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Manners of human gait: a crosslinguistic event-naming study

Abstract: Crosslinguistic studies of expressions of motion events have found that Talmy's binary typology of verb-framed and satellite-framed languages is reflected in language use. In particular, Manner of motion is relatively more elaborated in satellite-framed languages (e.g., in narrative, picture description, conversation, translation). The present research builds on previous controlled studies of the domain of human motion by eliciting descriptions of a wide range of manners of walking and running filmed in natural circumstances. Descriptions were elicited from speakers of two satellite-framed languages (English, Polish) and three verb-framed languages (French, Spanish, Basque). The sampling of events in this study resulted in four major semantic clusters for these five languages: walking, running, non-canonical gaits (divided into bounce-and-recoil and syncopated movements), and quadrupedal movement (crawling). Counts of verb types found a broad tendency for satellite-framed languages to show greater lexical diversity, along with substantial within group variation. Going beyond most earlier studies, we also examined extended descriptions of manner of movement, isolating types of manner. The following categories of manner were identified and compared: attitude of actor, rate, effort, posture, and motor patterns of legs and feet. Satellite-framed speakers tended to elaborate expressive manner verbs, whereas verb-framed speakers used modification to add manner to neutral motion verbs.

Keywords: lexicalization patterns, motion events, manner of motion, crosslinguistic

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1 Introduction

What are the cognitive bases of linguistically expressed categories? The vast literature on comparative semantics, stretching back to the 18th century, has proposed both universal and language-specific categories (see, for example, papers in Gentner and Goldin-Meadow 2003; Malt and Wolff 2010). By now a number of conceptual domains have been scrutinized by typological linguists and psycholinguists (e.g., Boroditsky 2011; Levinson and Wilkins 2006; Majid et al. 2006, 2008; Malt and Majid 2013), showing both kinds of categories. On the basis of research on domains of location, motion, causality, object destruction, body parts, and others, Melissa Bowerman concluded: "In recent years, there has been a growing realization that semantic structure is a lot more variable across languages than we used to realize" (Bowerman 2012: 21).

The dominant empirical tool used in arriving at this conclusion is what we will call "the Nijmegen Method"; it is the method employed in the current study as well. The method was systematized at the Max Planck Institute for Psycholinguistics on the basis of pioneering crosslinguistic research devised by Melissa Bowerman and Eric Pederson (1992) and then further refined (Majid 2012). We followed the research paradigm as set forth in a special issue of *Cognitive Linguistics* devoted to categories of "cutting and breaking" (C&B) events: "To establish an empirical database for within and across language analysis, C&B project members created a set of video clips depicting C&B events [...], to be used in eliciting comparable event descriptions from speakers of diverse languages" (Majid et al. 2007: 136–7). Basically, in the Nijmegen Method, consultants from various language communities are asked to provide labels for a standard set of stimuli. The naming behavior constitutes a sort of covert sorting: the assumption is that stimuli receiving common labels form a group or category and thereby reveal underlying similarity.

Two striking findings emerge from years of this research tradition: (1) Rather than representing discrete, compositional, Aristotelian categories, language use reveals conceptual continua, with languages differing in the number of cuts along a continuum. The data suggest that the continua themselves are cognitively basic, standing outside of the lexical semantics of individual languages. These dimensions – the stuff out of which language-specific concepts are fashioned – appear to be universal. (2) The underlying dimensions generally do not receive linguistic labels, and are often more or less ineffable. For example, in the domain of cutting/breaking, the major dimension that languages agree upon can be characterized as "predictability of locus of separation," where "predictability" is a matter of degree. Furthermore, languages differ in use of co-occurring dimensions. For example, where locus of separation can be precisely predicted by use

of a sharp instrument, English is content to *cut* with either knives or scissors, whereas Dutch must distinguish between cutting with a single blade (*snijden*) or a double blade (*knippen*). In the domain of object location there is a continuum that might be characterized as "from solid support through tenuous support to containment," with a series of event types along the way: support from below–clinging–hanging–joined to surface–point attachment–full containment (Bowerman 2012: 59). Where English makes one cut along this continuum, using *on* to label many types of support, distinguished from *in* for containment, Dutch separates solid support (*op*) from tenuous support (*aan*), and both from containment (*in*), and Spanish uses a single term for the entire continuum (*en*). In sum, language usage shows universality with regard to underlying dimensions and language specificity with regard to the granularity of semantic categories.

Motion events have played a central role in this research, thanks to Talmy's (1985, 1991, 2000) conceptual analysis into components of Path, Manner, Figure, and Ground, and his binary typology of verb-framed and satellite-framed languages.[1] However one characterizes the typology of motion event description, there remains a basic distinction which is relevant to the current study – namely, whether Path is encoded in the main verb of a motion-descriptive clause or in some other element ("satellite") associated with the main verb. There has been a good deal of consensus with regard to the basic dimension of Path ("an object's basic location shifts from one point to another in space" (Talmy 2000: 35), with much research on varieties of Path; however in the current investigation Path is not at issue. All of the events that we have sampled consist of ongoing forward location without reference to source or goal.

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1 Talmy's typology has been much debated and revised in recent years, particularly with regard to two issues. First, the binary typology fails to account for some motion constructions. Several problems can be mentioned here: the notion of satellite (Beavers et al. 2010; Croft et al. 2010; Hijazo-Gascón and Ibarretxe-Antuñano 2013; Iacobini and Masini 2006), the boundary-crossing constraint (Aske 1989; Özçalışkan 2013; Slobin and Hoiting 1994), and the broad nature of semantic components (Berthele 2004; Narashimham 2003; Wälchli 2001). Second, Talmy's theory overlooks possible types of variation within the two types of lexicalization patterns. This gives rise to several problematic cases: "mixed languages" that make frequent use of verb-framed and satellite-framed motion constructions (Filipović 2007; Soroli 2012), languages that do not fit into either of those two categories (Bohnemeyer et al. 2007; Grinevald 2011; Slobin 2004; Zlatev and Yangklang 2004), intratypological variation among languages with genetically-different and genetically-similar filiations (Goschler and Stefanowitsch 2013; Hijazo-Gascón and Ibarretxe-Antuñano 2013; Huang and Tanangkingsing 2005; Ibarretxe-Antuñano 2004, 2009a; Slobin 1997b), diatopic variation (Berthele 2006), and inter-language diachronic variation (Fanego 2012; Ferrari and Mosca 2010; Iacobini and Fagard 2011; Kopecka 2009, 2013; Slotova 2008). Talmy (2009) replies to some of these issues.

Our concern is with Manner of motion. A number of previous studies have found that satellite-framed languages, in comparison with verb-framed, tend to have a more differentiated lexicon of Manner of motion, particularly as shown in contexts of language use, such as narrative and conversation. Slobin (2004, 2006) has proposed that the encoding of Path outside of the main verb allows for the elaboration of Manner distinctions in the main verb. One goal of the current study is to seek further confirmation of this tendency by sampling a number of everyday manners of human gait as described by speakers of the two language types. A second goal is to refine the poorly-defined dimension of Manner of motion ("an additional activity that the Figure of a Motion event exhibits" – Talmy 2000: 45); "an ill-defined set of dimensions that modulate motion, including motor pattern, rate, rhythm, posture, affect, and evaluative factors" (Slobin 2004: 255). By applying the Nijmegen Method to a range of manners of motion, we seek to identify major dimensions of Manner and begin to determine if there are any universal anchor points in this domain. The linguistic literature seems to treat Manner as an undifferentiated domain, using a heterogeneous collection of verbs as examples (e.g., *crawl, drive, float, jump, limp, roll, run, swim,* and many more). There is little consensus among scholars as to the types of components relevant to Manner of motion. For example, the means of conveyance (e.g., *ride, ski*) is considered by some scholars to be a semantic component of Manner (e.g., Levin 1993; Slobin 2004, 2006) and by others to be a distinct semantic dimension (e.g., Frawley 1992; Ikegami 1969). Also, scholars do not always agree on how to classify some verbs that contain a directional component along with nuances of Manner of motion, such as *fall* and *flee*.

Slobin (1996: 459) proposed a first cut: "Languages seem to have a 'two-tiered' lexicon of Manner verbs: the neutral, everyday verbs – like *walk* and *fly* and *climb*, and the more expressive or exceptional verbs – like *dash* and *swoop* and *scramble*." In satellite-framed languages, like English, first-tier verbs are classificatory. Each type of creature has its default Manner verb: *the fish swam to the island, the bird flew into the cage*. These languages tend to considerably augment the second-tier, expressive lexicon. By contrast, the default expressions in verb-framed languages, like Spanish, use Path verbs: 'the fish went to the island, the bird entered the cage'. The equivalents of first-tier verbs are, themselves, explicitly verbs of Manner, albeit of the least expressive variety, and such languages tend to have smaller lexicons of expressive Manner verbs. However, Slobin's first tier leaves us with a minimal collection of basic verbs (*walk, swim, fly*; perhaps *crawl* for insects and small animals, *slither* for snakes) and an undifferentiated collection of Manner verbs, varying in elaboration or detail according to linguistic typology. In the current study we attempt a first pass at differentiating dimensions of manner of motion, with attention to descriptions of human locomotion

(on a level terrain, without explicit goal orientation).[2] Malt et al. (2008) used the naming task in a crosslinguistic experiment attending to manner of motion in a limited and controlled environment: a single person walked on a treadmill as the rate and angle of motion increased. (Note the obligatory use of the English classificatory verb *walk* in our description; it would be unnatural to say *moved on a treadmill*.) Human gait in such a situation abruptly shifts from *walk* to *run*, as expressed by the two verbs in English. The distinction is a categorical, biomechanical discontinuity: "... in walking, the legs are like a pendulum around a fulcrum point and one foot is always in contact with the ground. Running has an impact-and-recoil motion, and there is a point in each stride in which neither foot is in contact with the ground" (Malt et al. 2010: 38). The two gait types are perceptually distinct to an observer. Malt et al. elicited names for video clips drawn from the treadmill event, in response to the question: "What is the woman doing? She is ..." Consultants were native speakers of American English, Belgian Dutch, Argentinian Spanish, and Japanese. Speakers in all four languages made a categorical split – and the same split – in naming these two basic gait types; furthermore, they also agreed in identifying the most typical instance of the named gaits. Here there is no underlying continuum, no semantic space with varying categories, but two non-gradient, distinct categories (although see Phelps and Duman 2012, for a discussion of the apparently noncategorical German verb *laufen*). The languages did differ, though, in the granularity of additional lexical terms for nuances of walking or running. These terms described aspects of Manner of motion. Malt et al. found a diversity of Manner verbs in relation to linguistic typology that matches findings from a number of other studies (Slobin 2004, 2006): Japanese, a verb-framed language, provided only two dominant verbs (*aruku* 'walk', *hashiru* 'run'), whereas Dutch, a satellite-framed language, demonstrated a high degree of granularity in the walking category (*lopen* 'walk', *wandelen* 'walk', *slenteren*

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2 There are studies that have proposed subclassifications of manner of motion, but on the basis of dictionaries and selective corpus searches. The most notable is Snell-Hornby's (1983) monumental work on "verb expressivity" in English and German. Using corpora of published fiction, Snell-Hornby proposed four major dimensions of walking and running: leisurely/aimless, measured/laborious, clumsy/unsteady, nimble/with energy. Ikegami (1969), using only his own invented English examples, proposed a number of "components of verbs of motion" corresponding to Manner, including speed, impetus, and an undifferentiated residual component. Ibarretxe-Antuñano (2006, 2009b) has classified more than 800 different types of motion ideophones used in Basque. Manner ideophones, which constitute the majority, are subdivided into several subcomponents: energy, forced motion, furtive motion, obstructed motion, rate, smooth motion, motor pattern. Cifuentes-Férez (2010) applies this classification to Spanish motion verbs.

'saunter', *stappen* 'step'). Within the two gaits, language use reveals gradient continua. For example, English speakers limited the verb *jog* to slow exemplars, switching to *run* as rate increased, and to *sprint* for the fastest gaits (Malt et al. 2010: 40). This finding suggests that underlying dimensions of Manner may be gradient rather than discrete.

A subsequent study was aimed at distinctions between a variety of manners of motion (Malt et al. 2010, 2014). A student was videotaped while acting out a variety of expressive manners of motion, excluding those denoted by verbs "such as *barge, bolt, bound, bump,* and *burst*, which seem to capture elements of movement such as speed, suddenness, or gracefulness but not gait per se" (Malt et al. 2010: 44). A variety of path types were used: forward, backward, sideways bipedally or on one foot. Names were gathered in English, Dutch, Spanish, and Japanese. As in the treadmill study, all four languages lexically distinguished pendulum-based limb motions from bounce-and-recoil motions. Speakers of English and Dutch made far more lexical distinctions among less common gaits than did Spanish and Japanese speakers. For example, clips named *hop, skip, jump*, or *leap* were all named *saltar* 'jump' in Spanish. These findings match the crosslinguistic patterns found by Slobin (2004, 2006) in narrative texts.

Although these studies demonstrate, again, that differentiation of manner of motion is related to verb- versus satellite-framed typology, the findings are limited in two ways. First, the videos used in the Malt et al. studies depicted highly stylized movement. One actor, a trained dancer, enacted different types of gaits, such as *shuffle, trudge, and clomp*. Although this highly controlled set of videos has some advantages, it also has certain disadvantages. It is important to test whether the dimensions revealed in Malt et al.'s investigation hold for more naturalistic motions, captured "in the wild." Second, Malt et al. studied a small set of languages. It is important to know whether the same parameters hold also for different languages. Therefore, an independent study such as the one reported here is called for. The current study seeks to directly explore the conceptual spaces of Manner of motion across languages. Like Vulchanova et al. (2013), we used a free-naming task across a variety of gaits and languages. Whereas Vulchanova et al. included human and animal motion, we explicitly focused on a wide range of normally-occurring gait patterns, filming people of various ages in natural settings. In so doing, we hoped to elicit collections of expressions across languages, allowing both for extraction of major semantic dimensions as well as comparisons between languages in terms of the granularity of semantic categories.

2 Method

2.1 Participants

Event descriptions were collected from speakers of five languages, contrasting typologically: English (Germanic, satellite-framed), Polish (Slavic, satellite-framed), French and Spanish (Romance, verb-framed), and Basque (non-Indo-European, verb-framed). Participants were all native speakers of the language. Data were gathered in the target language (researchers indicated by initials of author): English: Berkeley, California (DIS); Polish: Kraków, Poland: (AK); French: Lyon, France (AK); Spanish: Bilbao, Spain (I-A); Basque: Bilbao, Spain (I-A). Numbers of participants were: English $N = 22$, Polish $N = 10$, French $N = 16$, Spanish $N = 39$; Basque $N = 23$. Because socioeconomic status, and other demographic factors can influence vocabulary (Hoff 2006), participants across languages were kept relatively homogenous: all were middle-class speakers with some level of university education, and primarily undergraduate and graduate students.

2.2 Materials

In distinction to the staged gaits of previous studies, motion events were captured in natural settings, generally with anonymous movers, filmed by Slobin and students participating in an undergraduate research course. The stimuli were 34 video clips of 7–10 seconds showing people moving about in real environments (Berkeley/San Francisco, Lyon, Nijmegen); 15 of the events were staged in order to include manners of motion that were not noticed in filming everyday life. Path was not at issue: all motion events represented forward movement on a path without boundary crossing or goal attainment; all events were unidirectional, with the exception of a man pacing back and forth in a hallway and a woman moving in a broad loop to demonstrate *skipping*, *galloping*, and *prancing*. With the exception of two clips showing a man and woman walking as a couple, all of the clips were of single individuals; nine were of small children. The clips are presented in Table 1, where the labels are simply mnemonics used by the researchers to distinguish the clips; the labels are not based on naming data later provided by participants. For ease of presentation, the clips are roughly ordered in three groups: normal-to-slow rate (1–15); child movements (16–24); rapid rate (25–34). In the naming elicitation task the clips were not presented in the order shown in Table 1, but in random order.

Table 1: Motion Event Stimuli

Motion Event	Figure	Setting	Staged
Warm-up Clip			
walk	man	campus sidewalk	no
Stimulus Clips			
1. saunter	man	campus sidewalk	no
2. plod	woman	campus sidewalk	no
3. walk	woman	city sidewalk	no
4. stride 1	man	campus sidewalk	no
5. stride 2	woman	public square	no
6. strut	man	campus sidewalk	yes
7. stroll 1	male–female couple	campus sidewalk	no
8. stroll 2	male–female couple	city square	no
9. wander	woman	forest	yes
10. limp	man	campus sidewalk	no
11. walk-with-cane	woman	city sidewalk	no
12. limp-with-cane	woman	campus plaza	no
13. trudge	woman	campus lawn	yes
14. lumber	woman	campus lawn	yes
15. pace	man	hallway	yes
16. stomp	4-yr-old boy	living room floor	yes
17. toddle	girl toddler	campus hallway	no
18. crawl	baby	sanded field	no
19. crawl	3-yr-old girl	living room floor	yes
20. crab-walk	4 2-yr-olds	gym floor	no
21. slither	4-yr-old boy	living room floor	yes
22. jump	2-yr-old	gym rubber track	no
23. hop	3-yr-old girl	dining room floor	yes
24. leap	4-yr-old boy	living room floor	yes
25. skip	woman	campus lawn	yes
26. skip-gallop	woman	campus lawn	yes
27. gallop	woman	campus lawn	yes
28. prance	woman	campus lawn	yes
29. jog 1	man	campus sidewalk	no
30. run 1	woman	cross street	no
31. sprint	man	campus sidewalk	no
32. run 2	man	city square	no
33. jog 2	man	campus lawn	yes
34. jog 3	man	campus plaza	no

2.3 Procedure

Each clip was played twice, followed by a 10-second white screen with a black square in the upper left-hand corner. This period was for writing down descriptions. The next clip began immediately. The elicitation task was group-administered with presentation on a projection screen or individually on a computer monitor. Each participant was provided with a booklet with the following instructions on the cover sheet, in the language of the elicitation situation. The instructions were read out by the researcher: "You will see a series of video clips of people moving. Each clip will be repeated twice, then followed by a blank screen, then a visual and audio cue before the next clip starts. After each clip you see, please try to **name** the type of motion that you just saw with a single verb, as **specifically** as possible. If there is more than one specific verb that can be used, please write each separately. If the motion needs to be described more fully than in a single, specific verb, please do so in the space provided. For each clip, please try to answer the question "What is he doing? He is _____." In each clip, it should be fairly obvious who the subject is that is moving, but if there is some confusion, please use the text after the number (presented in **[bold bracketed type]**) to help you." The booklets were anonymous, with space for "native language" and "best language." Participants were excluded if their best language was not the language under investigation. There was a warm-up item followed by questions and beginning of the task, which ran through the 34 clips without pause. The answer sheet provided neutral descriptions of the moving figure as shown in Figure 1:

Video clip 12 **[Man in green shirt]**

Verb(s):

_____

_____

Additional Description

Fig. 1: Example of answer sheet

2.4 Coding decisions

Particular languages provide morphologically related word pairs. In Polish, in particular, aspectual doublets are typical of verbs of motion, broadly contrasting determinate and indeterminate event construals (e.g., *iść/chodzić* 'walk', *biec/biegać* 'run'). These aspectual distinctions are not relevant to our study of types of manners of motion, and therefore we fused aspectual doublets into single verb types for the purposes of analysis. A similar decision was made with regard to occasional French words which seem to refer to the same type of motion pattern in morphological alterations of a verb, such as *sauter/sautiller* 'jump'. However, when a complex verbal expression clearly changed the type of motor pattern being described, such as *sauter* 'jump' versus *sauter à cloche-pied* 'hop', we counted two different types of manner verbs.

3 Results

3.1 Verb types

It was expected that the two satellite-framed languages, English and Polish, would show greater linguistic diversity than the three verb-framed languages, French, Spanish, and Basque. Verb types were counted in two ways: (1) a strict count, excluding fixed expressions such as *drag feet, faire les cent pas* 'pace', and *dar pisadas* 'make heavy steps', (2) a broad count, including fixed expressions. The languages differed in use of fixed expressions, which were far more common in the verb-framed languages, apparently due to the sparseness of manner verb vocabulary. However comparisons between the five languages were identical using either count, so further comparisons are based on the liberal count only. Table 2 presents counts of lexical diversity following both counts. Because number of participants varied by language, we also present number of types of manner verbs per participant. By both counts, English speakers clearly demonstrated greater lexical diversity, but because the number of participants varied, and correspondingly the number of opportunities for different speakers to name clips, the most revealing comparison is in the fourth column, Types per Participant, where English and Polish by far outweigh the other three languages. Appendix 1 lists all of the verbs used by participants. A chi-square test on the number of different types of verbs across languages showed the languages were significantly different $\chi^2(4, N = 180) = 54.0$, $p < .0001$, Cramer's V = .55. English has more different types than would be expected by chance, whereas French, Spanish and Basque have fewer types.

Table 2: Numbers of Types of Manner of Motion Expressions

Language	Type	Strict Count		Liberal Count	
		Total Types	Types per Participant	Total Types	Types per Participant
English	satellite-framed	72	3.27	74	3.36
Polish	satellite-framed	38	3.8	41	4.1
French	verb-framed	32	2.0	40	2.44
Spanish	verb-framed	24	0.51	34	0.87
Basque	verb-framed	14	0.61	27	1.17

The chi-square test has some limitations, since it is only a global comparison and it cannot tell us whether the satellite-framed languages differ from the verb-framed languages in their lexical diversity. We tested this hypothesis directly by comparing the number of verbs each participant produced for the two satellite-framed languages versus the three verb-framed languages. Since the languages differed in sample size, we opted to compare only the first 10 participants of each language (because this was the maximum number of observations we had for Polish). An independent t-test showed that, indeed, participants produced greater lexical diversity in the satellite-framed languages than the verb-framed languages $t(48) = 4.74$, $p < .0001$, $d = 1.34$. However, there is also substantial variation within the language types too. A one-way ANOVA with Bonferroni post-hoc tests showed that there was a significant difference between languages in the number of types produced $F(4, 49) = 40.31$, $p < .0001$, $\eta^2 = .78$. English had significantly more types per participant than any other language. Polish had significantly more types per participant than Basque but did not differ significantly from French or Spanish; French had more types than Spanish and Basque, and Spanish had more types per participant than Basque. Overall, then, these analyses showed that English has substantially more manner verbs than any other language, even in comparison to the other satellite-framed language, Polish. There is a broad tendency for satellite-framed languages to show greater lexical diversity, but there is also substantial variation within language types (see footnote 1).

3.2 Similarity data: all languages

We next wanted to compare how the languages classify locomotion events. All of the verbs provided by participants were taken as the input for additional

Table 3: Between-group correlations between languages. All correlations significant at the .01 level (1-tailed).

	Basque	English	French	Polish	Spanish
Basque		.67	.70	.65	.81
English			.74	.69	.68
French				.67	.67
Polish					.66
Spanish					

analyses. For each language, a pairwise similarity matrix was created. First, for each participant we determined whether a pair of clips was called by the same term. If yes, then it was assigned 1; if no, it was assigned 0. This was done iteratively for each pair of clips, and then the individual participant matrices were summed to create a single language similarity matrix. The within-group reliabilities for each language (estimated using the split-half technique followed by the Spearman-Brown formula) were Basque .89, English .96, French .96, Polish .92, and Spanish .95. These high values confirm that the participants were internally consistent in each language. We then examined how consistent the participants were across languages by conducting Spearman's rho correlations across the aggregate matrices. The results are given above in Table 3, and also show considerable agreement.

The individual similarity matrices were then stacked, consisting of 34 columns (the clips) by 5×34 rows (language $\times$ clip) rows. This was then analyzed using the PROXSCAL package in SPSS. The resulting 2-dimensional solution had a Normalized Raw Stress of .11 and S-Stress of .26. The D.A.F. was .89 and Tucker's Coefficient of Congruence .94, indicating that a 2-dimensional solution was an acceptable model of the data. The resulting solution can be seen in Figure 2.

Dimension 1 seems to be a *velocity* dimension, with faster movements at the left. This dimension separates the basic gait patterns into two clusters, with *running* at the fast end of the dimension and *walk* at the slow end. The center of the *run* cluster is clip 32, which shows canonical running; at the center of the *walk* cluster is clip 3, showing canonical walking. Within each of these clusters the movement patterns toward the left of Dimension 1 are generally more rapid (based on inspection of the video clips). Dimension 2 does not seem to be readily interpretable.

Because we sampled a greater range of gait patterns than previous studies, there are two clusters that lack the characteristic features of steady bipedal
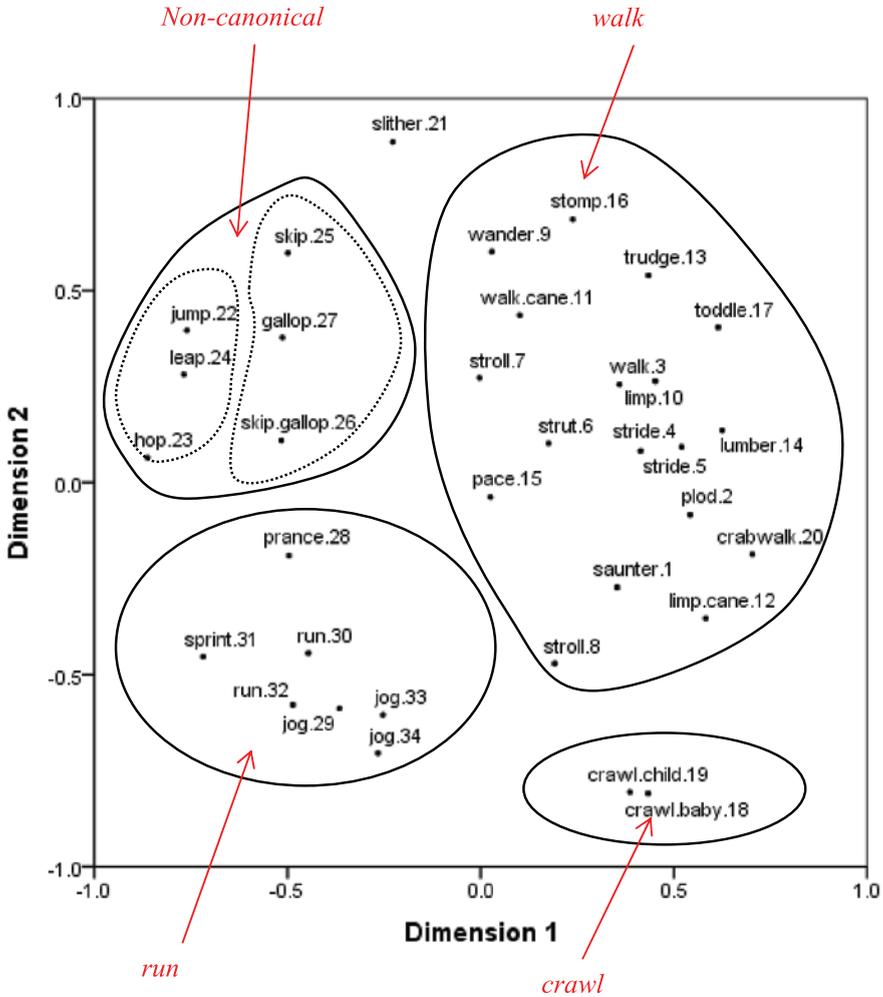
Fig. 2: MDS Solution based on naming data from five languages. (Clip names are mnemonics bestowed by the investigators, not names produced by participants.)

gait. In the lower right there is a small cluster with the two clips showing a baby or toddler crawling on all fours. In the upper left there is a collection of *non-canonical* gaits, which are distinct from the continuing, advancing movements of the other three clusters. There are two apparent sub-clusters of non-canonical gaits: *bounce-and-recoil* movements represented by 'jump/leap/hop' and *syncopated* movements represented by 'skip/gallop/prance'. At the top center there is an isolated example of slithering which does not fall into any of the four clusters.

This was the only motion pattern in which the body is not supported by the limbs. A small child is propelling himself along the floor on his belly, wriggling and using his arms to advance. Clip 20 ("crabwalk") is placed in the *walking* cluster by all five languages. It is the only motion pattern using support by toes and palms. The clip shows a row of 2-year-olds in kindergym following a teacher, all of them walking forward at a normal pace, alternating the four limbs.

3.3 Individual language patterns

We conducted the same MDS PROXSCAL analysis for each language independently too, in order to examine individual language patterns. All five of the languages show the two major *running* and *walking* clusters, and they are roughly comparable in locating two smaller clusters in less central areas of the conceptual space. In all five languages these clusters correspond to those shown in Figure 2, and in all languages 'slither' is an outlier. There are only minor differences in the distribution of particular clips within cluster areas. Detailed analysis would suggest that lexical diversity facilitates differentiation of proximities in semantic space. For example, clip 31, 'sprint', is close to the other running clips in Spanish and Basque, where the dominant response is 'run', whereas it is at the periphery of the running cluster in English, Polish, and French, where a specialized 'sprint' verb is used. Clip 16, 'stomp', shows a small child walking with a determined, heavy-footed gait. Four languages place it in the *walking* cluster, but English places it with skipping and galloping. Note that the dominant response in English is the specialized verb *stomp*, whereas the other languages use a 'walk' verb. English also makes the clearest distinction between 'skip/gallop' and 'hop/jump/leap', probably reflecting a more fine-grained manner lexicon in this language.

3.4 Cluster analysis: all languages

We also conducted cluster analyses on individual languages as well as the aggregate language matrix in order to examine patterns of groupings. We used hierarchical cluster analysis in SPSS, applying the furthest neighbor method and Euclidean distance. As was the case for the MDS solutions, the individual languages are in broad agreement, and we present only the composite analysis. Figure 3 shows the cluster analysis for all languages together. The dendogram allows for finer discrimination of hierarchical categories and subcategories. The node labels are our interpretations of the motion patterns reflected by the nodes.
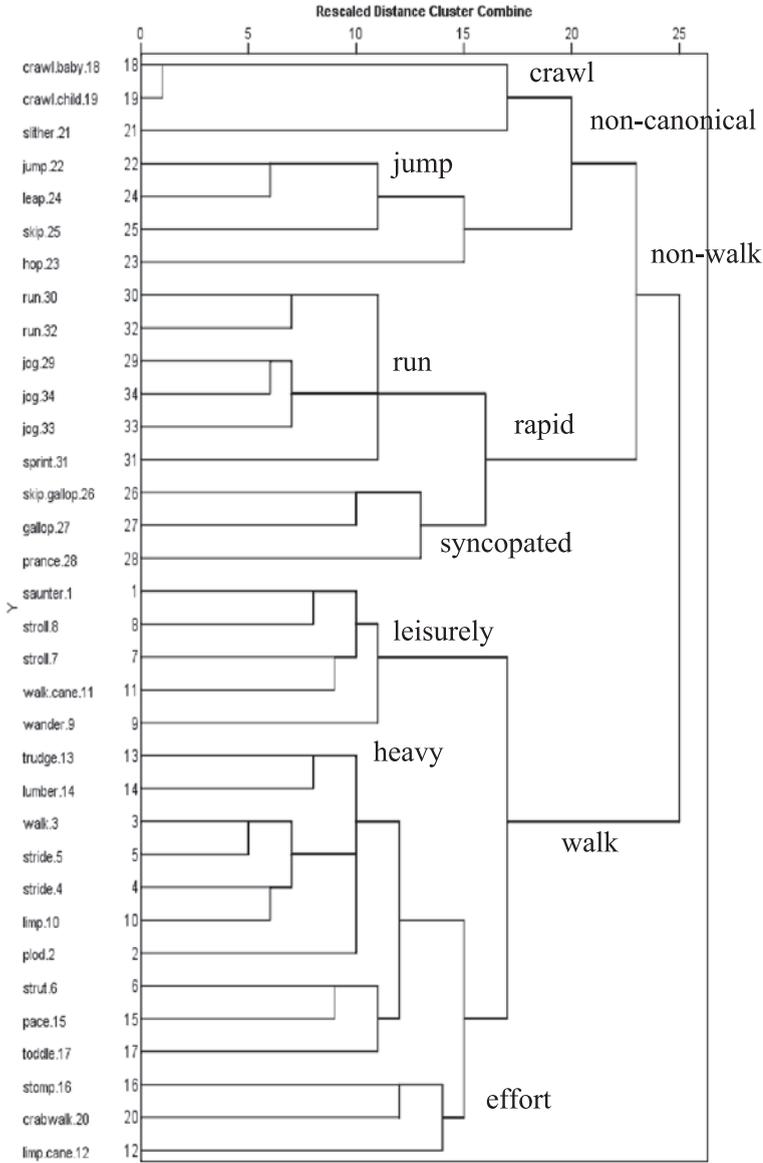
Fig. 3: Dendogram of cluster analysis based on all labels in five languages.

Again we see the *velocity* dimension, with faster gaits at the top and slower below. However, *run* and *walk* do not emerge as a binary division of gait patterns, no doubt because we sampled a wider range of manners of motion than the Malt et al. studies (2008, 2010, 2014). Rather, what we have is a primary split between non-walking and walking gaits. Non-walking divides into non-canonical gaits, with crawl and jump nodes. Below this is a collection of rapid bipedal gaits, with a separation between two rhythmic patterns: regular running and syncopated skipping and galloping. The lower half of the chart is a collection of walking gaits, distinguished at least by leisurely, heavy, and effortful gaits.

We have not attempted to label all of the sub-nodes, which would require more detailed event sampling and more layers of statistical analysis. But it is already clear from both the MDS analysis and the cluster analysis that the lexicons of motion verbs, as elicited by this naming task, are concerned with dimensions or components of manner of human motion, clustering clips on the basis of posture, rate, rhythm, and force dynamics. In addition, as we will see when discussing lexical items in the five languages, manner of motion verbs are concerned with subjective dimensions of attitude, inner state, and evaluation.

3.5 Dimensions of manner of motion

3.5.1 Verb types

The data presented above demonstrate differences between the languages with regard to lexical diversity in the domain of manners of motion, as expected. Here we ask whether the languages differ in relative attention to *types* of manner. We attempted to subcategorize manners of motion on an intuitive basis, following the conceptual dimensions suggested by the cluster analyses. Table 4 lists all of the verbs of manner provided by each of the five languages, sorted into major categories of manners of human motion, excluding instrument, which only occurred as a modifier 'with a cane'. We used ten groupings: basic level verbs, varieties of walking at a normal pace, relaxed walking, labored progress, impaired walking, quadrupedal movement, varieties of running, rapid movement, smooth movement, punctuated/repeatable movement. Each investigator coded verbs separately, according to language of competence; the final coding was arrived at by consensus.

The data presented in Table 4 suggest that each language has its own distribution of attention to dimensions of manner. Each language has a basic-level verb for walking (*walk*, *chodzić*, *marcher*, *andar*, *ibili*) and running (*run*, *biegać*, *courir*, *correr*, *korrika egin*). The five languages seem to be comparable with regard

Table 4: Types of Verbs of Manner of Movement Used in Clip Labels, by Language

Table 4a: English (74 types)

Manner Type	Verbs
basic level (2)	*walk*, *run*
variety of walking – normal pace (16)	*clop*, *cruise*, *dance*, *hike*, *march*, *pace*, *sashay*, *sidestep*, *speedwalk*, *step*, *stride*, *strut*, *swagger*, *tiptoe*, *tramp*, *waddle*
variety of walking – relaxed (5)	*amble*, *meander*, *saunter*, *stroll*, *wander*
labored progress (16)	*bumble*, *creep*, *dawdle*, *drag feet*, *drag oneself*, *lumber*, *mope*, *plod*, *poke*, *shuffle*, *skulk*, *slouch*, *sulk*, *toddle*, *trudge*, *wobble*
impaired walking (4)	*hobble*, *limp*, *stagger*, *stumble*
quadrupedal movement (2)	*crawl*, *walk-on-all-fours*
variety of running (5)	*gallop*, *jog*, *prance*, *sprint*, *trot*
rapid movement (12)	*bob*, *charge*, *dart*, *frolic*, *hurry*, *hustle*, *jaunt*, *race*, *rush*, *scamper*, *scurry*, *scuttle*
smooth movement (4)	*float*, *slide*, *slither*, *squirm*
punctuated, repeatable movement (8)	*bounce*, *bound*, *hop*, *jump*, *leap*, *skip*, *spring*, *stomp*

Table 4b: Polish (41 types)

Manner Type	Verbs
basic level (2)	*chodzić* 'walk', *biegać* 'run'
variety of walking – normal pace (5)	*przemierzać* 'pace', *stąpać* 'step, pace', *stawiać kroki* 'make steps', *tańczyć* 'dance', *truptać* 'walk with small tapping steps'
variety of walking – relaxed (4)	*gibać się* 'move in a supple way', *przechadzać się* 'saunter, stroll', *spacerować* 'stroll', *włóczyć się* 'roam'
labored progress (7)	*człapać* 'shuffle', *dreptać* 'toddle', *ociągać się* 'move reluctantly', *pełzać* 'creep', *powłóczyć nogami* 'trail one's legs', *wlec nogi* 'drag feet', *wlec się* 'drag oneself'
impaired walking (3)	*kołysać się* 'waddle', *kuleć* 'limp, hobble', *utykać* 'hobble, limp'
quadrupedal movement (3)	*chodzić na czworaka* 'walk on all fours', *czołgać się* 'crawl', *raczkować* 'crawl on all fours'

Table 4b (cont.)

Manner Type	Verbs
variety of running (6)	*biegać sprintem* 'run sprinting', *cwałować* 'gallop', *galopować* 'gallop', *kłusować* 'trot', *truchtać* 'trot', *uprawiać jogging* 'practice jogging'
rapid movement (4)	*gonić* 'race', *podążać* 'hasten', *pędzić* 'speed, rush', *śpieszyć się* 'hurry'
smooth movement (4)	*bujać się* 'float', *posuwać się* 'slide', *ślizgać się* 'slide', *wić się* 'wriggle, writhe'
punctuated, repeatable movement (3)	*skakać/podskakiwać* 'jump', *tupać* 'stamp, tramp', *uderzać nogami* 'spring'

Table 4c: French (40 types)

Manner Type	Verbs
basic level (2)	*marcher* 'walk', *courir* 'run'
variety of walking – normal pace (5)	*arpenter* 'pace/stride', *danser* 'dance', *faire des pas chassés* 'make dance steps' *faire les cent pas* 'pace', *swinger* 'jive, stomp'
variety of walking – relaxed (7)	*se balader* 'saunter', *déambuler* 'wander, stroll', *divaguer* 'ramble', *errer* 'wander', *flâner* 'stroll', *se promener* 'stroll', *traînasser* 'loaf'
labored progress (4)	*chanceler* 'totter', *se dandiner* 'wobble', *tituber* 'totter', *traîner* 'drag'
impaired walking (2)	*boiter/boitiller* 'limp, hobble', *claudiquer* 'hobble'
quadrupedal movement (2)	*marcher à quatre pattes* 'walk on all fours', *se traîner* 'crawl'
variety of running (5)	*faire des pas chassés* 'make dance steps', *galoper* 'gallop', *jogger/faire du jogging* 'jog', *sprinter* 'sprint', *trotter/trotiner* 'trot'
rapid movement (7)	*se dépêcher* 'hurry', *s'élancer* 'rush', *foncer* 'charge', *gambader* 'frolic', *se précipiter* 'hurl self', *se presser* 'hurry', *s'élancer* 'rush'
smooth movement (2)	*ramper* 'crawl on belly', *serpenter* 'slither'
punctuated, repeatable movement (3)	*bondir* 'leap, jump', *sauter/sautiller* 'jump', *sauter à cloche-pied* 'hop'

Table 4d: Spanish (34 types)

Manner Type	Verbs
basic level (2)	*andar* 'walk', *correr* 'run'
variety of walking – normal pace (7)	*caminar* 'walk', *dar pasos* 'take steps', *dar pisadas* 'take steps', *dar zancadas* 'take strides', *merodear* 'prowl', *pisar* 'step', *pisotear* 'tramp'
variety of walking – relaxed (5)	*deambular* 'stroll, saunter', *gandulear* 'loaf, loiter', *pasear* 'stroll', *vagabundear* 'wander', *vagar* 'wander'
labored progress (1)	*arrastrar(se)* 'drag self'
impaired walking (1)	*cojear* 'limp'
quadrupedal movement (2)	*andar a cuatro patas* 'walk on all fours', *gatear* 'crawl'
variety of running (5)	*corretear* 'run about in a lively or playful way', *esprintar* 'sprint', *galopar* 'gallop', *hacer footing* 'jog', *trotar* 'trot'
rapid movement (2)	*apresurarse* 'hurry', *darse prisa* 'hurry'
smooth movement (2)	*reptar* 'slither, creep', *serpentear* 'slither'
punctuated, repeatable movement (7)	*botar* 'bounce', *brincar* 'jump, leap', *patalear* 'stomp', *patear* 'stamp', *saltar* 'jump', *saltar a la pata coja* 'hop on one foot', *saltar-correr* 'jump-run'

Table 4e: Basque (27 types; * indicates ad-hoc verbs)

Manner Type	Verbs
basic level (2)	*ibili* 'walk', *korrika egin* 'run'
variety of walking – normal pace (4)	*dantza baten koreografia egin* 'dance', *oiloarena egin* 'walk like a cock', *pausoak eman* 'take steps, walk', *tipi-tapa ibili* 'walk in small steps'
variety of walking – relaxed (1)	*paseatu* 'stroll'
labored progress (3)	*arrastaka ibili* 'shuffle, drag, crawl', *bilin-bolanka ibili* 'stagger, totter', *dandarrez ibili* 'drag self'
impaired walking (2)	*hanka motzean ibili* 'limp', *herrenka ibili* 'limp'
quadrupedal movement (2)	*lau hanketan ibili* 'walk on all fours', *txakurrarena egin* 'walk like a dog'
variety of running (5)	*footing egin* 'jog', *sprint bat egin* 'sprint', *trotatu* 'trot', *zaldiarena egin* 'walk like a horse', *zaldikatu* 'prance'
rapid movement (0)	

Table 4e (cont.)

Manner Type	Verbs
smooth movement (2)	*irristatu* 'slide', *sugearena egin* 'walk like a snake'
punctuated, repeatable movement (6)	**heidiarena egin* 'walk like Heidi', *jauzi egin/eman* 'jump', *korrika-saltoka ibili* 'jump-and-run', *salto egin* 'jump', *saltoka ibili* 'skip (move jumping)', *txingoka ibili* 'hop'

to types of running, with 4–6 lexical items expressing similar types. They differ with regard to varieties of walking. On the basis of frequencies of verbs naming ways of walking, we can roughly summarize these patterns as follows (with numbers of types given in parentheses); recall, however, that the samples vary in number of participants.

- English seems to "specialize" in types of normal (16) and labored walking gaits (16).
- Polish seems to do the same, with concentrations of types in normal (5) and labored (7) walking gaits.
- French seems to have a fairly even distribution across the categories, with perhaps some specialization in relaxed gaits (7) and a collection of general verbs of 'hurrying' (7), without attention to motor type.
- Spanish seems to have a fairly even distribution, with relatively more attention to normal gaits (7) and punctuated movement (7).
- Basque has a small lexicon of manner verbs, with no type standing out. Note, too, that many of the responses are compound expressions, including ideophones (*arrastaka ibili* 'shuffle', *tipi-tapa egin* 'walk in small steps'). Basque is an interesting case since speakers make up ad-hoc verbs in order to describe these video clips. These are marked with an asterisk (*). The other languages use some loan word verbs for actions such as jogging (cf. *uprawiać jogging*, *jogger/faire du jogging*, *hacer footing*), but although Basque also has *footing egin*, the language makes wide use of ad-hoc devices. This is probably due to the ease of creating verbs in this language (Ibarretxe-Antuñano in press). Such constructions metonymically characterize the motion of the figure, using the construction: FIGURE-GENITIVE-DETERMINER *egin* 'make' (e.g., *suge* 'snake' *-aren* GEN *-a* DET *egin* 'make').

In order to better understand these differences we looked at the use of modifying adverbs and phrases to further validate crosslinguistic differences in reference to types of manner of movement.

3.5.2 Types of modification

We gave participants the option of providing additional descriptions of the video clips, and a great many different types of adverbial modification appear in the data. It is evident, for example, that the English verbs in Table 4a express nuances of evaluation and subjective description of similar motor patterns (e.g., compare *stride, swagger,* and *strut*, all describing firm, solid walking). Psycholinguists have done little to study these expressive dimensions, since the basic research thus far has attended to a simple contrast between path and manner, using the least expressive manner verbs. Insights come from work on contrastive discourse analysis, especially Snell-Hornby's (1983) classic study of "verb descriptivity" in English and German. We have extended her seminal work in classifying types of modification of manner verbs. Table 5 lists six varieties of attention to manner, with subcategories for each variety. Each modifier expression was coded for these features, with some modifiers combining two or more categories.

Table 5b presents illustrative examples from two languages, English and Spanish, using only the larger categories. The other languages are comparably rich in modifying expressions.

The five languages show a great deal of variation in relative use of these categories. Table 6 shows the patterns of verb modification by language (excluding instrument, where all languages made roughly equal use of expressions meaning 'with a cane'). The number of participants varied by language; because there were only ten Polish participants, the figures in Table 6 are based on the first

Table 5a: Categories and Subcategories of Manners of Human Motion

Category	Subcategories
attitude of actor	happy, proud, nervous, tired/lazy, calm, assured, uncertain, relaxed, depressed, thinking/brooding, motiveless, sexy/seductive
rate	fast, medium, slow, repeated
effort	light, heavy
posture	upright, looking down, bent, all fours, hands/arms, straight legs, feet together, arched, one leg, tummy, hips, leaning, knees, rigid hands, like creature, like object
steps	long, short, bouncy, tapping, high, rhythmic, irregular/impaired, firm, dance, creature, like some person
instrument	with a cane

Table 5b: Examples of Modifying Expressions in English and Spanish

Category	English	Spanish
attitude of actor	*confidently, dejectedly, happily, absent-minded, arrogant, leisurely, lethargically, cautiously*	*pensativo* 'thoughtful', *preocupado* 'worried', *con mucha tranquilidad* 'very calmly', *con resignación* 'with resignation', *alegremente* 'happily', *sin saber a dónde* 'not knowing where to', *por nervios* 'due to nerves', *totalmente agotada* 'exhausted'
rate	*briskly, quickly, rushed, in a hurry, slowly, taking his time*	*a gran velocidad* 'with great velocity', *apresuradamente* 'hastily', *con paso ligero* 'with light steps', *despacito* 'very slowly', *pisando huevos* 'walking on eggs'
effort	*laboriously, as hard as he can, like her bag is heavy, violently, easily*	*torpemente* 'clumsily', *con peso* 'heavily', *con pies de plomo* 'with leaden feet', *todo lo que puedas* 'all you can', *de forma suave* 'softly', *sin coger impulso* 'without gathering speed'
posture	*hunched over, slouched, stooped, on hands and feet*	*agachado* 'crouched', *con los hombros caídos* 'with drooping shoulders', *echada para adelante* 'bent forward', *con un movimiento de swing* 'with a swinging motion', *sin mover una mano* 'without moving a hand', *con manos y pies* 'with hands and feet'
steps	*bouncing, with a disability, lamely, smoothly, steadily*	*a saltitos* 'hopping', *trotando* 'trotting', *con pisada firme* 'with steady steps', *levantando las rodillas* 'lifting knees', *de modo particular* 'in a particular way', *a grandes zancadas* 'with big strides', *dando largos pasos* 'taking long steps'

Table 6: Distribution of Verb Modification Categories by Language (percentage of use out of total instances of verb modification)

	English	Polish	French	Spanish	Basque
attitude of actor	53	16	27	20	25
rate	12	20	20	25	32
effort	16	20	31	31	26
posture	4	36	16	16	14
steps	15	8	6	8	3

ten participants in each of the other languages. When participants add modification to verbs they may be expressing facets of the motion event that are not sufficiently codable by the use of a single verb or fixed expression. Of the five languages, English seems most concerned with adding nuances of the attitude of the actor, whereas the other languages display roughly similar specification of all of the categories of modification (though Polish shows somewhat greater concern for types of posture).

A major question here is whether modification compensates for gaps in the lexicon, with the result that all five languages would be comparable in their attention to qualities of motion events in the clips. English and Polish distribute modification more widely over types of verbs than do French, Spanish, and Basque, which predominantly use modification to add manner to basic verbs 'go', 'walk', 'run', and 'crawl'. It appears that the verb-framed languages use modification to compensate for the lack of lexical means for distinguishing manners of motion, whereas the satellite-framed languages also use modification to add additional nuances to available manner of motion verbs.

One way to approach this question is to separate basic verb types, which are minimally expressive – 'go', 'walk', 'run', 'crawl' – from the total lexicon of manner verbs used in the descriptions. If a greater proportion of verbs in the descriptions are used to characterize basic motor patterns, then the language may need to have recourse to modifying expressions to fill in nuances of manner that go beyond the verbs used. Table 7 presents the proportions of basic verb tokens out of total verb tokens for the five languages. It is evident that the three verb-framed languages use a higher proportion of these non-expressive verbs, suggesting a relatively greater need to provide additional modifying information when facing a task in which attention to manner of motion is called for.

Let us limit ourselves to the largest semantic category in the data, namely bipedal walking gaits of adults (excluding noncanonical and arrhythmic manners of motion). The first row of Table 8 is based on expressive verbs of manner of walking, such as *shuffle* and *plod in English*. The numbers present mean types of such verbs per participant by language. The two satellite-framed languages stand out as using more different types of expressive manner verbs in this semantic field. Now add modification to the picture. Modification of basic 'walk' verbs can

Table 7: Percentage of Basic Verb Tokens out of Total Verb Tokens, by language

English	Polish	French	Spanish	Basque
39	47	69	81	66

Table 8: Walking Events: Manner Expressions per participant

	English	Polish	French	Spanish	Basque
types of expressive manner verbs	2.0	1.7	1.0	0.26	0.35
tokens of expressive manner designations	11.2	9.9	8.6	8.5	9.2

be taken as an attempt to create expressive manner phrases in response to our task demands. Do speakers of verb-framed languages show equal attention to manner with this addition? We created a composite category of *expressive manner designations*, defined as the total number of modified basic verbs (such as 'walk dragging the feet') plus expressive manner verbs (such as *shuffle*). The second row of Table 8 presents data on this composite measure of manner salience, looking at tokens of expressive manner designations by participant. This composite measure of manner encoding appears to level out the differences between languages, although the English super-encoding of manner remains evident, with regard to both the diversity of manner verbs and the expressive modification of such verbs, as discussed below.

3.5.3 Functions of modification

What are the functions of modifications that are added to verbs, both basic and expressive verbs? It appears that the verb-framed languages use modification to compensate for the lack of lexical means for distinguishing manners of motion, essentially creating manner expressions such as 'walk with wide steps'. By contrast, an English or Polish speaker already has a verb like 'stride', and might elaborate it to add a nuance of attitude, such as 'stride with determination'. Similar patterns have been found in comparative studies of expressive manner in novels and oral narratives. Özçalışkan and Slobin (2003) compared narratives in English and Turkish, finding that in English modifications were used to qualify or augment manner verbs, whereas in Turkish they tended to add manner information to non-manner verbs. For example, an English speaker, having already specified manner by choice of a manner verb, often went on to elaborate or extend the description: not just *sneak*, but *sneak quietly*. Comparable to our data, they found that in English 73% of manner modifications occurred with verbs that already expressed manner of motion, whereas in Turkish 61% occurred with non-manner verbs. A comparable tendency was found in Polish narratives, where manner modifiers are often, though not exclusively, used to qualify or augment manner verbs (see Kopecka 2010). Modification of manner verbs by speakers of satellite-framed

languages is further indication of fine-grained attention to a domain that has already become salient through lexical diversity.

We can briefly summarize the functions of expressive modification used by the five languages in describing the motion clips. In English and Polish modifiers augment expressive manner verbs, whereas in French, Spanish, and Basque they create manner verbs out of non-expressive basic motion verbs. In more detail:

- English: Attitude tends to add a nuance to a verb that already implies an attitude (e.g., *stroll, strut, stumble*). As noted in Table 6, English is the only language in our sample that pays exceptionally heavy attention to assessing or evaluating the attitude of the moving figure. 'Rate' and 'steps' tend to add a nuance to a verb that already implies a sort of rate and step type (e.g., *jog, run*). Thus modification, as in earlier studies of fiction, is used to reinforce what is in the verb, rather than compensate for what is lacking. An exception is the basic verb *walk*, which does receive modification for more specificity. *Walk* is most frequently modified to express an attitude, often in combination with some motor characteristic of rate, posture, or steps.
- Polish: Expressive verbs (e.g., *galopować* 'gallop', *podążać* 'hasten', *przechadzać się* 'stroll, saunter') are sometimes modified to add nuances making them more expressive, but most expressive verbs are left without modification. The basic 'walk' verb is extensively modified to add all types of manner, but most heavily to add details of the nature of steps taken, thereby increasing the means for describing motor patterns, as in *chodzić ociężale* 'walk heavily', *chodzić szybkim krokiem* 'walk briskly', sometimes with a nuance of attitude or inner state, as in, *chodzić bez pośpiechu* 'walk leisurely'.
- French: Modifiers occur only with basic verbs – *courir* 'run', *marcher* 'walk', *sauter* 'jump' – adding nuances of motor pattern (posture, rate, steps), such as *marcher à grandes enjambées* 'walk striding', *courir à petites foulées* 'run jogging', *sauter à pieds joints* 'jump with both feet'. *Ramper* 'crawl', which names a distinctive motor pattern, is never modified. More expressive manner verbs are unmodified. Modifiers are used to make basic verbs into expressive verbs, but expressive verbs themselves seem to be considered sufficient without further modification.
- Spanish: The basic 'walk' verb, *andar*, receives a range of modifier types (*alegremente* 'happily', *con prisa* 'with haste', *con dificultad* 'with difficulty', *encorvado* 'hunched', *a pasitos* 'with small steps'), but *correr* 'run' is modified mainly with regard to motor pattern (rate: *deprisa* 'fast', steps: *dando zancadas* 'making strides'), apparently to subdivide this category into detailed motor patterns not described in single verbs. There seems to be a 'rate'

scale that goes from basic slow walking to basic fast running: *andar muy despacio* 'walk very slowly', *andar lentamente* 'walk slowly', *andar deprisa* 'walk fast', *andar corriendo* 'walk running' < *correr despacio* 'run slowly' < *correr ligeramente* 'run lightly' < *correr deprisa* 'run fast' < *correr muy velozmente* 'run very quickly'. *Gatear* 'crawl' is hardly modified and mainly to add rate (*rápido* 'fast').

– Basque: The basic 'walk' verb, *ibili*, receives all sorts of modification (*pozik* 'happy', *arin* 'quick', *arrastaka* 'dragging', *buruz behera* 'upside down', *pauso handiak eta gogorrak emanez* 'making big and strong steps'), sometimes even two modifiers (*lasai oinez ibili* 'walk on foot calmly'). The basic 'run' verb, *korrika egin*, is modified mainly for motor pattern (*zigi-zaga hankekin eginez* 'zigzaging with the legs', *saltoka* 'jumping'). *Lau hanketan ibili* 'crawl' is mainly modified for rate (*arrapaladan* 'very fast'). Modification is relatively rare overall, occurring primarily with 'walk', 'run', and 'jump'.

The crosslinguistic patterns are so detailed that it is useful to divide functions of modification into two main categories: inner state of actor vs. qualities of motor behavior. This comparison is presented in Figure 4.

English pays relatively equal attention to the actor's attitude and motor behavior, whereas the other four languages predominantly use modification to characterize motor patterns (force dynamics, rate, posture, movements of legs
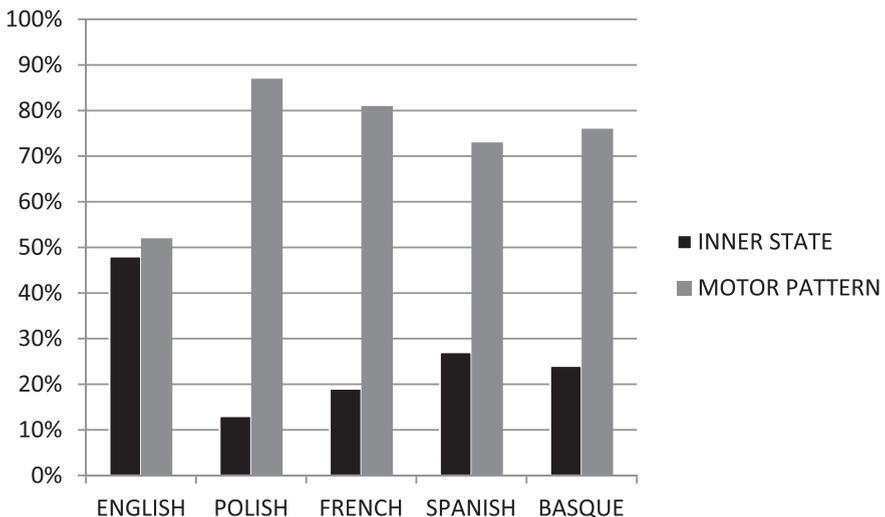

Fig. 4: Percentages of Modification of Motion Verbs for Inner State and Motor Pattern, by Language

and feet). There are no evident typological or cultural explanations for these differences. The answer may lie in detailed comparison of lexicons. English has a well-developed vocabulary for both inner states and motor patterns. Figure 4 suggests that speakers of the other four languages have a need to create expressive manner verbs to characterize gait patterns.

4 Conclusions

On the basis of previous theory and research, we expected to find that there would be greater lexical diversity of Manner of motion verbs in satellite-framed than in verb-framed languages. This expectation was confirmed. We also found further evidence that Manner of motion is particularly salient to speakers of satellite-framed languages. Our method and materials made it possible to begin to systematically characterize types of Manners of motion, showing several intersecting features. While Talmy's binary typology has proven useful in differentiating the role of Manner of motion in languages that mark Path in the main verb or elsewhere, it is clear from our study, as well as other intra-typological comparisons (see footnote 1) that broad typological categorizations do not fully account for language-particular patterns. As Beavers et al. (2010: 370) have noted, it is necessary to attend to "independent properties of the morphological inventories and morphosyntactic resources of particular languages" in order to more fully characterize encoding of motion events (as well as other domains). Nevertheless, Talmy's binary typology has proven useful in differentiating the role of Manner of motion in languages that mark Path in the main verb or elsewhere.

Our conclusions must be tempered, of course, by the particular collection of motion events that we happened to film and the small sample of five languages at our disposal. Although the events include a wider range of movement patterns than have been sampled in previous studies of human or animated video clips, the sample is still limited, both in terms of the range of movement patterns that were filmed and demography (European languages from a relatively culturally homogeneous group of people). For example, we could have kept a focus on human bipedal gait, but sought out more types of impaired walking, styles of interpersonally directed gaits, and so forth. Nevertheless, the data of five languages demonstrate that when people are asked to label a range of everyday human motion events on a level terrain, they seem to orient to what may be universally evident perceptions. That is, in spite of linguistic and cultural differences, two canonical gait patterns stand out in semantic fields produced by clusters of labels: walking and running. In addition, perceivers and labelers

attend to noncanonical postures and rhythmic patterns, isolating clusters of limited and arrhythmic gaits. A pervasive underlying dimension is velocity. Disregarding lexical diversity, the five languages we have considered show striking regularities with regard to basic underlying concepts. At the same time, the languages differ considerably in the granularity and types of distinctions they apply within each of the four major clusters. At this level, labels and descriptive modifiers reflect conceptual continua of rate and force dynamics. In all five languages, an aspect of fine-grained expressions of manner of motion is a concern with the inner state of the person who is moving, although with crosslinguistic differences as noted above. Concern here is not with the mechanics of motor patterns, but with the speaker's assessment and evaluation of the moving figure. Does he or she appear confident, too confident, arrogant, unsure? Many distinctions marked by manner of motion verbs may not be evident in motor patterns at all, but draw upon subjective evaluations. For example, in English, are there perceptual distinctions between leisurely gaits labeled by *saunter, stroll, amble*, and the like, or between over-confident gaits called *strut* and *swagger*? The full richness of manner of motion expressions – lexical items, modifying adjectives and adverbs, ideophones – will not be found in laboratory labeling of events, but in conversational, political, and literary discourse. Indeed, the systematic differences between verb- and satellite-framed languages that have been demonstrated in elicitation and comprehension studies have been most revealingly documented in studies of narrative (e.g., Berman and Slobin 1994; Slobin 1997a, 2004, 2006). Here we have left the familiar territory of compositional semantics and basic perceptual categories to enter uncharted psychological and sociocultural areas. We hope to have at least made a foray into that multidimensional, uncharted space.

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Appendix 1. Lexical diversity by language: types and numbers of occurrences of verbs (34 scenes/language)

74 TYPES OF ENGLISH MANNER VERBS
(22 PARTICIPANTS) [3.36/participant] (543 TOKENS) TYPES/SCENE = 2.176

amble 1	*jump* 14	*slither* 16
bob 1	*leap* 5	*slouch* 1
bounce 18	*limp* 13	*speedwalk* 3
bound 3	*lumber* 2	*spring* 1
bumble 1	*march* 3	*sprint* 17
charge 1	*meander* 8	*squirm* 1
clop 1	*mope* 5	*stagger* 2
crawl 54	*pace* 20	*step* 6
creep 1	*plod* 7	*stomp* 18
cruise 5	*poke* 1	*stride* 9
dance 2	*prance* 11	*stroll* 43
dart 1	*race* 2	*strut* 5
dawdle 1	*run* 39	*stumble* 3
drag 2	*rush* 3	*sulk* 1
drag feet 1	*sashay* 1	*swagger* 3
float 1	*saunter* 7	*tiptoe* 1
frolic 5	*scamper* 1	*toddle* 4
gallop 24	*scurry* 1	*tramp* 2
hike 3	*scamper* 1	*trot* 5
hobble 3	*scuttle* 1	*trudge* 3
hop 27	*shuffle* 1	*waddle* 1
hurry 6	*sidestep* 2	*walk* 119
hustle 5	*skip* 22	*walk on all fours* 2
jaunt 2	*skulk* 1	*wander* 5
jog 56	*slide* 2	*wobble* 2

41 TYPES OF POLISH MANNER VERBS

(10 PARTICIPANTS) [4.1/participant] (317 TOKENS) TYPES/SCENE = 1.206

biegać 'run' 56
biegać sprintem 'run sprinting' 5
bujać się 'float' 1
chodzić 'go on foot' 86
chodzić na czworaka 'walk on all fours' 4
cwałować 'gallop' 3
człapać 'shuffle' 1
czołgać się 'crawl' 5
dreptać 'walk with a tripping step' 2
galopować 'gallop' 6
gibać się 'move in a supple way' 1
gonić 'race' 1
kłusować 'trot' 2
kołysać się 'waddle' 1
kuleć 'limp, hobble' 5
ociągać się 'move reluctantly' 1
pędzić 'rush' 2
pełzać 'creep' 3
podążać 'hasten' 5
posuwać się 'slide' 3
powłóczyć nogami 'trail one's legs' 2

przechadzać się 'stroll, saunter' 12
przemierzać 'pace' 1
raczkować 'crawl on all fours' 16
skakać/podskakiwać 'jump' 43
ślizgać się 'slide' 1
spacerować 'stroll' 14
śpieszyć się 'hurry' 10
stąpać 'step, pace' 1
stawiać kroki 'make steps' 3
tańczyć 'dance' 1
truchtać 'trot' 4
truptać 'walk with small tapping steps' 1
tupać 'stamp, tramp' 2
uderzać nogami 'spring' 1
uprawiać jogging 'practice jogging' 3
utykać 'hobble, limp' 2
wić się 'wriggle, writhe' 2
wlec nogi 'drag feet' 1
wlec się 'drag oneself' 2
włóczyć się 'roam' 2

40 TYPES OF FRENCH MANNER VERBS

(16 PARTICIPANTS) [2.438/participant] (328 TOKENS) TYPES/SCENE = 1.147

arpenter 'pace/stride' 2
balader.se 'saunter' 2
boiter/boitiller 'limp, hobble' 13
bondir 'leap, jump' 5
chanceler 'totter' 1
claudiquer 'hobble' 6
courir 'run' 65
dandiner.se 'wobble' 8
danser 'dance' 1
déambuler 'wander, stroll' 7

dépêcher.se 'hurry' 6
divaguer 'ramble' 1
errer 'wander' 10
faire des pas chassés 'make dance steps' 5
faire du footing 'jog' 3
faire les cent pas 'pace' 9
flâner 'stroll' 9
foncer 'charge' 1
galoper 'gallop' 5
gambader 'frolic' 6

jogger/faire du jogging 'jog' 2
marcher 'walk' 143
marcher à 4 pattes 'walk on all
    fours' 31
préciper.se 'hurl self' 1
presser.se 'hurry' 4
promener.se 'stroll' 7
ramper 'crawl' 13
sauter/sautiller 'jump' 50
sauter à cloche-pied 'hop' 16
s'élancer 'rush' 1

serpenter 'slither' 1
sprinter 'sprint' 12
swinger 'jive, stomp' 1
taper des pieds 'stomp' 6
tituber 'totter' 3
traînasser 'loaf' 1
traîner 'drag' 2
traîner.se 'crawl' 5
traîner les pieds 'drag feet' 3
trotter/trotiner 'trot' 21

34 TYPES OF SPANISH MANNER VERBS
(39 PARTICIPANTS) [0.85/p] (1053 tokens) TYPES/SCENE = 0.9706

andar 248
andar a cuatro patas 'go on all fours' 18
apresurarse 'hurry' 4
arrastrar(se) 'drag self' 30
botar 'bounce' 1
brincar 'jump, leap' 16
caminar 'walk' 93
cojear 'limp' 23
correr 'run' 187
corretear 'run about – lively or playful' 1
dar pasos 'give steps' 8
dar pisadas 'give steps' 1
dar zancadas 'give strides' 4
darse prisa 'hurry' 3
deambular 'stroll, saunter' 7
esprintar 'sprint' 6
galopar 'gallop' 2
gandulear 'loaf, loiter' 1

gatear 'crawl' 72
hacer footing 'jog' 8
merodear 'prowl' 1
pasear 'stroll' 105
patalear 'stomp' 3
patear 'stamp' 1
pisar 'step' 17
pisotear 'tramp' 6
reptar 'slither' 5
saltar 'jump' 108
saltar-correr 'jump-run' 1
saltar a la pata coja 'hop on one
    foot' 32
serpentear 'slither' 2
trotar 'trot' 29
vagabundear 'wander' 3
vagar 'wander' 7

27 TYPES OF BASQUE MANNER VERBS
(23 PARTICIPANTS) [1.1304/participant] (669 TOKENS) TYPES/SCENE = 0.765

arrastaka ibili 'shuffle' 22
bilin-bolanka ibili 'stagger, totter' 2
dandarrez ibili 'drag self' 1
*dantza baten/koreografia egin
   'dance' 1
footing egin 'jog' 11
hanka motzean ibili 'limp' 2
*heidirena egin 'walk as Heidi' 5
herrenka ibili 'limp' 17
ibili 'walk' 279
irristatu 'slide' 1
jauzi egin/eman 'jump' 4
korrika egin 'run' 94
korrika-saltoka ibili 'jump-and-run' 8

lau hanketan ibili 'crawl' 41
*oiloarena egin 'walk like a cock' 1
paseatu 'stroll' 41
pausoak eman 'take steps, walk' 8
salto egin 'jump' 78
saltoka ibili 'skip (move jumping)' 40
sprint bat egin 'sprint' 3
*sugearena egin 'move like a snake' 4
tipi-tapa ibili 'walk in small steps' 1
trotatu 'trot' 1
*txakurrarena egin 'walk like a dog' 1
txingoka ibili 'hop' 1
*zaldiarena egin 'walk like a horse' 1
zaldikatu 'prance' 1

Appendix 2. Dominant label(s) provided for each clip in each language

ENGLISH

clip designation	DOMINANT	SECONDARY
1-saunter	walk 50%	stroll 32%
2-plod	walk 53%	plod 16%
3-walk	walk 82%	
4-stride1	walk 67%	
5-stride2	walk 53%	stride 12% speedwalk 12%
6-strut	walk 30%	strut 15%
7-stroll1	walk 37%	stroll 37%
8-stroll2	stroll 67%	walk 17%
9-wander	meander 23%	wander 15%
10-limp	walk 67%	
11-walk-cane	stroll 43%	walk 29%
12-limp-cane	limp 45%	walk 20%
13-trudge	walk 30%	mope 20%

14-limber	walk 42%	
15-pace	pace 95%	
16-stomp	stomp 95%	
17-toddle	toddle 24% walk 24%	
18-crawl-baby	crawl 100%	
19-crawl-child	crawl 95%	
20-crab-walk	animal-crawl 53%	crawl 20%
21-slither	slither 80%	
22-jump	bounce 68%	hop 14%
23-hop	hop 100%	
24-leap	jump 60%	leap 25%
25-skip	skip 64%	prance 23%
26-skip-gallop	gallop 62%	skip 19%
27-gallop	gallop 55%	skip 20%
28-prance	jog 45%	prance 18%
29-jog1	jog 76%	run 14%
30-run1	run 59%	
31-sprint	sprint 68%	run 14%
32-run2	run 45%	saunter 27%
33-jog2	jog 52%	run 24%
34-jog3	jog 70%	stroll 15%

FRENCH

clip designation	DOMINANT	SECONDARY
1-saunter	marcher 50%	
2-plod	marcher 62%	
3-walk	marcher 81%	
4-stride1	marcher 75%	
5-stride2	marcher 62%	
6-strut	marcher 31%	se dandiner 31%
7-stroll1	marcher 75%	
8-stroll2	se promener 37%	marcher 25%
9-wander	flâner 25%	marcher 18%
10-limp	marcher 68%	
11-walk-cane	marcher 56%	
12-limp-cane	boîter 44%	marcher 37%
13-trudge	errer 37%	marcher 25%
14-limber	marcher 56%	

15-pace	faire les cent pas 56%	marcher 12%
16-stomp	marcher 56%	
17-toddle	marcher 50%	
18-crawl-baby	marcher â quatre pattes 75%	
19-crawl-child	marcher â quatre pattes 75%	
20-crab-walk	marcher a quatre pattes 43%	
21-slither	ramper 75%	
22-jump	sauter 62%	
23-hop	sauter â cloche-pied 100%	
24-leap	sauter 68%	
25-skip	sauter 37%	
26-skip-gallop	trottiner 50%	sauter 25%
27-gallop	sauter 12%	
28-prance	trottiner 68%	courir 25%
29-jog1	courir 94%	
30-run1	courir 69%	
31-sprint	sprinter 62%	courir 12,5%
32-run2	courir 62%	
33-jog2	courir 62%	
34-jog3	courir 75%	

POLISH

clip designation	DOMINANT	SECONDARY
1-saunter	chodzić 91%	
2-plod	chodzić 72%	
3-walk	chodzić 63%	
4-stride1	chodzić 54%	
5-stride2	chodzić 72%	
6-strut	chodzić 63%	
7-stroll1	chodzić 45%	
8-stroll2	chodzić 36%	przechadzać się 36%
9-wander	chodzić 18%	
10-limp	chodzić 63%	
11-walk-cane	przechadzać się 36%	
12-limp-cane	chodzić 54%	
13-trudge	przechadzać się 18%	
14-limber	chodzić 81%	
15-pace	chodzić 45%	przechadzać się 18%

16-stomp	chodzić 18%	
17-toddle	chodzić 54%	
18-crawl-baby	raczkować 91%	
19-crawl-child	raczkować 54%	
20-crab-walk	chodzić 54%	raczkować 18%
21-slither	czołgać się 55%	
22-jump	skakać 100%	
23-hop	skakać 100%	
24-leap	skakać 100%	
25-skip	skakać 82%	
26-skip-gallop	galopować 55%	biegać 36%
27-gallop	biegać 27%	
28-prance	biegać 45%	
29-jog1	biegać 82%	
30-run1	biegać 72%	
31-sprint	biegać sprintem 45%	biegać 27%
32-run2	biegać 72%	
33-jog2	biegać 91%	
34-jog3	biegać 63%	

SPANISH

clip designation	DOMINANT	SECONDARY
1-saunter	pasear 65%	caminar 19%
2-plod	andar 75%	
3-walk	andar 52%	caminar 26%
4-stride1	andar 85%	
5-stride2	andar 65%	caminar 35%
6-strut	andar 83%	
7-stroll1	pasear 48%	andar 28%
8-stroll2	pasear 56%	caminar 32%
9-wander	pasear 63%	caminar 15%
10-limp	andar 68%	caminar 25%
11-walk-cane	pasear 52%	andar 30%
12-limp-cane	cojear 50%	andar 38%
13-trudge	andar 65%	caminar 13%
14-limber	andar 50%	caminar 25%
15-pace	andar 52%	pasear 24%
16-stomp	pisar 57%	andar 23%

17-toddle	andar 59%	dar pasos 7%
18-crawl-baby	gatear 95%	
19-crawl-child	gatear 92%	
20-crab-walk	andar a cuatro pasos 56%	
21-slither	arrastrarse 79%	reptar 16%
22-jump	saltar 94%	
23-hop	saltar a la pata coja 84%	
24-leap	saltar 97%	
25-skip	saltar 68%	brincar 29%
26-skip-gallop	correr 28% trotar 28%	saltar 19%
27-gallop	saltar 37%	trotar 30%
28-prance	correr 52%	trotar 17%
29-jog1	correr 90%	
30-run1	correr 88%	darse prisa 8%
31-sprint	correr 84%	esprintar 16%
32-run2	correr 85%	apresurarse 9%
33-jog2	correr 68%	trotar 9%
34-jog3	correr 75%	hacer footing 9%

BASQUE

clip designation	DOMINANT	SECONDARY
1-saunter	ibili 53%	paseatu 47%
2-plod	ibili 61%	herrenka egin 28%
3-walk	ibili 100%	
4-stride1	ibili 100%	
5-stride2	ibili 95%	
6-strut	ibili 100%	
7-stroll1	paseatu 64%	ibili 36%
8-stroll2	paseatu 66%	ibili 34%
9-wander	ibili 71,5%	paseatu 28,5%
10-limp	ibili 88%	bilin-bolanka 11%
11-walk-cane	ibili 66,6%	paseatu 33,4%
12-limp-cane	ibili 48%	herrenka ibili 48%
13-trudge	ibili 89%	
14-limber	ibili 94%	
15-pace	ibili 100%	
16-stomp	ibili 85%	
17-toddle	ibili 73%	pausoak eman 20%

18-crawl-baby	lau hanketan ibili 76%	arrastaka ibili 19%
19-crawl-child	lau hanketan ibili 76%	arrastaka ibili 9%
20-crab-walk	ibili 50%	lau hanketan ibili 50%
21-slither	arrastaka ibili 75%	sugearena egin 20%
22-jump	salto egin 96%	
23-hop	salto egin 73%	ibili 18%
24-leap	salto egin 82%	
25-skip	salto egin 44%	heidirena egin 25%
26-skip-gallop	ibili 30%	salto egin 30%
27-gallop	salto egin 47%	korrika egin 40%
28-prance	korrika egin 50%	ibili 28%
29-jog1	korrika egin 65%	ibili 23%
30-run1	korrika egin 76%	ibili 23%
31-sprint	korrika egin 77%	sprint bat egin 14%
32-run2	korrika egin 83%	ibili 17%
33-jog2	korrika egin 28% ibili 28%	salto egin 24%
34-jog3	korrika egin 45%	footing egin 35%