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ARTICLE

Speed as a dimension of manner in Estonian frog stories

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Abstract

Focusing on the expression of manner and path in the 'frog story' narrations of Estonian native speakers, this study shows that Estonian – a morphologically rich satellite-framed Finno-Ugric language – is characterised by high manner and high path salience. Furthermore, when analysing one of the core qualities of manner – speed – we show that when the participants were asked to narrate a story as if the events developed slowly, they also spoke slowly and their stories tended to be long (both in time duration and word count) and include many details. When they were asked to tell the story as if the events developed fast, they also spoke faster and used more verbs of caused motion and verbs of vertical motion. Thus, the speed of motion in the physical world seems to be mimicked by speech rate, indicating mental simulation and iconic prosody. The exact nature of speed effects in linguistic choices for expressing motion remains to be studied in future works.

Keywords: Estonian; frog stories in L1; manner salience; mental simulation; motion events; path salience; spatial language

1. Introduction

Recent decades have substantially expanded our knowledge about the linguistic realisation of motion events within and across languages. Even though the domain of motion has long attracted linguists' attention (Mirambel 1950, Tesnière 1959, Ikegami 1969, Hughes 1970, to name just a few), interest in the expression of motion got a boost from Talmy's (1972, 1975, 1985, 2000b, 2007) typology of motion events. In this typology, Talmy divided languages into verb- and satellite-framed languages based on how they encode the core component of motion: Path (for the most recent comprehensive treatment of motion events, see Talmy 2000b and 2007). Path, in turn, is defined as 'the path followed or site occupied by the Figure object with respect to Ground object' (Talmy 2000b:25). If a language expresses Path predominantly in the verb (e.g. the Spanish path verb *entrar* 'enter'), it is a verb-framed language (e.g. Spanish). If a language mainly expresses Path outside the verb with

a so-called satellite (e.g. a verbal particle such as *out*), it is a satellite-framed language (e.g. English).

Early studies of motion events in the vein of Talmy mainly dealt with establishing the typological profile of individual languages based on their expression of path and manner (e.g. Aske 1989, Choi & Bowerman 1991, Slobin 1996), but they soon triggered an avalanche of studies focusing on the fine-grained differences between and within languages in their lexical choices when expressing motion in relation to their main profile of lexicalisation patterns (e.g. Berthele 2004, Slobin 2004, Zlatev & Yangklang 2004, Filipović 2007, Ibarretxe-Antuñano 2009, Goschler & Stefanowitsch 2013, Fagard et al. 2017). Recently, more and more in-depth analyses have been conducted on the dimensions of motion descriptions that go beyond the general categories of path and manner (e.g. Ibarretxe-Antuñano 2017, Matsumoto & Kawachi 2020, Stosic 2020, Kopecka & Vuillermet 2021, Łozińska 2021, Montero-Melis 2021, Tuuri 2021), which significantly broadens the scope of studies of motion language.

The current study adds to this growing body of knowledge by applying a well-established data elicitation task – 'frog stories' – in Estonian[1] and focusing on a primary dimension of motion: SPEED. The term 'frog stories' refers to a narration task in which speakers tell a story based on the wordless picture book *Frog, Where Are You?* (Mayer 1969). As a data elicitation task, it has been used in linguistics for nearly forty years (see also Berman & Slobin 1994) and has proved to be an excellent tool for obtaining comparable data from various languages (Strömqvist & Verhoeven 2004, Guo et al. 2009). Importantly, this experiment is useful for studying and establishing both the path salience and manner salience of individual languages (Slobin 1996, 2004, Ibarretxe-Antuñano 2009). Path salience shows the extent to which spatial aspects of motion are elaborated upon in language (Ibarretxe-Antuñano 2009). Manner salience shows the extent to which a language details manner-related aspects (Slobin 1996, 2004). Both of these saliences are typically measured by means of the frog stories task. Thus, to relate Estonian data to cross-linguistic data and to establish Estonian degree of path salience and manner salience, we applied the same task.[2]

As for speed, it is one of the main dimensions of manner relating to any motion event. This is because motion is always characterised by how slowly or fast it progresses. In this paper, we define speed as a characteristic that shows how fast or slowly a mover changes its location in space. It is a sub-category of manner, the latter of which can be very broadly defined as the way motion is conducted (for in-depth treatments of the manner dimensions, see e.g. Cardini 2008, Slobin et al. 2014, Stosic 2019, Taremaa & Kopecka 2022). Thus, the encoding of speed is a matter of encoding manner. Needless to say, speed is essentially a non-linguistic notion that can be expressed in language by various devices (e.g. verbs, adverbs, larger constructions). As such, speed is a prime domain to investigate the language-cognition interface. We address speed here in the light of embodiment approaches suggesting that language is grounded in perception and action (Johnson 1989, Glenberg & Kaschak 2002, Gibbs Jr 2006, Barsalou 2008, Zwaan 2009, Pulvermüller 2013). We understand embodiment as mental simulation in that the use of language evokes sensorimotor simulation similar to performing the described action, and physical experiences, in turn, influence the structure of

language (for a recent overview of embodiment and mental simulation, see Speed et al. 2019).

The further rationale for focusing on speed in this study is driven by its central relevance to motion (Ikegami 1969, Slobin et al. 2014) and is also supported by the fact that motion verbs tend to form a continuum from those expressing very slow to those expressing very fast motion (Taremaa 2017). Furthermore, fast motion tends to have more lexical resources in terms of adverbs and adjectives in many languages (Dixon 1982, Plungian & Rakhilina 2013, Hallonsten Halling 2018, Schäfer 2020), which indicates the *fast-over-slow* asymmetry (Taremaa & Kopecka 2022). A recent corpus study on Estonian motion verbs (Taremaa & Kopecka 2023) further suggests that manner verbs expressing fast motion (e.g. *kihutama* 'dash') have somewhat distinct clausal patterns from manner verbs expressing slow motion (e.g. *lonkima* 'stroll, saunter'), and they often resemble goal-oriented path verbs (e.g. *suunduma* 'head') in their constructional behaviour.

Taking these aspects into account, the current study has two aims:

(i) To situate Estonian in a broader cross-linguistic context in its expression of motion, and particularly so regarding its manner salience and path salience.
(ii) To reveal any substantial differences between Estonian linguistic descriptions of motion events that evolve slowly and events that evolve fast.

Section 2 provides the background and rationale for these two study goals relating to (i) manner salience and path salience and (ii) speed as an essential dimension of motion. Section 3 describes the frog stories experiment and data coding. Based on these data, Section 4.1 contextualises the Estonian language amongst languages that are high-manner and high-path-salient. Section 4.2 addresses the study's second goal regarding speed effects. This subsection shows that such effects occur in the length and rate of narrations, and in the expression of manner-related information, whereas spatial information is – at least based on the frog stories data – not affected by speed. Section 5 discusses the results in the light of cross-linguistic findings and then addresses the impact of the elicitation tool on the results we achieved.

2. Background

In this section, we will first elaborate on the two clines of salience as proposed in the literature. Then we will discuss the issues related to the expression of speed. Finally, the linguistic inventory of expressing motion in Estonian is briefly described.

2.1 Manner salience and path salience

Our first goal relates to cross-linguistic differences of manner salience and path salience. In the literature, these are known as the two clines of salience that reveal differences between languages in expressing motion. MANNER SALIENCE, as suggested by Slobin (1996, 2006), stands for a language's tendency to express manner-related information frequently and in a fine-grained way. Broadly divided, manner can be expressed by verbs resulting in manner verbs (e.g. *jooksma* 'run' in Estonian) and by other expressions (e.g. *aeglaselt* 'slowly' in Estonian). These other

expressions are often termed 'manner modifiers' and they are understood to cover all expressions in a clause (apart from verbs) that specify how motion is conducted. Speakers of a manner-salient language have easy and quick access to their large mental lexicon of manner verbs, and they detail manner-related aspects frequently in language. This tendency for manner-richness characterises satellite-framed languages, whereas in verb-framed languages, expressing manner is much more optional (Slobin 1996, 2006).

Manner salience has been measured by the size of the manner lexicon and usage frequency of manner verbs and modifiers. The data in earlier crosslinguistic studies by Slobin (1996, 2004, 2006) suggest that, for example, Spanish and French have low manner salience, German and English are manner-salient, and Russian is an extremely manner-salient language (Slobin 2004). A recent improvement in research on manner salience comes from Akita and Matsumoto (2020), who compared manner salience in English and Japanese by examining the fine-grained distinctions of manner with a special focus on sound as a dimension of manner. Based on two experiments (one of which was a frog stories task and the other was a video-based elicitation task), they concluded that English is more manner-salient than Japanese.

Estonian is a satellite-framed language that exhibits a large set of manner verbs and expresses manner-related information frequently and in a nuanced way (Pajusalu et al. 2013, Taremaa 2017, Taremaa & Kopecka 2022). This suggests that along the cline of manner salience (Slobin 2004, 2006), Estonian can potentially be situated amongst the languages that are highly manner-salient.

PATH SALIENCE, as described and investigated by Ibarretxe-Antuñano (2009; see also Ibarretxe-Antuñano & Hijazo-Gascón 2012), refers to the language's ability to express path-related information in a fine-grained way. It is measured by the presence of spatial expressions other than the verb and its satellite (e.g. prefix, verbal particle). Languages that routinely express path outside the verb and its possible satellite (by so-called plus-ground clauses: Slobin 1996) are understood to be path-salient languages. The notion of path salience was proposed by Ibarretxe-Antuñano (2009), who based the cline of salience on a number of studies including her own. In her 2009 paper, she presented 21 languages and showed that high-path-salient languages include, for example, Basque and Swedish, but also English. Low-path-salient languages include, for example, West Greenlandic, Tagalog, and Chinese.

Building upon the cline of salience, the following languages have more recently found their place in this cline of path salience: Jaminjung (an Australian language), which is inclined towards the low-path-salient languages with its close to 40% of plus-ground clauses (Hoffmann 2012), and Ilami Kurdish as a language that uses approximately 50% plus-ground clauses (Karimipour & Rezai 2016). Furthermore, in Finnish frog stories, plus-ground clauses were used in 87% of clauses (Pasanen & Pakkala-Weckström 2008). This finding places Finnish within the most high-path-salient languages.

Moreover, as can be seen from these examples, path salience is not strictly correlated to the typological profile of a language (i.e. satellite-framed or verb-framed) nor to its manner salience, as both verb-framed and satellite-framed languages can be path-salient. For instance, amongst the languages of high path salience,

Basque is a verb-framed language and Swedish and English are satellite-framed languages. However, an important factor that is associated with a language's degree of path salience is its lexical and morphological richness (Ibarretxe-Antuñano 2009, Ibarretxe-Antuñano & Hijazo-Gascón 2012). That is, high-path-salient languages tend to have a large lexical and morphological inventory to express space. These characteristics apply to Estonian as well. Thus, similarly to its kindred language Finnish, we can also expect that Estonian is a high-path-salient language.

2.2 Speed of motion as a dimension of manner

Our second goal – to establish if there are any principal differences between describing slow and fast motion – is concerned with a specific manner dimension that characterises any motion event: speed. More specifically, we aim to determine whether the encoding of space and manner is influenced by the speed of described motion.

Differences in speed can be expressed through lexical choices, such as verbs of fast vs. slow motion (compare *kihutama* 'dash' and *lonkima* 'stroll') or adverbs of fast vs. slow motion (compare *kiiresti* 'fast' and *aeglaselt* 'slowly'). Moreover, it has been shown for Estonian motion verbs that speakers attribute to them speed meanings so that the verbs fill the continuum from slow to fast verbs (Taremaa 2017). Regarding adverbs and adjectives, studies have shown that the lexicon of fast motion adverbs and adjectives is much larger than that of slow motion in a number of languages (Ikegami 1969, Dixon 1982, Plungian & Rakhilina 2013, Hallonsten Halling 2018). This suggests the predominance of explicit expression of fast motion. Based on written corpus data, a similar asymmetry has been shown to occur in Estonian: manner modifiers of fast motion are almost five times more frequent than those of slow motion, and they are also more diverse in terms of their lexical inventory and morphosyntactic realisation (Taremaa & Kopecka 2022). Thus, the *fast-over-slow* bias has been suggested (Taremaa & Kopecka 2022).

Furthermore, this preliminary investigation (Taremaa & Kopecka 2022) suggests that the expression of fast motion is more prone to redundancy in that speed is frequently conveyed by both the verb and the manner modifier (e.g. *ta kihutas ruttu koju* [(s)he rush.PST.3SG fast home] '(s)he rushed home fast'; Taremaa & Kopecka 2022). The expression of slow motion is much more flexible in that verbs of slow motion can easily be combined not only with manner modifiers of slow motion (e.g. *ta roomas aeglaselt* [(s)he crawl.PST.3SG slowly] '(s)he was crawling slowly') but also with modifiers of fast motion (e.g. *ta roomas kiiresti* [(s)he crawl.PST3SG fast] '(s)he was crawling fast'). Finally, verbs of fast motion in Estonian occur frequently in combination with Goal expressions similarly to goal-oriented path verbs (compare *ta kihutas koju* [(s)he rush.PST.3SG home] '(s)he rushed home' and *ta suundus koju* [(s)he head.PST.3SG home] '(s)he headed home', making manner and path verbs similar in terms of their preferable clausal patterns; Taremaa & Kopecka 2023).

2.3 Linguistic inventory to express motion in Estonian

Estonian is a Finno-Ugric language spoken by approximately one million people. Structurally, it is very similar to Finnish in terms of its morphosyntactic richness

(for a general overview of Estonian, see Erelt 2003; for more detailed accounts of Estonian, see Tauli 1973, 1983, Erelt & Metslang 2017, Viht & Habicht 2019). In terms of its typological profile in Talmy's (2000b) sense, it is a prime example of a satellite-framed language (Pajusalu et al. 2013).

Relevant to spatial language, Estonian has motion verbs that can occur either as bare verbs (e.g. *jooksma* 'run') or in combination with a satellite (adverb as a verbal particle), forming particle verbs (also termed as phrasal verbs, e.g. *välja jooksma* 'run out'). The transparency of particle verbs varies from full idiomaticity (e.g. *peale käima* [lit. onto walk] 'insist') to full transparency (e.g. *välja jooksma* 'run out'). The line between verbal particles and free adverbs is vague (see also Rätsep 1978, Veismann & Sahkai 2016, Aedmaa 2019). Motion verbs can also occur as a part of other complex verbs, such as catenative verbs (e.g. *hakkab jooksma* [start.PRS.3SG run.INF] '(s)he starts running'), serial verbs (e.g. *läheb*[3] *jookseb* [go.PRS.3SG run.PRS.3SG] '(s)he goes and runs'), and idiomatic phrasal verbs (e.g. *jalga laskma* [leg.ILL let/shoot.INF] 'escape, run away'). Verbal morphology includes various categories, such as tense, person, number, voice, and mood. The sentences from the current study's experiment exemplify these categories (see (1)) in that all the verbs are in indicative mood, personal voice, and third person plural. They differ in tense, in that the verbs in (1a) and (1c) are in the present tense and the one in (1b) is in the simple past tense.

(1) a. Nad kuku-vad vette.
they.NOM fall-PRS.3PL water.ILL
'They fall into the water.' (Control Condition)

b. Nad roni-si-d kõik puutüve peale.
they.NOM climb-PST-3PL all.NOM tree.trunk.GEN onto
'They all climbed onto the tree trunk.' (Slow Condition)

c. Nad suundu-vad üle palgi.
they.NOM head-PRS.3SG over log.GEN
'They head over the log.' (Slow Condition)

In the nominal sphere, nouns in Estonian can be inflected in 14 cases, including six spatial cases known as interior cases (i.e. *in*-cases) and exterior cases (i.e. *on*-cases). The former consists of illative, inessive, and elative. The latter includes allative, adessive, and ablative. In addition to these, terminative also encodes spatial information by expressing motion until something. An example of a case-inflected spatial expression is in (1a), where Goal is expressed by a noun inflected in illative case (*vette* 'into the water'). In addition, there are adpositions in Estonian (they mostly occur as postpositions) and a large proportion of these express spatial information, as the postposition *peale* 'onto' in (1b) and the preposition *üle* 'over' in (1c). Frequently, the same spatial lexical items can function as verbal particles (e.g. *alla jooksma* 'run down') and adpositions (e.g. *laua alla* [desk.GEN under.GOAL] 'under the desk').

From the perspective of the central semantic notions relating to motion, 'path' can be expressed by verbs. In this study, all verbs that predominantly encode directional information are considered to be path verbs. This also includes deictic verbs such as *minema* 'go' and *tulema* 'come' (see also Levin 1993). Apart from verbs, path can be expressed by

satellites (i.e. a morpheme closely related to the verb) which in Estonian are verbal particles (e.g. *välja (jooksma)* '(run) out'). The semantically defined term 'manner' can represent various types of linguistic realisations. In Estonian, adverb phrases (e.g. *kiiresti* 'fast'), noun phrases (e.g. *kiire-l sammu-l* [fast-ADE step-ADE] 'at fast pace'), and gerund forms (e.g. *kiirusta-des* [hurry-GER] 'running') are most commonly used to express manner (besides verbs which are then called 'manner verbs').

Furthermore, word order is relatively free in Estonian, noun phrases can be long and complex, and clauses can simultaneously incorporate a number of spatial or manner expressions. In a constructed example (2), an event is described by a manner-of-motion verb (*jooksma* 'run') in combination with a Location, Source, Trajectory, Goal, and Manner expression. In this example, the expression of Source illustrates a lengthy noun phrase, and the expression of Trajectory illustrates an adpositional phrase.

(2) [Metsa-s] jooksi-s ta [kiiresti] [mööda tee-d]
forest-INE run-PST.3SG (s)he.NOM fast along path-PART
[Location] [Manner] [Trajectory]
[ühe-st väga lagune-nud vildaka-st onni-st] [teise]
one-ELA very decay-APP dilapidated-ELA hut-ELA another.ILL
[Source] [Goal]
'In the forest, (s)he ran fast down the road from one very decayed hut to another.'
(constructed example)

As can be seen in (2), Estonian allows combinations of manner verbs to express boundary-crossing events, which is a typical characteristic of satellite-framed languages (see also Aske 1989, Slobin 1996). Despite the predominance of the satellite-framing strategy and rich inventory of manner verbs and modifiers, Estonian routinely also uses verb-framing strategies, as exemplified in (1c) by the path verb *suunduma* 'head'.

All in all, Estonian is a morphologically rich and flexible satellite-framed language. Being morphology-rich, Estonian is likely to be a highly path-salient language. Similarly, being a satellite-framed language, Estonian is also likely to be a highly manner-salient language. It is this high degree of manner salience that allows speed as a dimension of manner to be expressed in a nuanced way in Estonian.

3. Method and data

In this section, we describe (i) the implementation of the frog stories task, (ii) the data coding decisions, and (iii) the statistical techniques used to analyse the data.

3.1 Method

Participants. The experiment was conducted with 45 adult participants (39 female, 5 male, 1 non-binary). All participants were native speakers of Estonian. The mean age of the participants was 26 years (SD 10; range 19–60). Participants were randomly assigned to one of the three conditions of the experiment: A (Control Condition), B (Slow Condition), or C (Fast Condition). Each condition had an equal number of participants ($N = 15$).

Materials and design. To collect data, we asked the participants to narrate a story based on the wordless picture book *Frog, Where Are You?* (Mayer 1969) following the experiment design of Berman and Slobin (1994). With the introduction of video clips as experimental stimuli where the variability of motion events can be captured and presented in a more natural way (e.g. Vuillermet & Kopecka 2019, Lewandowski 2021, Matsumoto et al. 2022), the frog stories design seems to have been used less often in cross-linguistic research over the past ten years. However, this task is a basic elicitation task for measuring a language's degree of manner salience and path salience. Thus, we chose the frog stories design to obtain comparable data for Estonian for two main reasons. Firstly, there are a number of languages for which frog stories have been used to examine the expression of motion. Secondly, as the task elicits descriptions of path and manner in the scenes of horizontal and vertical motion, the frog stories design was deemed to be a prime tool for preliminary investigation of speed effects in language.

The pictures of the frog story book were digitised and presented to the participants on a computer screen. In addition to the standard experiment in which participants can narrate the story as they wish (Berman & Slobin 1994), we tested two more conditions. CONTROL CONDITION corresponds to the standard design in that the participants were asked to narrate the story based on the pictures as they saw fit. As such, the participants of this condition serve as a control group. SLOW CONDITION and FAST CONDITION were designed to elicit speed-related language of slow and fast motion respectively. In Slow Condition, the participants were told to follow the pictures and tell the story as if the events evolved very slowly (the exact wording of the instructions can be found in the Appendix). In Fast Condition, the participants were told to tell the story as if the events evolved very fast. The picture stimuli were identical across the three conditions. The only difference between the conditions was in the instructions given to the participants.

Procedure. The experiments were conducted in the Phonetics Lab at the University of Tartu where the narrations were audio-recorded. The participants' task was to narrate a story based on the sequence of frog story pictures. The instructions (see the Appendix) were given orally as well as on the computer screen. The pictures were presented on the computer screen, with one picture per slide. Prior to the task, the participants could go through all the pictures and ask questions. When narrating, they could change the slides at their own pace. They sat alone in the recording studio but could ask questions from the researcher using a microphone during the experiment (no participant used this opportunity, though; all the participants narrated the story without communicating with the researcher).

3.2 Data

The audio data were automatically transcribed using the Estonian speech transcription system of the Tallinn University of Technology (Alumäe, Tilk & Asadullah 2018), and then manually checked and corrected. The written utterances were entered into a spreadsheet with each clause placed in a separate row. Clauses were defined as chunks of text in which a finite verb occurs together with all other sentential units associated with it (see also Slobin 1996). Occasionally, when a motion event was described with a converb construction, it was also considered to be a

Table 1. Variables describing the whole data of the narrations

Variables	Values	Explanations	Data characteristics
TOTALSPEECHTIMEINMINUTES	Numeric values	The length of the narrations measured in minutes per participant	Range 2.0 to 18.8 minutes
CLAUSESPERPARTICIPANT	Numeric values	The number of clauses produced by a participant (i.e. counts)	Min 34 and max 295 clauses per participant
MOTIONCLAUSESPERPARTICIPANT	Numeric values	The number of motion clauses produced by a participant (i.e. counts)	Min 10 and max 55 motion clauses per participant
WORDSPERSECOND	Numeric values	The speech rate of a participant calculated as the number of words per second	Range 1.0 to 2.1 words per second
CONDITION	'Control Condition', 'Slow Condition', 'Fast Condition'	The condition of the experiment under which the story was produced	15 participants in each condition

clause (e.g. *akna-st alla kukku-des* [window-ELA down fall-GER] 'falling down the window'). After that, the data (i.e. each clause) were coded for motion-related variables, verb-related variables, and variables of space and manner. In a separate spreadsheet, the length of the narrations (by minutes and clauses) and the participants' speech rate were automatically coded. In the following subsections, all relevant variables are explained in detail alongside their general frequencies in our data.

3.2.1 Variables characterising the narrations

The narrations are captured by five variables (see Table 1). They stand for the length of the narrations in terms of speech time (TOTALSPEECHTIMEINMINUTES), number of clauses produced by a participant (CLAUSESPERPARTICIPANT), number of motion clauses produced by a participant (MOTIONCLAUSESPERPARTICIPANT), speech rate (WORDSPERSECOND), and experiment condition (CONDITION).

3.2.2 Variables of motion

Two variables of motion were tagged: MOTION and MOTIONTYPE (see Table 2). MOTION specifies whether the clause depicts motion or not. If coded as 'yes', we have a motion clause. This variable enables us to examine motion descriptions of translational motion while leaving the rest of the clauses out. Importantly, in line with earlier studies using frog stories (e.g. Slobin 1996, 2004, Ibarretxe-Antuñano 2009), we only consider translational motion, which is understood as motion in which the mover changes their position in space by moving entirely from one point to another (see also Talmy 2000b:35–36). Descriptions of activities that comprise

Table 2. Motion variables of general type

Variables	Values	Explanations	Data characteristics
MOTION	'yes', 'no', 'unclear'	An indication of whether the clause depicts translational motion or not	1137 clauses identified as expressing clearly (translational) motion
MOTIONTYPE	'self-motion', 'caused motion'	If motion is expressed, the type of motion in terms of self-motion and caused motion	965 instances of self-motion (85%) and 172 instances of caused motion (15%)

motion but in which motion is not the main purpose (e.g. searching) are not analysed as motion descriptions in our study (for a different and broader approach, see Pasanen and Pakkala-Weckström 2008). Descriptions of self-contained motion (i.e. motion in which the mover stays in the same location), including expressions of moving one's hand or leg, were excluded from motion clauses (i.e. they were labelled as 'no' or 'unclear'). The rest of the variables of this study presented below were only coded if MOTION was coded as 'yes'.

MOTIONTYPE (see Table 2) was coded for the purposes of distinguishing between 'self-motion', in which the mover is the sole main participant expressed and motion can be agentive or non-agentive (e.g. *ta jookseb välja* [run.PRS.3SG out] '(s)he is running out', *ta kukub alla* [fall.PRS.3SG down] '(s)he falls down'; not to be confused with self-contained motion as explained above), and 'caused motion', in which the motion of an entity is caused by another entity (e.g. *öökull ajab poissi taga* [owl.NOM drive.PRS.3SG boy.PART behind] 'the owl is chasing the boy').

3.2.3 Verb-related variables

Verb-related variables stand for the form and meaning of verbs used in the motion clauses (see Table 3). Four variables were coded: VERB, VERBTYPESEM, VERBTYPEMORHPSYNT, and PARTICLE.

VERB refers to the verb lemmas without their optional verbal particles (e.g. *minema* 'go', *kukkuma* 'fall'). Regarding the semantic type of motion verbs (VERBTYPESEM), the main distinction was made between path and manner verbs. In our analysis, path verbs lexicalise directional meanings (e.g. *minema* 'go', *suunduma* 'head') and manner verbs lexicalise how motion is conducted (e.g. *jooksma* 'run', *ronima* 'crawl', *hüppama* 'jump'). Because deictic verbs express directional information, they were analysed as path verbs. In addition to the two main types of motion verbs, we coded path+manner verbs as verbs that saliently express both directional and manner meanings, making their classification into discrete categories of path or manner verbs difficult, if not impossible. This mainly concerns verbs of vertical motion (e.g. *kukkuma* 'fall'). The label 'unclear' was assigned to verbs that we were unable to classify unambiguously. This category exclusively contains verbs of caused motion (e.g. *ajama* 'chase, drive', *võtma* 'take').

VERBTYPEMORHPSYNT distinguishes between bare verbs and particle verbs. Verbs occurring with verbal particles (i.e. satellites, e.g. *alla kukkuma* 'fall down') are coded as 'particle verb'. All other verbs are coded as 'bare verb' (e.g. *kukkuma*

Table 3. Verb-related variables coded in motion clauses

Variables	Values	Explanations	Data characteristics
VERB	*minema* 'go', *kukkuma* 'fall', etc.	The individual verb lemmas without their optional particles (satellites)	107 unique verbs
VERBTYPESEM	'path verb', 'manner verb', 'path+manner verb', 'unclear'	The semantic type of motion verbs	60 unique manner verbs, 15 path verbs, 8 path+manner verbs, and 26 unclear verbs (i.e. verbs of caused motion)
VERBTYPEMORHPSYNT	'bare verb', 'particle verb'	The morphosyntactic type of the verb whether it occurs with or without verbal particles	83 unique bare verbs and 149 particle verbs. Of all motion clauses, 557 contain bare verbs and 580 contain particle verbs
PARTICLE	*välja* 'out', *alla* 'down', *kaasa* 'with', etc.	The individual lemmas of verbal particles	32 different verbal particles

'fall'). PARTICLE specifies the verbal particle (if present). The coding of verbal particles followed Estonian reference grammars (Erelt et al. 1993, 1995, Erelt 2017).

3.2.4 Variables of space and manner

Variables of space and manner specify the semantic structure of motion clauses (see Table 4). The main variable – GROUND – was taken from Slobin (1996), who, in turn, used the term in the vein of Talmy (2000b). Talmy (2000b:25) defines Ground as a 'reference object' with respect to where the Figure object is located or moving. To differentiate clauses in which only the verb (together with its optional particle, i.e. satellite) was used to express spatial settings of motion from those in which Ground was elaborated upon outside the verb, Slobin applied the terms MINUS-GROUND CLAUSES and PLUS-GROUND CLAUSES, respectively. In our analysis of the Estonian data, 'plus-ground clauses' are coded if space is expressed as Source, Location, Trajectory, Direction, or Goal. Otherwise, 'minus-ground clauses' are coded. If a category such as Source or Direction is expressed with a verbal particle, it is not considered a plus-ground clause. Other variables of space include SOURCE, LOCATION, TRAJECTORY, DIRECTION, and GOAL. In defining MANNER, we rely on previous research (Cardini 2008, Slobin et al. 2014, Stosic 2019, Taremaa & Kopecka 2022) and define it as pertaining to various dimensions of the way in which a mover progresses that, one way or another, relate to the body-movements of a moving object.

3.3 Statistical tools

In analysing the data, we use descriptive statistics and frequency analysis. Even though our study is predominantly exploratory, we have chosen simple frequency

Table 4. Clause-related variables of space and manner in motion clauses

Variables	Values	Explanations	Data characteristics
GROUND	'plusGround', 'minusGround'	Clause type in terms of whether a motion verb (either a bare or particle verb) occurs in a clause with a Ground expression ('plus-ground') or not ('minus-ground')	364 (32%) minus-ground clauses and 773 (68%) plus-ground clauses
SOURCE	'yes', 'no'	The presence ('yes') or absence ('no') of expressions that describe the starting point of motion (e.g. *purgist* [jar.ELA] 'from a jar')	332 (29%) clauses with a Source expression. Six instances of these expressions are verbal particles
LOCATION	'yes', 'no'	The presence ('yes') or absence ('no') of expressions that describe the area where the motion takes place (e.g. *puu all* [tree.GEN under] 'under the tree')	17 (1%) clauses with a Location expression. Of these, one has the form of a verbal particle and three combine a verbal particle and some other phrase
TRAJECTORY	'yes', 'no'	The presence ('yes') or absence ('no') of expressions that describe the path covered when moving from Source to Goal (e.g. *puud mööda* [tree.PART along] 'along the tree'). Trajectory is also known as route, medium, and path	29 (3%) clauses with a Trajectory expression. Two of these are verbal particles, and five are combinations of a verbal particle and some other phrase
DIRECTION	'yes', 'no'	The presence ('yes') or absence ('no') of expressions that describe the Ground towards which motion is conducted (e.g. *metsa poole* [forest.GEN towards] 'towards the forest')	623 (55%) clauses with a Direction expression. Of these, it is expressed by verbal particles in 548, in 32 by a combination of a verbal particle and other Direction phrases, and in 43 by a phrase that is not a verbal particle but, for example, an adpositional phrase
GOAL	'yes', 'no'	The presence ('yes') or absence ('no') of expressions that describe the endpoint of motion (e.g. *jõkke* [river.ILL] 'into the river')	357 (31%) clauses with a Goal expression (never by a verbal particle)
MANNER	'yes', 'no'	The presence ('yes') or absence ('no') of expressions that describe how motion is conducted (e.g. *kiiresti* [ADV] 'fast', *prantsatusega* [thump.COM] 'with a thump')	143 (13%) clauses with a Manner modifier

analysis techniques. This enables us to relate our results to results obtained by similar previous studies, and to present plots that are reader-friendly and easy to interpret. We also applied statistical tests when examining the manifestation of a variable with respect to the experimental conditions, to better account for

differences that are statistically significant. In particular, we applied independent two-tailed Wilcoxon tests for analysing continuous variables (this test was chosen because our data are not normally distributed) and Chi-square tests for analysing categorical variables. The latter are accompanied by Cramér's V to account for the effect sizes of the associations. The data were analysed and the figures were created in R using the packages 'base' (R Core Team 2020), 'dplyr' (Wickham et al. 2020), 'sjPlot' (Lüdecke 2021), 'ggplot2' (Wickham et al. 2021), and 'ggpubr' (Alboukadel 2020). The coded data and R code are available through the data repository DataDOI.[4]

4. Results

In this section, we will first establish the degree to which Estonian is a manner-salient and path-salient language. For this purpose, we examine the data from Control Condition and analyse the same subsets of the data as in previous studies that address manner salience and path salience in languages. After that, we will address any possible speed effects in frog stories by comparing narrations (and motion clauses in particular) of the three conditions: Control, Slow, and Fast Condition.

4.1 Manner salience and path salience in Estonian

We hypothesised that Estonian is a high-manner-salient and high-path-salient language based on its framing profile (satellite-framed language) and linguistic inventory (morphosyntactic richness: see Section 2.1). As a measure of MANNER SALIENCE, we applied a similar approach to that used by Akita and Matsumoto (2020) and calculated the proportion of all manner expressions (i.e. manner verbs and modifiers) in motion clauses that the participants produced. To compare our results with Akita and Matsumoto (2020:151), we only examine clauses of translational self-motion in Control Condition (304 clauses in total) and also exclude verbs of vertical motion (e.g. *fall*) from manner verbs. As explained in Section 3.2.3, to best represent the semantics of the verbs of vertical motion, we call verbs of vertical motion 'path+manner verbs'. As such, we only analyse clauses that describe self-motion that is translational and horizontal (234 clauses in total).

The results indicate that roughly half of the clauses specify manner of motion one way or another: manner is expressed either by a verb (as by *ronima* 'climb' in (3a)), modifier (as by *vaikselt* 'quietly' in (3b)), or both (as by the verb *jooksma* 'run' and modifier *suure hooga* 'with great speed' in (3c)) in 125 clauses (53%), and is not expressed in 109 clauses (47%). This indicates that Estonian is a high-manner-salient language. In comparison, the results obtained by Akita and Matsumoto (2020:153) for English and Japanese show that 42% of clauses contained a manner expression in the English data and 27% of clauses contained a manner expression in the Japanese data. If considering only manner verbs (i.e. leaving manner modifiers aside) in the Estonian data, we find that they occur in 115 clauses of self-motion out of the total of 234 (49%; see examples (3a, 3c)).

This result positions Estonian close to English, as according to Slobin's (2004:231) data, manner verbs were used in English frog stories in approximately 45% of clauses.

(3) a. poiss **roni-s** kivi otsa
boy.NOM *climb-PST.3SG* *rock.GEN* *onto*
'The boy climbed onto a rock.' (Control Condition)

b. Konnakene tuli **vaikselt** purgi-st välja
froggy.NOM *come.PST.3SG* *quietly* *jar-ELA* *out*
'The froggy came out of the jar quietly.' (Control Condition)

c. Taksikoer **jooksi-s** **suure** **hoo-ga** eest ära
dachshund.NOM *run-PST.3SG* *great.GEN* *momentum-COM* *from.in.front.of* *away*
'The dachshund ran away with great speed.' (Control Condition)

Furthermore, if we analyse the proportion of manner verbs used in depicting the owl's exit (see Slobin 2004), we can see that path verbs (used in 7 clauses, as in (4); 78%) are preferred over manner verbs. In fact, manner verbs are particularly infrequent (they are used only in 2 clauses; 22%), but given that the number of clauses expressing the owl's exit in our data is extremely small (only 9 clauses in total in Control Condition), these results should be interpreted with caution. When comparing with Slobin's (2004:225) cross-linguistic data, Estonian would be similar to Dutch and German. In these two languages, manner verbs were used in close to 20% of clauses describing the owl's exit. Roughly 30% of clauses contained manner verbs in Slobin's (2004) English data. Thus, along the cline of manner salience, Estonian can be situated close to the Germanic languages, between German and English.

(4) ning puuõõnsuse-st **tuli** välja öökull
and *tree.cavity-ELA* *come.PST.3SG* *out* *owl.NOM*
'And an owl came out of the tree cavity.' (Control Condition)

To relate our study to crosslinguistic findings on path salience, we present the results for falling scenes similarly to Ibarretxe-Antuñano & Hijazo-Gascón (2012) and follow Slobin's (1996:200–201) distinction between minus- and plus-ground clauses. As explained in Sections 2.1 and 3.2.4, minus-ground clauses refer to constructions in which the verb is not accompanied by an additional spatial expression (excluding verbal particles). Plus-ground clauses refer to constructions in which the verb occurs in a clause with an additional spatial expression of a ground other than the verb and its optional particle. In this analysis, we include both self-motion and caused motion (i.e. 356 clauses), of which clauses of falling scenes in Control Condition occur in 63 instances in total. The results reveal that the control group produced minus-ground clauses in 19% ($N = 12$) and plus-ground constructions in 81% ($N = 51$) of all motion clauses that describe the falling scenes ($N = 63$). These two structures are exemplified in (5a) by a minus-ground clause in which *alla kukkuma* 'fall down' is used and in (5b) by a plus-ground clause in which the same particle verb combines with a Source expression (*aknast* 'from the window').

The high proportion of plus-ground structures (81%) suggests that along the cline of path salience (Ibarretxe-Antuñano & Hijazo-Gascón 2012:354), Estonian is a language of high-path salience following Chantyal (plus-ground 100%), Basque (88%), and English (82%).

(5) a. taks **kukku-s** **alla**
dachshund.NOM *fall-PST.3SG* *down*
'The dachshund fell down.' (Control Condition)

b. kuid koer **kukku-s** **akna-st** **alla**
but *dog.NOM* *fall-PST.3SG* *window-ELA* *down*
'But the dog fell down from the window.' (Control Condition)

To summarise, Estonian is a high-manner and high-path-salient language. In terms of its use of manner verbs and modifiers in horizontal self-motion (altogether in 53% of clauses), Estonian is more manner-salient than English (for which Akita and Matsumoto (2020) report such usage in 42% of clauses). If considering only manner verbs (used in 49% of clauses), Estonian is similar to English (where they were used in 45% of clauses, according to Slobin 2004). This suggests that it is the frequent use of manner modifiers that makes Estonian a particularly high-manner-salient language.

As for path salience, we found that in the falling scenes of the frog stories, plus-ground constructions were used in 81% of clauses. In these clauses, the verb (and its optional particle) co-occurred with an additional spatial expression (e.g. a noun phrase expressing the source of motion). This indicates that not only is Estonian a high-path-salient language, but it is also similar to English in this respect (as reported by Ibarretxe-Antuñano (2009), English used plus-ground constructions in 82% of clauses). In comparison, Finnish has been reported to have plus-ground constructions in 87% of clauses. However, it should be considered that in the analysis by Pasanen & Pakkala-Weckström (2008), all motion clauses from all scenes were included while some motion clauses were excluded in the current study (similarly to Ibarretxe-Antuñano 2009).

4.2 Speed effects in the Estonian frog stories

Our second aim was to establish any possible speed effects in expressing motion. We measure the speed effects by means of (i) the length of the narrated stories and speech rate of the participants, (ii) lexical choices of motion verbs, and (iii) clausal characteristics of motion descriptions.

4.2.1 Narrations across the conditions

Below, we examine the general characteristics of the data across the three conditions (see Figures 1 and 2). The stories in Slow Condition tend to be the longest and those in Fast Condition the shortest in terms of average speech time in minutes and the number of clauses produced by a participant (see panels A and B in Figure 1). The stories in Control Condition are in between the two. An independent two-tailed Wilcoxon test[5] confirms that speech time in minutes relative to Control

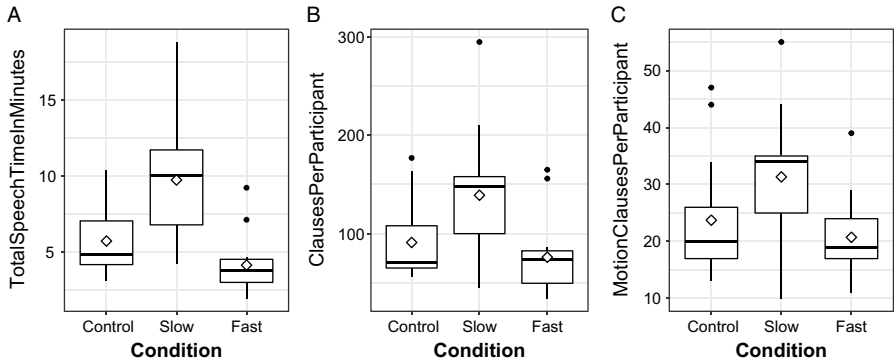

Figure 1. Panel A: length of the narrations produced by the participants in three conditions measured in minutes. Panel B: length of the narrations in the number of clauses in total. Panel C: the number of motion clauses. The horizontal lines indicate median values. The diamond figures stand for mean values.

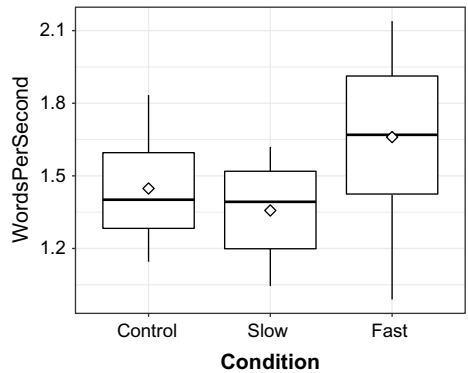

Figure 2. Speech rate of the narrators across the conditions. The horizontal lines indicate median values. The diamond figures stand for mean values.

Condition is significantly longer for Slow Condition ($W = 42$, $p < 0.01$) and significantly shorter for Fast Condition ($W = 165$, $p = 0.03$). Similarly, as can be inferred from panel B in Figure 1, the length of the narrations in terms of clauses relative to Control Condition is greater for Slow Condition ($W = 58$, $p = 0.02$), but not significantly smaller for Fast Condition ($W = 142.5$, $p = 0.21$). The difference between Slow and Fast Condition in length is significant ($W = 184$, $p < 0.01$). The same pattern is reflected for the number of motion clauses produced by the participants (Control vs. Slow: $W = 60.5$, $p = 0.03$; Control vs. Fast: $W = 127$, $p = 0.55$; Slow vs. Fast: $W = 180.5$, $p < 0.01$; see panel C in Figure 1).

Furthermore, the speech rate is fastest in Fast Condition and slowest in Slow Condition, as shown in Figure 2. However, an independent two-tailed Wilcoxon test indicates that the number of words per second relative to Control Condition is not significantly smaller for Slow Condition ($W = 136$, $p = 0.35$) and also not

Table 5. The five most frequent bare verbs across the three conditions (absolute frequencies)

Conditions (*N* of clauses with bare verbs)		
Control (175)	Slow (240)	Fast (142)
minema 'go' (40)	*minema* 'go' (41)	*minema* 'go' (33)
kukkuma 'fall' (22)	*ronima* 'climb' (32)	*ronima* 'climb' (21)
ronima 'climb' (22)	*jooksma* 'run' (16)	*kukkuma* 'fall' (14)
jooksma 'run' (11)	*põgenema* 'escape' (14)	*jooksma* 'run' (7)
jõudma 'reach' (9)	*tulema* 'come' (13)	*tulema* 'come' (7)

Table 6. The five most frequent particle verbs across the three conditions (absolute frequencies)

Conditions (*N* of clauses with particle verbs)		
Control (181)	Slow (230)	Fast (169)
alla kukkuma 'fall down' (36)	*alla kukkuma* 'fall down' (18)	*alla kukkuma* 'fall down' (24)
välja tulema 'come out' (25)	*välja tulema* 'come out' (18)	*välja tulema* 'come out' (16)
taga ajama 'chase' (14)	*maha kukkuma* 'fall down' (14)	*taga ajama* 'chase' (12)
kaasa võtma 'take with' (7)	*taga ajama* 'chase' (13)	*plehku panema* 'escape, run away' (8)
välja ronima 'climb out' (7)	*välja hiilima* 'sneak out' (10)	*kaasa võtma* 'take with' (6)

significantly larger for Fast Condition ($W = 66$, $p = 0.06$). Nevertheless, there is a significant difference between Slow and Fast Conditions ($W = 49$, $p < 0.01$).

Taken together, speed effects manifest themselves in the length of narrations and in the speech rate. The stories told in Slow Condition were considerably longer and narrated at a slower pace than those in Fast Condition.

4.2.2 Lexical diversity of motion verbs across the conditions

The list of all verbs that occurred in motion clauses (whether depicting self-motion or caused motion) together with their optional particles (satellites) is given in the Supplemental Materials. The top five verbs in terms of their absolute frequencies are presented in Table 5 (bare verbs) and Table 6 (particle verbs). In all conditions, the path verb *minema* 'go' is the most frequently used bare verb and *alla kukkuma* 'fall down' (path+manner verb with a verbal particle) the most frequently used particle verb. As for differences, *kukkuma* 'fall' as a verb of vertical motion does not appear amongst the most frequent verbs in Slow Condition, and *alla kukkuma* 'fall down' is less frequent in Slow Condition than in the other conditions.

The frequencies of types and tokens of motion verbs (regardless of whether they occurred with or without particles) across the conditions are presented in Table 7. It shows that the number of different verbs (types) is highest in Slow Condition. This is to be expected because the stories narrated in Slow

Table 7. The frequencies of the types and tokens of motion verbs (without their optional particles) used by the narrators

Verbs (without particles)	Conditions		
	Control	Slow	Fast
types in total (i.e. individual verbs)	54	79	55
tokens in total	356	470	311
tokens per type (mean)	6.6	5.9	5.6

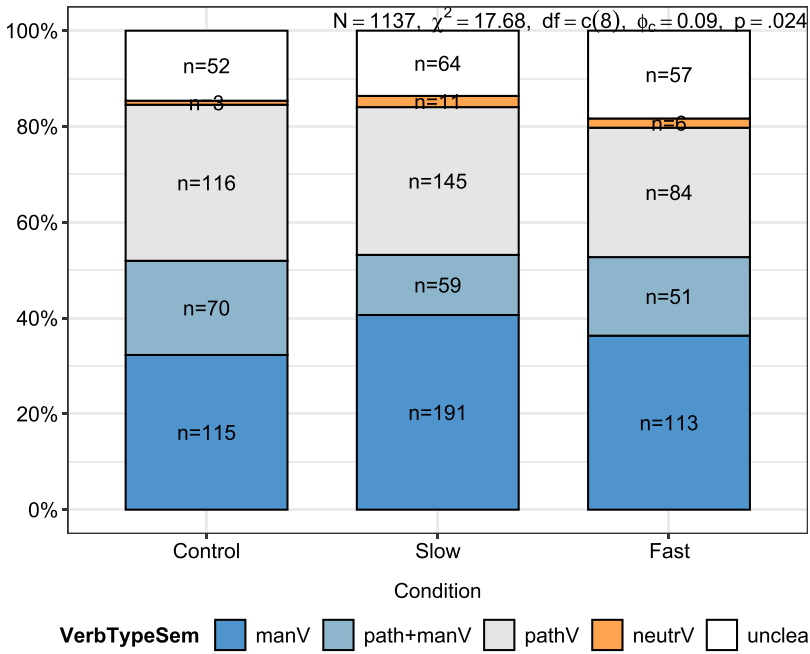

Figure 3. The distribution of verbs across three conditions: manner verbs (= 'manV'), path+manner verbs (= 'path+manV'), path verbs (= 'pathV'), neutral verbs (= 'neutrV'), and verbs of ambiguous semantics (= 'unclear').

Condition were much longer than those in Control and Fast Conditions. When we look at the mean frequencies of tokens per type, it appears that Fast Condition is somewhat more diverse in its verb choice (approximately 5.6 tokens were used per type) than Control and Slow Conditions (approximately 6.6 and 5.9 tokens per type, respectively) with Control Condition being least diverse. In other words, the participants used the same verbs most frequently in Control Condition and least frequently in Fast Condition.

As for semantic verb types used to express motion (i.e. path vs. manner verbs), significant differences appear across the conditions, as shown in Figure 3.

In particular, when the participants were asked to pay attention to the speed of motion to tell the story as if the events developed slowly (Slow Condition) or fast (Fast Condition), they used not only more diverse verbs compared to the control group (see Table 7) but also used manner verbs more frequently than the control group (see Figure 3), as in (6).

(6) **Aeglaselt** **ja** **võimalikult** **vaikselt** **roni-si-d** poiss ja koer
slowly *and* *maximally* *quietly* *climb-PST-3PL* *boy.NOM* *and* *dog.NOM*
puutüve-le
tree.trunk-ALL
'Slowly and as quietly as possible, the boy and the dog climbed onto the tree trunk.' (Slow Condition)

The comparison of Slow and Fast Conditions indicates that the participants in Slow Condition used path+manner verbs less frequently than those in Fast Condition (and Control Condition). The use of a path+manner verb in Fast Condition is exemplified in (7a) by *kukkuma* 'fall', where it combines with an onomatopoetic manner expression *plärtsti* 'with a splash' which further adds information about forceful and fast motion. Moreover, the participants in Fast Condition used path verbs less frequently than those in Slow and Control Condition. This suggests that speakers in Slow Condition elaborated extensively upon horizontal motion, but they described the scenes of vertical motion (where the path+manner verbs would be needed) as little as possible. In Fast Condition, there are many uses of verbs of caused motion (in terms of expressing path or manner, these are labelled as 'unclear': see Section 3.2.3) that describe not only fast but also forceful motion, as exemplified in (7b).

(7) a. Ja nii nad **kukku-si-d** kahekesi **plärtsti** vette
and *so* *they.NOM* *fall-PST-3PL* *two.of.them* *with.a.splash* *water.ILL*
'And so the two of them fell into the water with a splash.' (Fast Condition)

b. Ja **viska-s** poisi üle järsaku ääre alla vette
and *throw-PST.3SG* *boy.GEN* *over* *cliff.GEN* *edge.GEN* *down* *water.ILL*
'And threw the boy over the edge of the cliff down into the water.' (Fast Condition)

All in all, verb choice in Slow and particularly in Fast Condition was more diverse than in the control group. Furthermore, manner verbs were used more frequently in Slow and Fast Conditions than in Control Condition. Particularly in Fast Condition, verbs of caused motion tended to be used.

4.2.3 Clausal characteristics of motion descriptions across the conditions

In this section, we concentrate on the semantic makeup of motion descriptions and measure how spatial aspects as well as manner features are expressed in the narrations. To start with spatial aspects, the frequencies of plus-ground and minus-ground clauses are provided in panel A in Figure 4. This essentially shows whether the verb is accompanied by a spatial expression other than its optional particle (plus-ground clauses) or not (minus-ground clauses), as explained in

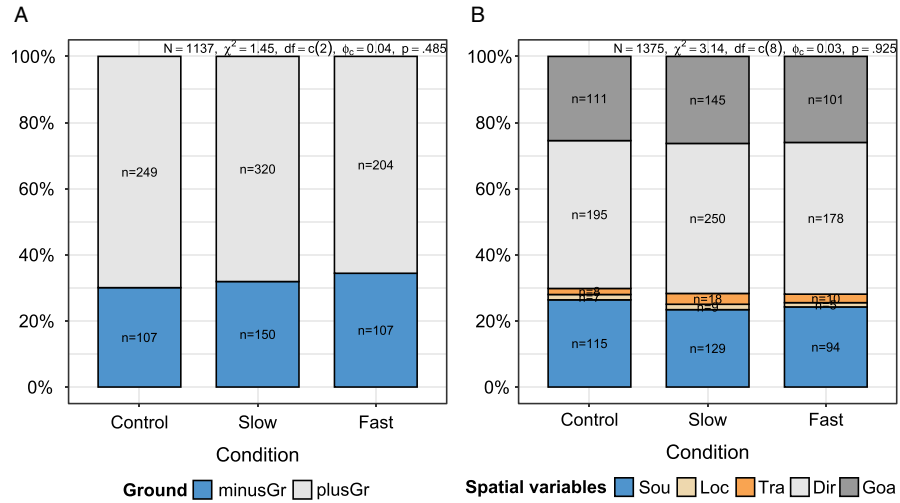

Figure 4. The characteristics of all motion clauses across three conditions in terms of (i) the frequencies of minus-ground (= 'minusGr') and plus-ground clauses (= 'plusGr'; panel A) and (ii) the expression of spatial categories (panel B).

Section 3.2.4. The proportions of these two types of clausal structures show no differences between the three conditions. That is, we see no speed effects here.

As for the presence of spatial expressions apart from the verbs, the same result is obtained (see panel B in Figure 4). In other words, speakers in different conditions select the spatial aspects to be described rather uniformly, which is most likely related to the specifics of the elicitation tool (see Section 5).

Regarding manner modifiers (see Figure 5), Slow Condition triggered more frequent mentions of how motion is conducted (i.e. manner expressions other than the verb) than Control and Fast Conditions.

For instance, in (6), manner is expressed as *aeglaselt ja võimalikult vaikselt* 'slowly and as quietly as possible'. If we add to this that manner verbs were also most frequently used in Slow Condition (see Figure 3), we can generalise that Slow Condition is manner-biased. The narrations in Slow Condition were the longest across the three conditions. This may suggest that the participants not only took more time to tell their story but also applied manner expressions as a convenient tool to describe the pictures (which mostly depicted rather fast motion) so that the motion would be described more slowly than it was depicted in pictures. In Fast Condition, the participants presumably relied mainly on expressing speed through motion verbs, and to save time, they omitted as many manner modifiers as possible. Nevertheless, as can be seen in (7a), in which the onomatopoetic adverb *plärtsti* 'with a splash' is used, manner modifiers are possible in Fast Condition and particularly so if they convey the speed or forcefulness of motion.

5. Discussion

In this study, we set out to contribute to cross-linguistic knowledge about motion events by establishing the degree to which Estonian – a Finno-Ugric and

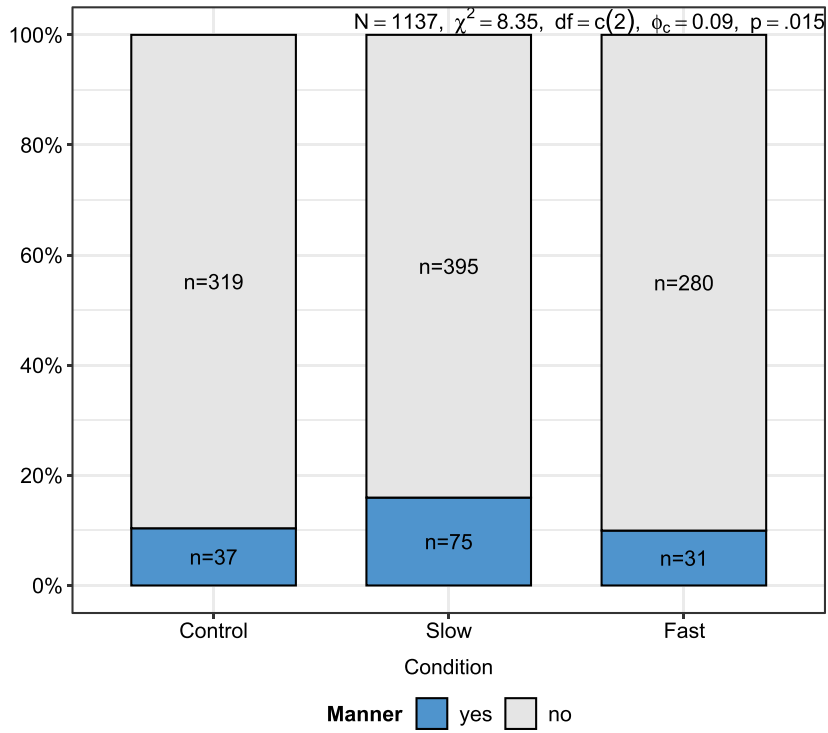

Figure 5. The presence (= 'yes') or absence (= 'no') of manner modifiers across three conditions.

satellite-framed language – is manner- and path-salient. Our second goal was to focus on an underlying dimension of manner – speed – to determine any linguistic differences between fast and slow motion. To do this and to directly relate our results to previous cross-linguistic findings, we used frog stories as a data elicitation task.

As for the two clines of saliences, along the cline of MANNER SALIENCE (Slobin 1996, 2004, 2006, Akita & Matsumoto 2020), Estonian is a high-manner-salient language with manner being extensively expressed by verbs and other expressions. Along the cline of PATH SALIENCE (Ibarretxe-Antuñano 2009, Ibarretxe-Antuñano & Hijazo-Gascón 2012), Estonian can, again, be placed amongst the most high-path-salient languages. These two findings are not surprising. This is because satellite-framed languages tend to be manner-salient (Slobin 2004) and morphology-rich languages tend to be path-salient (Ibarretxe-Antuñano 2009), and Estonian is both satellite-framed and morphology-rich. A question for future research would be exactly how the various characteristics of a language (morphological richness, manner salience, and path salience) interact with each other and with the language's degree to which it is satellite-framed or verb-framed (regarding variation in languages' typological profiles, see e.g. Berthele 2004, Strömqvist & Verhoeven 2004, Goschler & Stefanowitsch 2013, Ibarretxe-Antuñano 2017).

SPEED EFFECTS in the frog story data manifest themselves mainly in the length of the narrations and speech rate of the participants. That is, the participants who were

told to narrate the frog story as if the events evolved slowly, tended to tell longer stories and at a slower pace than those of the control group. Those who were asked to tell the story as if the events evolved quickly, narrated shorter stories and had a faster speech rate. This indicates that speed effects occur in the granularity of the discourse (if slow motion is expressed, more attention is paid to describing the details, making the descriptions lengthy) and in suprasegmental features of language in terms of speech rate. The speech rate, in turn, may be taken as evidence of embodiment (e.g. Johnson 1989, Gibbs Jr 2006, Barsalou 2008, Fischer & Zwaan 2008) in that speakers talk faster if they describe events that evolve fast and more slowly if they describe slowly evolving events. In other words, language is grounded in action and perception in that speakers mimic the perceived motion rate by their speech rate (see also Speed & Vigliocco 2014).

Speech rate varying in relation to event speed can also be seen as an instantiation of iconic prosody. In fact, several studies that were conducted in line with iconic prosody have shown the same effect in speech rate (Shintel, Nusbaum & Okrent 2006, Shintel & Nusbaum 2008, Perlman et al. 2015, Fuchs et al. 2019). For instance, studies of Shintel et al. (2006) and Shintel and Nusbaum (2008) showed a correlation between speech rate and speed of event, and Perlman et al. (2015) found similarly that English speakers read stories of fast motion faster and stories of slow motion more slowly. In later research, Fuchs et al. (2019) provided converging evidence to these findings from spoken language in a written form (blog texts) in which the word *slow* was more readily lengthened by means of letter replication than the word *fast*. Speed effects in iconic prosody, in turn, has been explained as a consequence of speed and speech rate being 'correlated in experience' (Perlman et al. 2015:1360).

As for speed effects on clausal patterns, we found that when people were asked to describe slow events (i.e. as if the events progressed slowly), their narrations were particularly manner-rich. When people had a task to describe fast motion events (i.e. as if the events progressed fast), narrations entailed frequent use of verbs of vertical motion as well as those of caused motion. Thus, providing fine-grained manner information in narrations to describe slow motion seems to be a convenient tool to make motion sound slow. Again, a parallel can be drawn from physical motion in that one can notice much more detail when moving slowly whereas one can observe the surroundings less when moving fast. Nevertheless, it should be noted that all three experimental conditions showed Estonian as a manner-salient satellite-framed language. The differences between the conditions in highlighting variable facets of a highly complex category of manner indicate discourse- and task-related characteristics. In particular, fastness of motion foregrounded manner dimensions related to force dynamics (being closely related to caused motion and vertical motion); slowness foregrounded manner qualities related to horizontal motion.

This indicates that, firstly, manner as a context-sensitive domain should essentially be analysed not only as a general category but from the perspective of its individual closely related dimensions, such as body-movements, force, effort, and speed (see also Narasimhan 2003, Cardini 2008, Slobin et al. 2014, Stosic 2020, Taremaa & Kopecka 2022). Secondly, language-internal variation in expressing motion events is sentient to various factors including those relating to speech context and task

characteristics, all of which can be labelled as discourse-related factors. The impact of discourse on motion language has already been highlighted by Slobin (2004), but has nevertheless received limited attention in linguistics with most studies focusing on word- or clause-level phenomena. Finally, language-internal variation in motion events is closely related to whether self-motion or caused motion is expressed, as shown also by Lewandowski for German, Polish, and Spanish (2021). These two types of motion, in turn, are related to force dynamics as put forward by Talmy (1988, 2000a), whereas force dynamics itself is closely associated with the direction of motion in terms of horizontality and verticality (see also Glenberg & Kaschak 2002). Force dynamics is also associated with speed, as evidenced by the current study. Thus, motion events and their linguistic encoding are a complex phenomenon that should ultimately be addressed through the lens of high-dimensional data analysis with discourse factors taken into account.

Apart from the expression of manner, we found no evidence for differences between the three conditions in terms of encoding spatial information, whether considering plus- and minus-ground constructions or the expression of spatial categories such as Source and Goal. This may be due to the visual stimuli that the participants were told to use when narrating the stories. Because the major locations relevant to the actions were depicted in the pictures (e.g. the window out of which the dog fell or the pond where the boy and the dog were thrown), it is likely that these ground objects were salient for the participants and, in order to create a story, essential aspects to describe regardless of the speed at which the events evolved. This suggestion is supported by the fact that across all conditions, Location and Trajectory were rarely mentioned, which does not reflect the general tendencies of describing space as measured in corpus studies (e.g. Pajusalu et al. 2013, Taremaa 2017, Taremaa & Kopecka 2023).

This leads us to discuss the elicitation task. The main advantages of using the frog stories is that it enables us to draw cross-linguistic conclusions when eliciting path- and manner-sensitive data. The disadvantage of the frog stories is that the depicted scenes are rather Source- and Goal-oriented, and most of the depicted motion events could be interpreted as having fast and forceful motion. Furthermore, it has been argued that stories produced based on such visual stimuli are not as natural as free narrations (Klamer & Moro 2020). Therefore, one must be cautious when interpreting the results and particularly so concerning spatial language. For example, our experiment indicates that a large number of clauses contained Direction or Goal expressions followed by Source expressions. This could be taken as evidence of the *goal-over-source* bias (Ikegami 1987, Dirven & Verspoor 1998), whereas in fact the high number of such clauses is simultaneously also a consequence of the elicitation task. In addition, because the pictures depict rather fast motion, this might have put the participants of Slow Condition into the difficult situation of using language of slow motion to describe pictures that depict fast motion. This difficulty, in turn, could have resulted in slower processing speed affecting the speech rate and lexical choices of the speakers in Slow Condition. To confirm whether there is an internal link between the speed of an event and how this event is linguistically encoded, more thorough future research is needed.

6. Conclusion

We used the frog stories elicitation task to examine Estonian in the context of manner salience and path salience studies and to reveal any speed effects in motion descriptions. As expected from Estonian being a satellite-framed and morphologically rich language, our results situate Estonian in the clines of manner salience and path salience amongst languages that display high manner salience and path salience. The expression of manner-related information was particularly frequent when the participants were asked to narrate the frog story as if the events developed slowly. Furthermore, we attested embodiment effects which can also be analysed in line with iconic prosody. Namely, the length of the stories and speech rate correlated with the experimental task. The participants who narrated the story as if the events evolved slowly told substantially longer stories and spoke more slowly than those who narrated the story as if the events evolved fast.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/S0332586522000245

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Notes

1 In the glossed examples of Estonian, Leipzig Glossing Rules are followed. The abbreviations used are as follows:

3	person
ADE	adessive
ADP	adposition
ALL	allative
APP	active past participle
GEN	genitive
COM	comitative
ELA	elative
ILL	illative
INE	inessive
INF	infinitive
NOM	nominative
PART	partitive
PL	plural
PRS	present
PST	past
SG	singular

2 In linguistics, a number of elicitation tools have been used to examine spatial language in general and motion descriptions in particular. The tools include various questionnaires (many of which can be found in the webpage of Max Planck Institute, https://www.eva.mpg.de/lingua/tools-at-lingboard/questionnaires.php, accessed 21 June 2022), picture-based narration tasks and various video-based tasks (such as *Pear Stories* (Chafe 1980) as an older and *Trajectoire* (Vuillermet & Kopecka 2019) as a more recent video-based elicitation tool), and other more sophisticated experimental means that measure the processing or production of motion language (e.g. Kaschak et al. 2005, Lindsay et al. 2013).

3 *Läheb* 'goes' is the suppletive form of the verb *minema* 'go'.

4 The data and statistical code are available in DataDOI: https://datadoi.ee/handle/33/487.

5 Because the data are not normally distributed, a non-parametric test is used.

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Appendix. Instructions to the participants in the frog stories experiment

Control Condition

1st slide

Sinu ülesanne on jutustada pildiseeria järgi lugu. Kõigepealt saad kõik pildid järgemööda läbi vaadata, kokku on 24 pilti. Kasutades nooleklahve, saad pilte edasi-tagasi kerida. Kui oled pildid läbi vaadanud ning sa midagi küsida ei soovi, algab katse. Jutusta lugu, lähtudes piltidel kujutatust. Pilte saad edasi kerida nooleklahviga. Jutustamise ajal väldi palun piltide tagasikerimist. Kui oled valmis alustama, vajuta nooleklahvi.

'Your task is to tell a story according to a series of pictures. First, you can review all the pictures. There are 24 pictures in total. Use the arrow keys to scroll the images back and forth. Once you've reviewed the pictures and don't want to ask anything, the experiment will begin. Tell a story based on the pictures. You can scroll through the pictures with the arrow keys. Please avoid rewinding pictures during narration. When you are ready to start, press the arrow key.'

26th slide (presented after the frog story pictures)

Kas sul tekkis pärast piltide läbivaatamist katse kohta küsimusi?

'After reviewing the images, do you have any questions about the experiment?'

27th slide (after which the pictures are presented again, one picture per slide)

Algab katse. Jutusta lugu nii, nagu ise soovid, ent lähtu piltidel kujutatust. Pilte saad edasi kerida nooleklahviga. Palun väldi piltide tagasikerimist.

'The experiment begins. Tell the story as you wish, but follow the pictures. You can scroll through the pictures with the arrow keys. Please avoid rewinding the pictures.'

Slow Condition

1st slide

Sinu ülesanne on jutustada pildiseeria järgi lugu. Kõigepealt saad kõik pildid järgemööda läbi vaadata, kokku on 24 pilti. Kasutades nooleklahve, saad pilte edasi-tagasi kerida. Kui oled pildid läbi vaadanud ning sa midagi küsida ei soovi, algab katse. Jutusta lugu nii, nagu toimuks kõik tegevused **väga aeglaselt**, ent lähtu piltidel kujutatust. Pilte saad edasi kerida nooleklahviga. Jutustamise ajal väldi palun piltide tagasikerimist. Kui oled valmis alustama, vajuta nooleklahvi.

'Your task is to tell a story according to a series of pictures. First, you can review all the pictures. There are 24 pictures in total. Use the arrow keys to scroll the images back and forth. Once you've reviewed the pictures and don't want to ask anything, the experiment will begin. Tell the story as if all the activities were taking place **very slowly**, but follow the pictures. You can scroll through the pictures with the arrow keys. Please avoid rewinding pictures during narration. When you are ready to start, press the arrow key.'

26th slide (presented after the frog story pictures)

Kas sul tekkis pärast piltide läbivaatamist katse kohta küsimusi?

'After reviewing the images, do you have any questions about the experiment?'

27th slide (after which the pictures are presented again, one picture per slide)

Algab katse. Lähtu piltidel kujutatust ning jutusta lugu nii, nagu toimuks kõik tegevused **väga aeglaselt**. Pilte saad edasi kerida nooleklahviga. Palun väldi piltide tagasikerimist.

'The experiment begins. Based on the pictures, tell the story as if all the activities were taking place **very slowly**. You can scroll through the pictures with the arrow keys. Please avoid rewinding the pictures.'

Fast Condition

1st slide

Sinu ülesanne on jutustada pildiseeria järgi lugu. Kõigepealt saad kõik pildid järgemööda läbi vaadata, kokku on 24 pilti. Kasutades nooleklahve, saad pilte edasi-tagasi kerida. Kui oled pildid läbi vaadanud ning sa

midagi küsida ei soovi, algab katse. Jutusta lugu nii, nagu toimuks kõik tegevused **väga kiiresti**, ent lähtu piltidel kujutatust. Pilte saad edasi kerida nooleklahviga. Jutustamise ajal väldi palun piltide tagasikerimist. Kui oled valmis alustama, vajuta nooleklahvi.

'Your task is to tell a story according to a series of pictures. First, you can review all the pictures. There are 24 pictures in total. Use the arrow keys to scroll the images back and forth. Once you've reviewed the pictures and don't want to ask anything, the experiment will begin. Tell the story as if all the activities were taking place **very fast**, but follow the pictures. You can scroll through the pictures with the arrow keys. Please avoid rewinding pictures during narration. When you are ready to start, press the arrow key.'

26th slide (presented after the frog story pictures)

Kas sul tekkis pärast piltide läbivaatamist katse kohta küsimusi?

'After reviewing the images, do you have any questions about the experiment?'

27th slide (after which the pictures are presented again, one picture per slide)

Algab katse. Lähtu piltidel kujutatust ning jutusta lugu nii, nagu toimuks kõik tegevused **väga kiiresti**. Pilte saad edasi kerida nooleklahviga. Palun väldi piltide tagasikerimist.

'The experiment begins. Based on the pictures, tell the story as if all the activities were taking place **very fast**. You can scroll through the pictures with the arrow keys. Please avoid rewinding the pictures.'

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