* (to trample/stomp), and *å liste seg* (to sneak/tiptoe).

Basic verbs + modifier(s) was the second most frequent structure used by this group. Some examples observed include: *å gå baklengs* (to walk/go backwards), *å gå på stedet* (to walk in place), å *hoppe sidelengs* (to hop sideways) for the English 'sidestep', as well as *å løpe på stedet* (to run in place). See Table 14 for the distribution of the following four structures: (stand-alone) basic verbs, specific verbs, basic verb + modifier(s) and specific verb + modifier(s). The specific verb column is accented in blue, reflecting the highest number of descriptions. This aligns with previous research in that Norwegian, a so-called satellite-framing language, focuses on Manner and thus holds a large inventory of specific verbs (Talmy, 1985; Vulchanova & van der Zee, 2013).

[19] This data was intended only to provide me with a general idea of the Norwegian motion vocabulary, since I do not speak Norwegian. However, since part two of the experiment did not run as planned, I decided to use any data I could.

Table 14

Norwegian pilot control group: distribution of responses

Participant	Basic verbs	Specific verbs	Basic verbs + modifier(s)
NPC1	3	11	6
NPC2	4	10	6

7.2.2. Experimental group

Although conclusions cannot be made based on results from one participant, it is certainly interesting to note the differences between the experimental participant and the pilot group. This subject used significantly more basic verbs + modifier(s) and very few specific verbs, as compared with the pilot control group. Notably, this participant also used a very high (17) number of basic verbs + modifier(s) in their French descriptions. Some of the basic verb + modifier(s) structures written by this participant include: *å gå med høye kneløft* (lit. 'to walk/go with a high knee lift') for the English 'march', *å gå ganske fort* (lit. 'to go pretty fast') for the English 'walk', *and å gå avslappet* (lit. 'to walk/go relaxed') for the English 'swagger'. See Table 15 for the distribution of responses provided by this subject.

Table 15

Experimental group: distribution of Norwegian descriptions provided by one participant

Basic verbs	Specific verbs	Basic verbs + modifier(s)
2	3	14

7.3. General discussion

This section summarizes the general patterns and implications of the results, in relation to the original research questions. Note that the third research question involving eye tracking is not addressed.

i. *To what extent do speakers use the patterns predicted by previous research?*

As indicated by the similarities in gait distinctions observed in descriptions by the groups in this study; categorization and conceptualization appear to rely on constraints in the natural world, and not on cross-linguistic differences. Although speakers of French and Norwegian preferred different encoding strategies in their motion event descriptions, this does not appear to reflect a difference in perceived reality. Rather, their responses reflect what is available in their respective lexicons, consistent with Slobin's thinking for speaking hypothesis. This finding is also consistent with my hypothesis on shared gait distinctions and aligns with the previous research reviewed in section 2 of this thesis (see e.g. Slobin, 1987; Malt et al., 2008; Malt et al., 2014; Berman & Slobin, 1994).

When describing patterns of human locomotion in the L1, both French and Norwegian speakers in the present study often used distinct thinking for speaking patterns prevalent in their respective L1s. The results support my hypothesis concerning less Manner encoding by native French speakers, and more Manner encoding by the native Norwegian speakers. These results were reflected in the choice of verb types. For instance, native French speakers in the present study used basic verbs + modifiers to describe the majority of locomotion scenes, and particularly those involving specific patterns of locomotion. They used very few specific verbs, indicating less of a preference overall for encoding Manner in the main verb. Crucially, even for motion events corresponding with a specific verb existing in French (e.g. *se balader* 'stroll'), speakers typically did not use them. In contrast, native Norwegian speakers in the pilot control group used a much higher number of specific verbs in their descriptions, indicating a preference for the encoding of Manner in the main verb. These results align with both Talmy's typology, as well as Vulchanova and van der Zee's (2013) refined system of conceptual granularity.

A few Path verbs were produced by the native French speakers, a typical v-framing pattern. However, not many were used overall, in contrast with my prediction of L1 French speakers resorting to more v-framing tendencies. This is once again likely attributed to the nature

of the videos (i.e. Manner was the most salient feature portrayed in the videos), rather than to a lack of typological preference.

Nevertheless, French speakers did use some specific verbs encoding Manner, and Norwegian speakers used a fair number of basic verbs with outside modifiers encoding Manner. These results confirm my hypothesis regarding intralinguistic variation. As such, although separating languages into a typology may be tempting based on general patterns, it is imperative to recognize the variability and flexibility observed across languages. Languages should thus be described as exhibiting general tendencies, often similar in terms of the most salient parameters (e.g. gait) and differing in terms of which conceptual features they choose to highlight most frequently (i.e. reflected in inventories of specific verbs). This finding aligns with the research reviewed in section 2.4 regarding criticisms and revisions to Talmy's typology (see e.g. Dimitrova-Vulchanova et al., 2012; Croft et al, 2010, Vulchanova and Martinez, 2013, etc.).

ii. To what extent does cross-linguistic variation in the encoding of verbs of human locomotion impact second language acquisition?

The experimental group's descriptions displayed some native-like patterns. The most similar responses across the groups were observed in descriptions of basic and basic + modifying patterns of locomotion, attributed to the basic nature of such concepts and their universality across languages. L2 speakers also used similar numbers of *faire* constructions as did the native speakers. However, the specific L2 expressions used for basic verb + modifier and *faire* constructions differed and were less complex than L1 speakers'. Further, L2 descriptions displayed much more variation than L1 French speakers', particularly with regard to specific patterns of human locomotion.

In addition, proficiency levels of the L2 speakers were sometimes reflected in the distinct tendencies. For instance, those with higher proficiency levels behaved more like native speakers with regard to a higher use of basic verb + PP structures. In contrast, participants with lower proficiency levels tended to be less consistent and displayed more variation in lexicalization patterns. Such observations indicate that higher proficiency levels in the intermediate range may lead to the use of more native-like patterns in regard to the encoding of motion components; this confirms my prediction of heightened L2 thinking for speaking tendencies amongst more

advanced speakers. These results are in accordance with Cadierno and Ruiz (2006), who hypothesized that L1 thinking for speaking patterns may be stronger in the beginning and intermediate phases of SLA. As learning progresses to more advanced phases, L1 patterns begin to fade. Since participants in the present study range from beginner-higher intermediate levels, both of these tendencies were observed. However, as L2 participants were not in higher-advanced stages of SLA, descriptions only reached the beginnings of L2 thinking for speaking patterns. More advanced stages of acquisition would thus exhibit a further frequent usage of L2 thinking for speaking patterns. The present study also provided further evidence for Cadierno and Robinson (2009), who reported that the differences of participants' proficiency was the factor most related to their response patterns. Such findings are perhaps intuitive, as it is expected that lexical inventories expand with increase in proficiency, however, they remain useful (Cadierno & Robinson, 2009).

In contrast with results from Cadierno and Ruiz (2006), however, the L2 speakers in the present study did not rely on s-framing tendencies regarding Path encoding in a satellite outside of the main verb. However, this is likely a reflection of the nature of the videos in the present study, rather than a lack of conforming to typical patterns.

Moreover, results from the present study did not support my hypothesis regarding transfer. I predicted that some transfer in the encoding of locomotion would be observed, however, no such evidence was found. This may be partially due to the fact that it was not possible to look at the experimental group's L1 and L2 responses in combination. The ability to compare participants' responses in French and Norwegian would have been incredibly useful in seeing whether they employ similar or distinct patterns in the two languages. The lack of transfer observed may also be attributed to Cadierno's (2008) hypothesis, which suggested that speakers with more elaborate systems experience less difficulty when learning languages with less elaborate systems. Since Norwegian holds a more elaborate inventory of specific motion verbs, and as corresponding specific verbs do not exist or are not commonly used in French, participants resorted to other strategies, i.e., using a basic verb with the addition of a PP or ADVP to further specify the action. Such basic verb structures are likely learned early on in acquisition, and as a result, L2 results sometimes converged in native-like naming patterns both at the basic level, and regarding the numbers of basic verb + modifiers used, i.e., appropriate rethinking for speaking.

Nevertheless, L2 descriptions were sometimes unnaturally literal, and overall less complex and conventional than those of L1 speakers. Some L2 descriptions also contained errors, similar to the findings in Dimitrova-Vulchanova et al. (2012). Recall that their study reported that L2 Norwegian responses produced by L1 Bulgarian speakers converged with L1 Norwegian naming patterns (i.e. verb + PP); however, the L2 responses contained some errors. These authors claimed, conforming with Cadierno (2004) and Cadierno and Ruiz (2006), that the L2 speakers had acquired appropriate thinking for speaking strategies in the L2, yet, they had not fully acquired the correct usage of the appropriate lexical items. They concluded that the errors reflect the degree of L2 attainment rather than thinking for speaking patterns, which is also likely to be the case in the present study.

In general, the appropriate lexical items appeared too complex for beginner to intermediate L2 French proficiency levels, particularly for specific patterns of human locomotion. Regarding specific verbs in French, even the native speakers often did not use them; this may be attributed to preference, frequency or lack of recall. This finding conforms with Soroli and Verkerk (2017), who discussed how many languages hold Manner and Path verbs in their inventories; however, the frequency of use is variable and is dependent on typological tendencies. In contrast, L2 speakers likely do not hold these specific forms in their lexicon at all. For instance, many of the conventional expressions used for corresponding specific patterns, e.g., *marcher sur la pointe des pieds*, appeared to be unavailable to L2 speakers at this level. As a result, the experimental group rarely produced the same constructions as the native speakers in this category.

Finally, regarding part two of the experiment, the participant tended more toward French naming patterns (i.e. primarily basic verbs + modifiers, and low numbers of specific verbs) in their L1 Norwegian descriptions. Crucially, these responses do not align with predictions regarding L1 Norwegian lexicalization patterns in general. This contrasted with the Norwegian pilot group, where a much higher number of specific verbs was observed. This is an interesting observation and could be related to priming from part one of the experiment, or perhaps to transfer from the L2 to the L1. Due to such limited data, however, more research must be conducted before conclusions can be made.

7.4. Limitations and future research

Certainly, the primary limitation of the present study is regarding low participant numbers and an inability to complete part two of the experiment. The preliminary aim was to have around 25 participants, and to complete two rounds of testing for each participant. Such a sample size would have resulted in the ability to produce more reliable results and conclusions. Furthermore, the second part of the experiment was intended to provide insight into general lexicalization patterns, as participant's responses during the two rounds were meant to be compared. Perhaps transfer effects may have been observed if this had been the case. The experiment, initially intended to begin during the first semester, would have allowed for a more prolonged period over which to recruit a higher number of participants. Issues with software setup and illness, however, pushed the project into an unfortunate time where it had to be cut even shorter due to the pandemic.

Another limiting factor in this study was my lack of Norwegian knowledge. Discussion with participants regarding instructions during the experiment, for instance, would have been ideally provided in the native language. In fact, one subject commented that they were mixing up languages in their head while participating in the experiment, since written instructions were in Norwegian, descriptions were given in French, and oral conversation took place in English. Thus, the combination of input from all three languages may have impacted responses. Along similar lines, testing English descriptions for the videos would have been useful, since all participants speak and use English regularly. It would be interesting to see whether there is any transfer related to English. Unfortunately, however, the time was too limited to complete three rounds of testing in the present study, thus future research should consider this. Furthermore, the reverse experiment (i.e. native French speakers with L2 Norwegian labelling videos in both languages) would be a useful addition and would likely lead to richer results.

In addition, perhaps the use of a more standardized and cited grammar proficiency test would have also been useful in this thesis. It was challenging finding an assessment tool that was adequate and time efficient, while also providing results that could be widely understood. Kwiziq was thus a compromise, however, it has never been cited and thus its validity is not entirely certain. Furthermore, the way in which the MultiPic databank was used in the present study was perhaps not the most efficient. All participants, apart from one, received 100% on the quiz. The lexical items were perhaps too limited, and too simple for this group, resulting in responses

which did not end up telling us much about their lexical capacities. Perhaps a larger set of items could have been used, including some which were more challenging.

The addition of more Path-focused videos would be an advantageous addition to the present study as well. For instance, videos where the subject is entering, climbing or going down a particular structure. Using Manner and Path focused stimuli in combination may provide further insight into the tendencies of language users. It would have been particularly interesting to observe whether L2 French speakers at the beginner-intermediate level have acquired some of the v-framing tendencies.

Moreover, as previously discussed, this thesis was intended to incorporate an analysis of the eye tracking data collected during the experiment. The addition of this nonlinguistic data aimed to provide further insight into conceptualization and cognition. The use of linguistic and nonlinguistic methods in combination should be considered in further research.
Eye tracking in the present study, however, was only conducted on the native Norwegian speakers. It would be useful to track native French speakers as well, and compare the two.

Finally, future research in this domain must continue to include a wider array of languages, including minority languages, since the majority of previous studies focus on a small set of languages. This is a crucially missing link in much of the research and is thus imperative in order to see the complete picture.

8. Conclusion

The study of cross-linguistic variation and the encoding of verbs of human locomotion provides insight into how sensory input is categorized and conceptualized. Languages employ different encoding strategies in this domain, and thus finding distinct lexicalization patterns is useful for predicting what is possible in a given language. Cross-linguistic differences may also impact SLA, and whether or to what extent linguistic transfer occurs have been topics of debate. These are important issues to explore, typically with the aim of better understanding human language and cognition in general.

The present study explored these topics in combination, through both a literature review and free naming task. The task involved participants describing videos depicting basic, basic + modifier, and specific patterns of human locomotion. Native French and Norwegian pilot control groups described the videos in the L1, and the experimental group, i.e., L1 Norwegian speakers of L2 French, described the videos in the L2. One experimental participant also described the videos in the L1.

Both L1 French and Norwegian speakers in the pilot groups used lexicalization patterns consistent with those predicted in previous research (i.e. more basic verbs + modifiers and low number of specific verbs vs. high number of specific verbs, respectively). Interestingly, in contrast, the L1 Norwegian descriptions provided by the experimental participant were more consistent with French patterns. Regarding French descriptions, L2 responses were similar to L1 speakers' in the basic and basic + modifier categories of locomotion. However, L2 responses for specific patterns of locomotion varied significantly, likely reflecting beginner-intermediate proficiency levels. Linguistic transfer was not observed in the experimental group, perhaps reflecting the L1's more elaborate inventory of specific motion vocabulary. Overall, precise motion vocabulary appeared complex for the L2 speakers in the present study, as indicated by errors as well as a large use of unconventional expressions. However, participants with higher proficiency levels tended to behave more like native speakers overall, indicating that some appropriate rethinking for speaking is possible in this domain, as language learning progresses.

Results from this thesis are preliminary, due to a small sample size and entire portions of the experiment which were unable to move forward. It remains to be seen whether similar patterns are observed in further research.

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Appendix A: Informed consent form

This is an inquiry about participation in a research project. In this letter we will give you information about the purpose of the project and what your participation will involve.

Purpose of the project

The purpose of this study is to gain insight into how Norwegian learners of French describe what they see. Eye movements will also be tracked. This study is a Master's thesis and it will take place at NTNU Dragvoll, in the Language Acquisition and Language Processing Lab.

Who is responsible for the research project?

NTNU is the institution responsible for the project.

Why are you being asked to participate?

Between 20-25 people have been asked to participate. Participants in this study must be between 18 and 35 years of age, must be speakers of French and native speakers of Norwegian, and have normal or corrected to normal vision (i.e. ability to see fine with glasses or contacts).

What does participation involve for you?

If you decide to participate in this study, you will be asked to watch several video clips on a computer screen, and your eye movements will be recorded using an eye tracker. You will be seated in front of an eye tracker. Next you will look at several dots on a computer screen and press buttons to calibrate the eye tracker with your eyes. While the tracker is tracking your eyes, you'll watch video clips and write descriptions of the videos on the computer. These descriptions and eye movements will be collected as data.

The experiment has two parts that will take place during two separate times. During the first part, you will be asked to write video descriptions in French. We will also ask you questions about your educational background and your language experience. Your responses to these personal questions will be stored on a secure database. You will also be asked to complete proficiency tests in French. The second part will take place approximately one week later, and you will be asked to provide descriptions in Norwegian. Your participation in each part of this study will take approximately 30 minutes to one hour.

After all experimentation is complete, you will receive a cinema gift card worth 150 kr as a thank you for your participation.

Participation is voluntary

Participation in the project is voluntary. If you choose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you choose not to participate or later decide to withdraw.

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

The project supervisor (Dr. Mila Vulchanova, NTNU) and the Masters student (Natalie Stevenson), are the only people who will have access to your data. We will record your name only because you will be unable to participate in studies using the same stimuli. However, your name will be stored separately from your experimental data and will not be linked to your data in any way. All paper documents will be stored in a locked filing cabinet in the Language Acquisition and Language Processing Lab at NTNU. You will not be identifiable in any publications resulting from this research. The project is scheduled for completion by the end of 2020. After project completion, paper data will be destroyed and recorded data (ie. from eye tracking) will be made anonymous.

What will happen to your personal data at the end of the research project?

The project is scheduled to end by the end of 2020. After project completion, paper data will be destroyed and recorded data (ie. from eye tracking) will be made anonymous.

Your rights

So long as you can be identified in the collected data, you have the right to:

- ➢ access the personal data that is being processed about you
- ➢ request that your personal data is deleted
- ➢ request that incorrect personal data about you is corrected/rectified
- ➢ receive a copy of your personal data (data portability), and
- ➢ send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with NTNU, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:
NTNU via Natalie Stevenson (Masters student - natast@stud.ntnu.no) or Mila Vulchanova (supervisor - mila.vulchanova@ntnu.no).

Our Data Protection Officer: Thomas Helgesen
NSD – The Norwegian Centre for Research Data AS, by email: (HYPERLINK "mailto:personverntjenester@nsd.no" personverntjenester@nsd.no) or by telephone: +47 55 58 21 17.

Yours sincerely,

Natalie Stevenson	*Mila Vulchanova*
(Masters Student)	(Main Supervisor)

Consent

I have received and understood information about the project "Eye Tracking Study - Encoding motion in L1 Norwegian and L2 French" and have been given the opportunity to ask questions. I give consent:

☐ to participate in providing free descriptions of video clips
☐ to participate in an eye tracking experiment

I give consent for my personal data to be processed until the end date of the project, approx. end of the calendar year, 2020.

_____

(Signed by participant, date)

Appendix B: Background Questionnaire

1. What is your participant number?

2. What is your age?

3. What is your gender? Female/Male/Non-Binary/Other

4. Have you received any previous diagnoses that could potentially affect your language learning (e.g. impaired vision, dyslexia, etc.)?

5. Record all language(s) you speak and fill in the following information:

   a. Age you began learning (if from birth, write 0)

   b. Primary setting in which you learned e.g. home, school, work, with friends, etc.

   c. Years of formal instruction in this language e.g. school, private tutoring etc.

   d. Current usage e.g. daily, weekly, monthly, rarely

6. Please indicate your self assessed French proficiency (near-native, advanced, intermediate or beginner) in each of the following categories:

   Listening:

   Reading:

   Writing:

   Speaking:

7. Have you ever traveled to a French speaking region? If yes, please specify:

   a. Where you went

   b. When you went

   c. For how long you stayed

8. Have you ever lived in a French speaking region? If yes, please specify

   a. Where you went

   b. When you went

   c. For how long you stayed

9. Do you have family members or close friends who speak French? If yes, please specify.

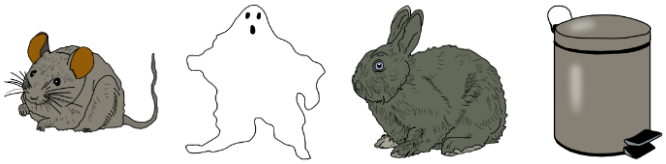
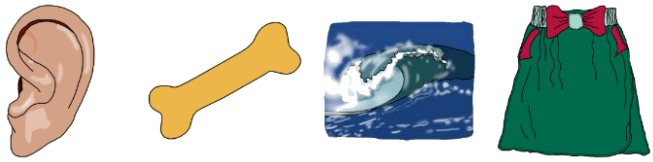
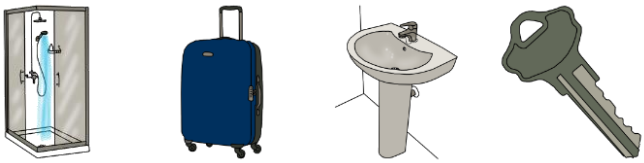
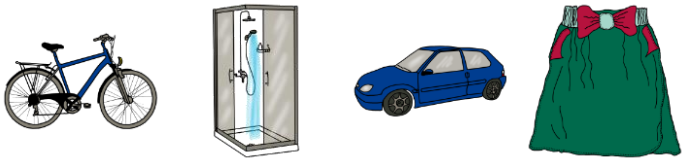
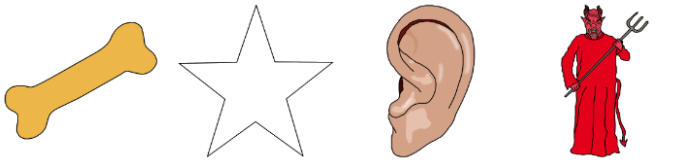
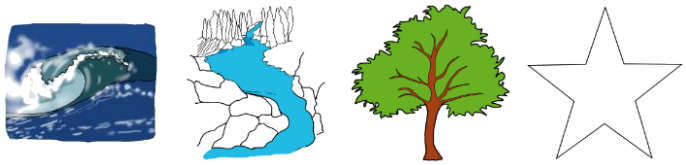
10. Which university level French courses have you completed (or are currently in the process of completing)?

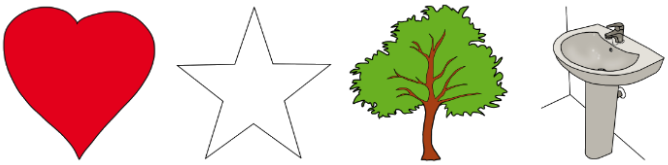
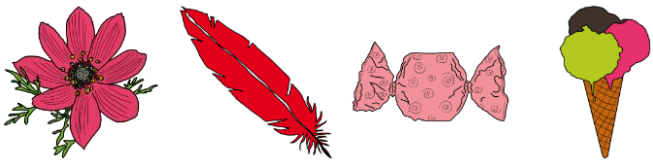
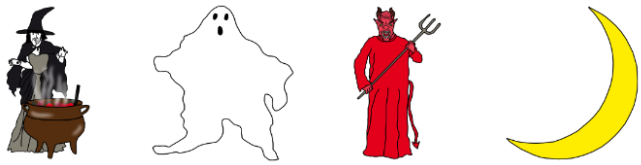
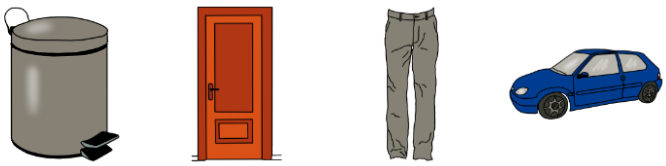
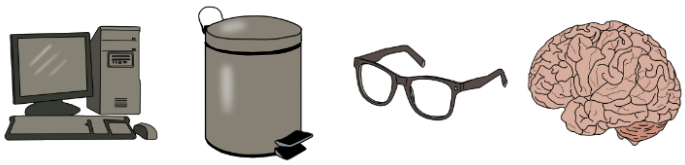
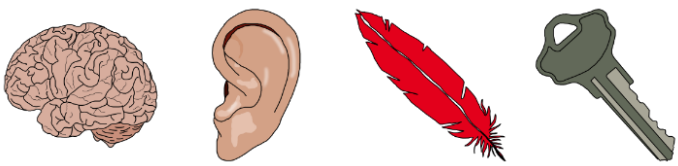
11. When do you use French in everyday life? Select all those which apply.

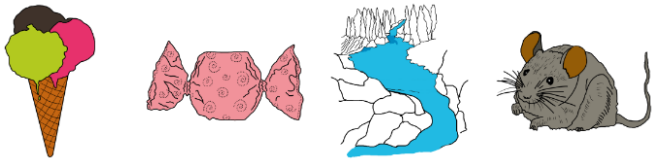
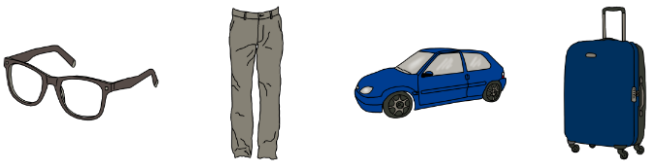
- On TV/movies with subtitles
- On TV/movies without subtitles
- Talking to friends/family
- Listening to French music
- French blogs/webpages/articles/social media accounts
- At school
- French books (not including course literature)
- Writing French texts (not including assignments for school)
- Other

Appendix C: Vocabulary test items

These items were all taken from The MultiPic dataset provided by Duñabeitia et al. (2018). Below, the vocabulary item is provided in French, with the corresponding English translation. The four images provided for each item include the correct response, followed by the distractors, i.e., images from the same conceptual category as well as those which are unrelated. Also note that the size and order of images does not reflect what was seen during the actual test; images were much larger and ordered randomly for participants.

Vocabulary Item	**Images**
Souris | Mouse	
Oreille | Ear	
Douche | Shower	
Vélo | Bike	
Os | Bone	
Vague | Wave	

Clé | Key	
Cœur | Heart	
Valise | Suitcase	
Fleur | Flower	
Sorcière | Witch	
Poubelle | Garbage can	
Ordinateur | Computer	
Cerveau | Brain	

Lapin | Rabbit	
Jupe | Skirt	
Glace | Ice cream	
Étoile | Star	
Lunettes | Glasses	
Plume | Feather	

Appendix D: Video stimuli

Video 1: Jump

Video 2: Run in place

Video 3: Trudge

Video 4: March

Video 5: March in place

Video 6: Jog

Video 7: Run

Video 8: Walk

Video 9: Stride

Video 10: Stomp

Video 11: Walk backwards

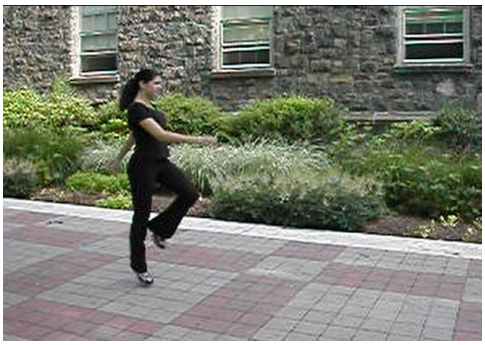
Video 12: Walk in place

Video 13: Sidestep

Video 14: Jump in place

Video 15: Hop

Video 16: Skip



Video 17: Stroll

Video 18: Sneak

Video 19: Swagger

Video 20: Tiptoe