LINGUISTIC RELATIVITY IN COGNITIVE PROCESSES

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Abstract

Motion of objects and animates is a considerable aspect of life daily conceptualised and referred to in language by individuals. Motion is composed of four basic conceptual dimensions, (F) a moving figure, (P) a path trajectory or endpoint, (G) a spatial ground reference, and (M) a manner of displacement. Expressing those conceptual dimensions in various languages is realised differently in semantic forms, however, resulting in those dimensions being selectively codable and highlighted. In English, all four dimensions are typically encoded, whereas in French, the manner is typically left out. The question this paper addresses is whether differing semantic representations (SRs) entail differing conceptual representations (CRs) in cognition. This question, also known as linguistic relativity, has been extensively examined by cognitive linguists with regards the domain of motion – in various languages. Most studies have focused on testing the effects of SRs on the cognitive functions of category formation (e.g. through triad judgement tasks), and memory (e.g. through free prose recall and recognition tasks). Few have found any effects and maybe none have explored inferencing – an equally interesting cognitive ability wherefrom to contemplate the potential influences of SRs on CRs, and hence a new direction in relativistic research. This study investigates inferencing processes. Questions for testing inferences must pertain to events or scenes as wholes, as inferences constitute constructive CRs following from the processing of elements perceived salient in the situation. Testing inferences is thus highly interesting to understanding holistic CRs of motion events as wholes, rather than as complex representations decomposable into discrete dimensions (e.g. path, manner). Inferencing is of further interest as it relies heavily on other cognitive processes, such as attention and memory, and as such, it should be an insightful index of the relativity of conceptualisation via these other cognitive modes of processing. Tests were performed with English and French native speakers to offer a comparative assessment of the potential relativity of inferencing motion event CRs, based on the same objective stimulus. Results present considerable differences across the two language groups, such that the English speakers reveal more salient manner-based CRs than the French speakers, and such that the French speakers reveal more salient path-related CRs than the English. Overall, this paper further suggests that investigating and understanding the potential for language-based relativity of concepts is critical, as its implications entail that speakers of different languages therefore differ in their cognitive conceptualisation of otherwise similar events.

INTRODUCTION

This paper addresses a number of topics, including linguistic relativity, motion conceptualisation and experimental psychology. Linguistic relativity suggests that language patterns and semantic representations influence cognition, so that speakers of different languages entertain differing conceptualisations of otherwise similar events and entities (Whorf 1956, Lucy 1992a). In modern cognitive science, the idea is approached as a hypothesis in need of scientific investigation and empirical evidence. Addressing such a vast question is best achieved by selecting a given domain of experience, investigating its available means of expression in different languages, using the cross-linguistic differences identified as foundations for hypothesising how they may then influence conceptual representations of the selected domain (Lucy 1997).

The chosen domain in this study is space, and more specifically, motion (as opposed to locational reference, e.g. Levinson 2003). Motion is an ideal domain of investigation for several reasons, (i) it pervades human experience and is thus an essential domain of conceptualisation and expression, (ii) it is a complex enough domain not to be amenable to neurophysiological determinism (c.f. colour tradition, e.g. Berlin & Kay 1969), (iii) it remains experientially grounded in human and terrestrial physics and hence it may be culturally subjective to a limited extent only (c.f. kinship research, e.g. Danziger 2001), (iv) it is expressed differently across languages, including closely-related ones (c.f. Talmy 1985), and (v) its means of expression reach beyond lexical resources to the sentence and text levels (c.f. Slobin 2004).

This paper begins with an outline of these linguistic differences, with a special focus on English and French. It then addresses methodological issues in relativistic experimentation by reviewing a number of important studies with similar aims to the present research, namely to provide evidence for linguistic relativity in the domain of motion (e.g. Gennari et al. 2002, Papafragou et al. 2002, Finkbeiner et al. 2002, Bohnemeyer et al. 2004, Zlatev & David 2004, 2005). These studies interestingly fail to meet these aims, yet they also fail to agree in their findings. This paper elaborates a discussion explaining this lack of concordance in methodological terms. It also argues that motion conceptualisation independently of language has been ill-researched – if at all – and that the domain remains to be properly analysed and understood prior to relativistic applications. This paper offers a number of innovative studies to cater for such an understanding (Kopecka & Pourcel in prep, Pourcel 2004, 2005). These studies examine the dynamics of motion conceptualisation and suggest that a number of fundamental variables determine the relative cognitive salience of motion dimensions (e.g. manner, path), regardless of the cogniser's native language. These variables include figure animacy and humanness, path telicity, manner force dynamics, and motion causality (Pourcel in prep.).

Based on these conclusions, the present study proceeds to testing linguistic relativity in the domain of motion at a more controlled level of methodological and conceptual understanding. It offers a novel methodology using a motion 'scenario', as opposed to isolated motion events, and compares the linguistic and cognitive performances of 22 English speakers and 25 French

speakers in recall, recognition and inferencing tasks. The data demonstrate that the same motion scenario is not only expressed differently by the two language communities, but that its details and sub-events are also memorised and inferred differently in cognition. Importantly, these differences reflect semantic foregrounding and backgrounding for expressing motion in the two languages. The data is thus strongly suggestive of linguistic relativity effects.

MOTION IN LANGUAGE

The domain of motion contains a number of central conceptual components, including a moving entity, or figure, a spatial reference of displacement, or ground, a directionality entailing motion, or path, and a motion co-event which may be physical, i.e. manner, or causal, i.e. cause (c.f. Talmy 1985). An example of a motion event may thus be:

(1)	the rock	rolled	down	the hill.
	figure	manner	path	ground

These conceptual components are central to the domain of motion and are thus near-systematically expressed in language when relating motion scenes. However, these central components are neither lexically encoded nor syntactically distributed alike across languages. Cross-linguistic variability has been famously documented in Talmy's typological work (e.g. 1985, 1991, 2000). The typology suggests that most of the world's languages follow one of two main patterns in encoding motion events. Languages typically encode figures, paths and grounds. However, they differ in how they encode the concepts of path and manner. Either they frame path in a verb particle, or satellite, and express manner in the main verb – as in English and other Germanic languages, among others, e.g. (1). Or they frame path in the main verb, and leave manner to be encoded in an optional constituent – as in French and other Romance languages, among others, e.g. (2).

(2)	Alicia	a traversé	le pont	à vélo.
	Alicia	*crossed*	*the bridge*	*on a bike.*
	'Alicia cycled across the bridge.'			

Satellite-framing and verb-framing languages further differ in the lexical resources they employ to encode manner and path, and in the codability of those resources. The concept of path is the core schema of motion events (Talmy 1991), and as such is highly codable in both types of languages, though less so in verb forms in satellite languages. The concept of manner, on the other hand, is highly codable in satellite-framing languages only. The difference is not only quantitative, but also qualitative, in that languages such as English afford semantic fine-graining of manner verbs, whereas Romance languages do not. Table 1 illustrates this differential codability with only a few *walk* verb examples.

Table 1. Examples of WALK verbs in English & French.

English	French	English gloss
To drudge	Marcher péniblement	*To walk tediously*
To march	Marcher au pas	*To walk stepping*
To plod	Marcher d'un pas lent	*To walk with a slow step*
To sashay	Marcher d'un pas léger	*To walk with a light step*
To saunter	Marcher d'un pas nonchalant	*To walk with a nonchalant step*
To scoot	Marcher rapidement	*To walk quickly*
To scuttle	Marcher précipitamment	*To walk hurriedly*
To shamble	Marcher en traînant les pieds	*To walk dragging one's feet*
To shuffle	Marcher en traînant les pieds	*To walk dragging one's feet*
To sidle	Marcher de côté, furtivement	*To walk sideways, furtively*
To slink	Marcher sournoisement, honteusement	*To walk with a mean or shameful air*
To slog	Marcher avec effort, d'un pas lourd, avec obstination	*To walk with effort, with a heavy step, with obstinacy*
To sneak	Marcher furtivement	*To walk furtively*
To stalk	Marcher d'un air digne ou menaçant	*To walk with a dignified or threatening air*
To stomp	Marcher d'un pas lourd, bruyant	*To walk with a heavy or noisy step*
To stride	Marcher à grands pas	*To walk with great steps*
To stroll	Marcher sans se presser, nonchalamment	*To walk without hurrying, nonchalantly*
To tiptoe	Marcher sur la pointe des pieds	*To walk on tiptoes*
To toddle	Marcher à pas hésitants	*To walk with hesitating steps*
To traipse	Marcher d'un pas traînant ou errant	*To walk with a dragging step or wandering aimlessly*
To tramp	Marcher d'un pas lourd	*To walk with a heavy step*
To trundle	Marcher lourdement, bruyamment	*To walk with a heavy, or noisy step*
To wade	Marcher laborieusement dans l'eau	*To walk laboriously through water*
To waddle	Marcher comme un canard, en se dandinant	*To walk like a duck, lolloping*
To whiz	Marcher à toute vitesse	*To walk with great speed*

These typological and lexical characteristics engender further differences at the discursive level (c.f. Slobin 2004). The resulting fashions of speaking entail narratives with divergent semantics. English narratives, for instance, emphasise the dynamic, action- and process-oriented aspects of motion scenes; whereas Spanish and French narratives, for instance, emphasise the static, situational and resultative aspects of motion scenes.

LANGUAGE & COGNITION – PREVIOUS RESEARCH

Based on those linguistic differences, cognitive scientists have been interested in querying whether these pervasive patterns and resources influence speakers' cognitive representations of motion events and the relative salience of their schematic components – especially path and manner (e.g. Gennari et al. 2002, Papafragou et al. 2002, Finkbeiner et al. 2002, Bohnemeyer et al. 2004, Zlatev & David 2004, 2005). The question as to whether semantic representations influence non-linguistic cognition, also known as linguistic relativity, has been particularly popular with respect to the domain of motion, given its importance in daily human

communication and conceptualisation, and given the importance of the linguistic differences under consideration.

Previous research has mainly been addressing the cognitive abilities of categorisation and memory. The experimental format of choice has been the use of triadic stimuli, presented with one item as a target, and the other two items as alternates. The categorisation task requires subjects to select one alternate as closer in resemblance to the target. The memory task typically demands of the subjects to recognise stimuli presented in the categorisation task. Given the experimental similarity between previous research, studies should be highly comparable in their findings. This is not the case, however.

Gennari et al. (2002) compared Spanish and English performance, using short videos of human motion events as stimuli. They report a language-independent path bias approximating 60%, meaning that both language groups performed similarly and that no language effect was found. However, they also used a naming-first testing condition, which yielded strong differences between the two groups, in agreement with language patterns. Nevertheless, the authors dismiss linguistic relativity, and suggest that language influences cognition only when speakers choose to use language as a strategic problem-solving tool.

Papafragou et al. (2002) compared Greek and English performance, using static pictures and photographs depicting human motion. They report an equal distribution of path and manner scores, meaning that subjects selected either variable equally as more cognitively salient. Besides, cross-linguistic performance was identical in the categorisation and in the memory tasks. The authors strongly argue against relativity in their conclusions.

Finkbeiner et al. (2002) compared Japanese and English performance, using 3-D computer animations. They report an unequal distribution of path and manner scores in favour of manner. However, both language groups performed similarly, hence the data demonstrate a language-independent manner bias overall.

Bohnemeyer et al. (2004) and Zlatev & David (2004, 2005) compared a high number of satellite and verb framing languages, using a 2-D computer animation in the shape of a smiling tomato. These research teams agree in reporting a language-independent manner bias approximating 60% in all language groups. Like the previous studies, they therefore conclude against linguistic relativity. Note, however, that Zlatev & David (e.g. 2004) do report some ‘mild’ effects when itemising responses as per spatial axis (i.e. vertical vs. horizontal).

In sum, previous research efforts appear to lack in agreement. The one thing they agree on is that motion conceptualisation is not relative to motion encoding in language – either in categorisation or memory. There are a number of problems with the above studies, however, which help explain the glaring divergences. Methodological points, for instance, shed a relative level of uncertainty over the reliability of some of the findings reported. To name but a few, Papafragou et al. used only 8 triads of stimuli, all of a static nature; the tomato experiments used only 12 subjects per language group; Gennari et al. used an unusually high level of control in their testing instructions; etc. Besides, stimuli types differ across studies. They differ, for instance, in the type of figure they display as performing motion. Gennari et

al. is the only study using realistic stimuli for the representation of human motion. Finkbeiner et al. (2002), Bohnemeyer et al. (2004) and Zlatev & David (2004, 2005) obtain results pertaining to the conceptualisation of virtual, imaginary motion. The applicability of findings on virtual tomato motion to human motion conceptualisation is questionable, and this point is important because human motion is the main type of motion conceptualised and expressed in language by speakers. Note too that the latter two teams do not offer a 3-dimensional perspective either. In addition, none of the above studies contextualises motion scenes in real-life settings. All the stimuli used are devoid of contextual relevance. Furthermore, most studies used a very limited number of subjects and testing formats to draw exceedingly important conclusions regarding the relationship between language and cognition. In sum, it is highly possible that diverging methodologies are responsible for a significant portion of the variability in responses. These pieces of research are therefore not transparently comparable.

However, a more central problem pervades the above-reviewed research, which concerns the types of manner being contrasted in triadic stimuli. Recall that the question is to assess which variable between path and manner is more cognitively salient to subjects. A triad may present [manner α + path a] in the target, [manner β + path a] in alternate (1), and [manner α + path b] in alternate (2). If the subject chooses alternate (1), s/he has categorised in terms of path similarity, thus judging path as more cognitively salient than manner; whereas if s/he chooses alternate (2), then the categorisation is in terms of manner similarity, and hence manner is judged more cognitively salient. Now, working with the cross-linguistic differences outlined above, previous research has slotted e.g. *run* and *walk* in the α and β manner types to be contrasted in one triad. In doing so, previous research has acknowledged that satellite languages would encode those manner types centrally in main verbs, whereas verb languages might leave those manner types out in expression. In doing so, however, previous research has also overlooked the fact that verb languages <u>can</u> encode those manner types if desired. Indeed, most languages – including verb-framing ones – do have basic manner verbs such as *walk, run, jump, roll, dance, swim*, and so on. The linguistic difference between verb and satellite framing of motion is not merely structural, but also lexical and discursive – as mentioned above. At the level of manner distinctions, the crucial difference between those languages is that verb framing seldom affords semantic fine-graining of manner types. In other words, previous research has merely shown that Greek, Spanish, Japanese, English, and other speakers are equally able to discern running from walking, or bouncing from rolling, or jumping from tripping, and so on. Referring back to Table 1 above, for instance, it would have been more interesting to contrast α and β manner types pertaining to the same generic type of manner, e.g. types of walking, or types of running, or types of jumping, etc.

These studies highlight one further point. Motion conceptualisation independently of language is an ill-understood domain of experience, which deserves greater attention and further research. Indeed, I wish to suggest and demonstrate that motion conceptualisation is not static across events (let alone across cognisers), and is fundamentally influenced by a number of variables. The variables include (i) figure type, (ii) manner type, (iii) path telicity, and (iv) motion causality.[1]

[1] Evidently, I do not claim that the list is comprehensive.

MOTION IN COGNITION – UNDERSTANDING FIGURE IMPACT

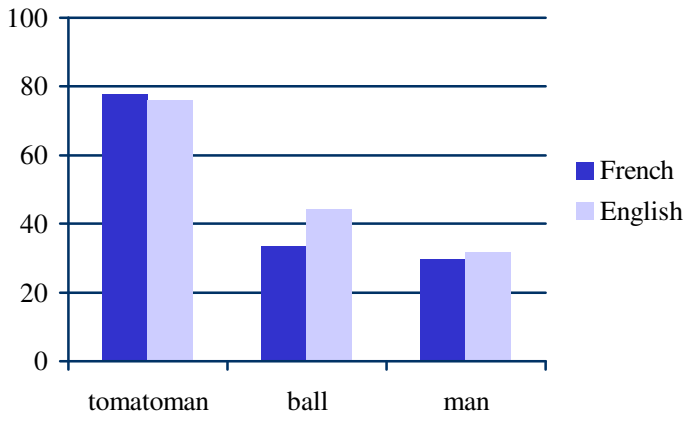
Kopecka & Pourcel (in prep) tested 21 French native speakers and 24 English native speakers to assess the role of figure type in motion conceptualisation. The study investigated categorisation, using triads similar to the ones mentioned in previous research. The triads comprised 3 types of figure:

a. [+animate] [-animate] figure, i.e. the virtual tomato
b. [+animate] [+human] figure, i.e. a human being
c. [-animate] [-human] figure, i.e. a ball

The aim of the study was not to obtain relativistic effects, but to confirm which basic variables influence conceptualisation in a possibly universal fashion. For this purpose, subjects were recruited from verb-framing and satellite-framing languages and generic manner types only were contrasted. 'Default' manner types were used, e.g. rolling/ bouncing for a ball, running/ walking for the human figure, in order to minimise manner type interference. Likewise, only telic path types (i.e. with a clear endpoint) were used to avoid path type interference. The stimuli are thus comparable in terms of path and manner types, but not in terms of figure types. Note that none of the motion scenes displayed caused motion. All were physical motion events.

Results indicate a clear correlation between the relative salience of path and manner and the type of figure – equally across language speakers. Indeed, as shown in Graph 1, human figures encourage a path bias in conceptualising motion, whereas non-human figures (especially virtual ones) encourage manner-focused conceptualisation. These results are in agreement with the results in previous studies, and they help explain the divergences in the findings those studies report.

Graph 1. Figure type: cross-linguistic preferences for manner



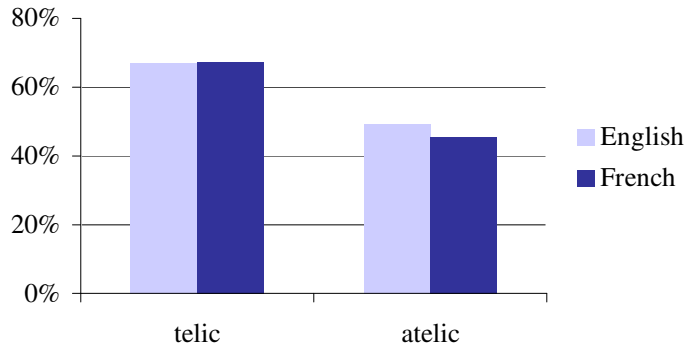
MOTION IN COGNITION – UNDERSTANDING TELICITY, MANNER AND CAUSALITY IMPACTS

Pourcel (2004, 2005) tested 35 French native speakers and 34 English native speakers to assess the role of path, manner and motion type in motion conceptualisation. The study investigated categorisation, using 15 triads similar to the ones mentioned in previous research. The triads comprised one type only of figure, namely human. However, the triads contrasted

d. locative and telic paths, e.g. along vs. across
e. default, forced and instrumental manners, e.g. walk vs. limp vs. cycle
f. caused and physical motion, e.g. X causes Y to undergo motion vs. X undergoes motion

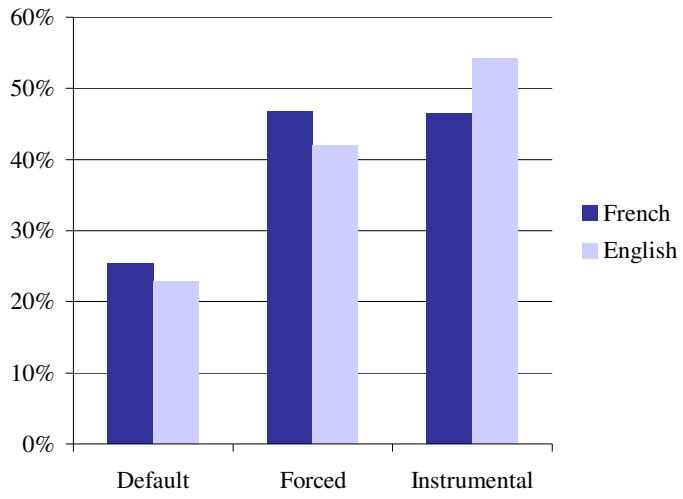
Results indicate a clear correlation between the relative salience of path and manner and the type of path – equally across language speakers. Indeed, as shown in Graph 2, telic paths encourage a path bias in conceptualising motion, whereas locative, or atelic, paths encourage more manner-focused conceptualisation – though the path bias is merely reduced.

Graph 2. Telicity: cross-linguistic preferences for path



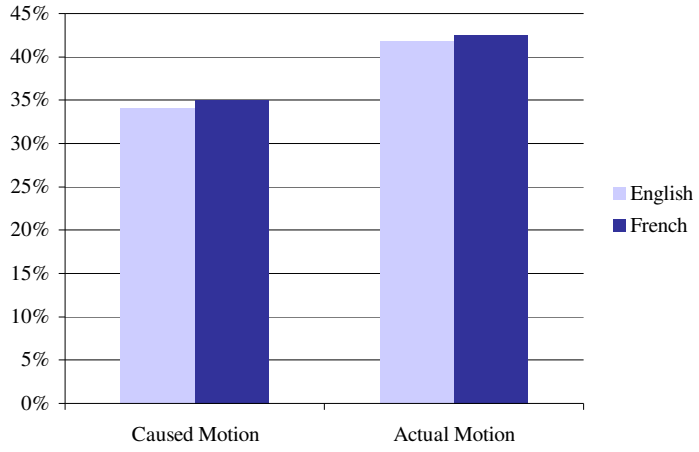
Results further indicate a clear correlation between the relative salience of path and manner and the type of manner – equally across language speakers. Indeed, as shown in Graph 3, default manners encourage a path bias in conceptualising motion, whereas forced and instrumental manners encourage more manner-focused conceptualisation – though the path bias is again merely reduced.

Graph 3. Manner type: cross-linguistic preferences for manner



Finally, results also indicate a correlation between the relative salience of path and manner and the type of motion – equally across language speakers. Indeed, as shown in Graph 4, caused motion encourages a path bias in conceptualising motion, whereas physical motion reduces the path bias.

Graph 4. Motion type: cross-linguistic preferences for manner



The above findings make important suggestions regarding the conceptualisation of motion. Conceptualising motion is not a uniform process across different types of motion scenes. Instead, conceptualisation is fundamentally influenced by the type of figure performing the motion, by the type of path followed, the type of manner and the type of motion itself, i.e. physical or caused. Given these considerations, future research efforts need to re-define their understanding of motion more realistically prior to applying that domain to relativistic hypotheses or other. Before proceeding to the main study reported here, I would like to emphasise the need to decide on the type of motion under focus in research. It is important to ascertain whether we are investigating human motion, object motion, animal motion, virtual motion, or other – as these appear to determine conceptualisation to extents too great to be ignored as superficial. As mentioned above, human motion appears to be the main type of motion conceptualised and related to in language by individuals. The present study will thus focus on human motion.

Methodologically, the studies reviewed are also valuable in highlighting a few extra critical points. First, these studies have approached the study of motion conceptualisation using constructed stimuli with minimal noise. Though the ensuing techniques are clean, they cannot help but de-contextualise the nature of 'real' motion, as it would be naturally conceptualised by subjects. In this sense, it may be important to consider testing conceptualisation of human motion as it occurs in typical instances, that is, within real-life settings rather than out of context, as displayed in photos or short videos. I suggest that the study of motion requires more than motion events; instead, it requires a larger motion *scenario,* or real-life framework in which motion events are embedded and take on significance. A motion scenario would comprise internal schematic diversity, e.g. diversity of paths, fine-graining of manners, and also dimensions external to the motion itself, e.g. agent goals, states, emotions, non-motion events, physiological senses, cultural dynamics. The following section offers an example of one such scenario.

Besides, understanding domain conceptualisation – be it motion or other – is a complex epistemological and experimental process. It seems important therefore to allow for multiple approaches to studying and testing conceptualisation. In relativistic applications, several cognitive functions are hypothesised to be influenced by semantic representations. Such applications therefore demand that more than one cognitive function be tested, e.g. categorisation, memory, recognition, inference. Given the partial only understanding of the human mind currently entertained in cognitive science, it seems crucial to be thorough in one's search for effects across several cognitive processes. Besides, experimental psychology is known for its methodological difficulties, in terms of procedures but also in terms of the reliability of findings. Therefore, it seems advisable to use more than one type of test per cognitive function under examination. Such basic lessons have been made transparent by conclusive research on the linguistic relativity hypothesis and therefore need to be remembered (e.g. Lucy 1992b, Levinson 2003).

LANGUAGE, MOTION & COGNITION – PRESENT RESEARCH

The present study examines human motion in context. To this end, it has used a motion scenario consisting of a 4 ½ minute extract from Charlie Chaplin *City Lights*. The scenario relates a suicide attempt taking place at night on a river bank with two main characters, Charlie Chaplin and a drunken gentleman. In summary, the scenario comprises:

1.	3 figures	Charlie Chaplin, a millionnaire, a policeman
2.	1 location	river bank
3.	several grounds	river, stairs, platform, bench
4.	several props	suitcase, rope, stone, flower, canes, hats
5.	numerous manner types	stumble, stroll, walk, run, limp, jump, climb, sway
6.	numerous path types	around, down, up, into, out of, across
7.	caused and physical motion events	human, object
8.	other events besides motion	talking, crying, smelling flowers, watching
9.	psychological reality (emotions, intentions, goals, states)	fear, anger, joy, panic, surprise, tiredness
10.	cultural reality	symbols, morals, ideologies

The relativistic set of questions this study addresses are

(i) whether French and English subjects conceptualise this same scenario differently, i.e.
   a. whether French and English subjects talk about the scenario differently
   b. whether French and English subjects recall the scenario differently
   c. whether French and English subjects perform inferences relating to the scenario differently

(ii) and if so, how different are their conceptualisations of the scenario

(iii) can the differences in conceptualisation be correlated with the habitual language patterns found in French and in English.

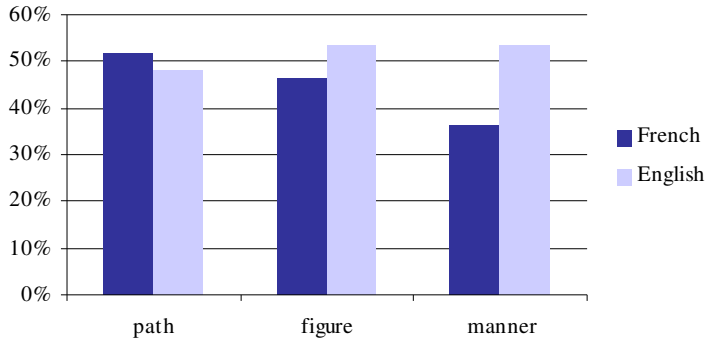
In other words, the relativistic hypothesis does not solely seek effects, but questions the extent of those potential effects. This study thus aims to tackle the relativistic problematic qualitatively.

For this purpose, two sample groups of French and English speakers (N_E=22, N_F=25) were individually observed in immediate free prose recall and late recognition (i.e. 24 hours following visualisation) tasks. Their performance was analysed for memory and inferencing.

Memory

The nature of the data was thus linguistic in format. 47 narratives were obtained from the free prose recall exercise. Narratives were analysed on an information statement-type basis, whereby a statement constitutes one type of conceptual information, e.g. path, figure, emotion, etc. The French narratives elicited 1037 statements (mean M per subject = 41.48), including 548 relating motion information (M=21.92); and the English narratives elicited 947 statements (M=43.05), including 555 relating to motion information (M=25.23). These motion-relating statements usefully confirmed the language differences existing across French and English for expressing motion (see Graph 5).

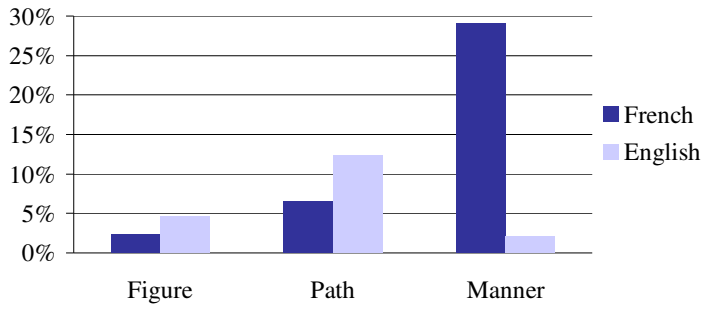
Graph 5. Semantic representations found in cross-linguistic narratives



The narrative data thus confirm the crucial difference between French and English usage concerning the differential expression of manner information. English expresses Manner information to greater extents than French both quantitatively (i.e. Graph 5 suggests an 18 point difference) and qualitatively (i.e. in terms of semantic fine-graining, which is not apparent from the graph).

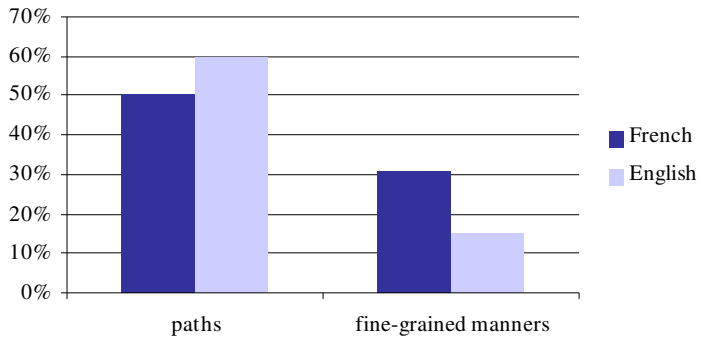
From this template, the narratives were analysed for accuracy of recall. The aim was to monitor for similarities and differences in memory across the two language groups. Importantly, the analysis sought to reveal whether English speakers display better recall of manners of motion than French speakers – in line with language-based predictions in the domain of motion. Error rates strongly support this prediction, as shown in Graph 6, with 29% of the French manner statements being erroneous, as compared to 2.1% of the English manner statements. This difference is particularly interesting when taking into account that English manner statements were found in greater frequency and with greater fine-graining than French manner statements. Note too that an unexpected 6 point difference is apparent for accurate recall of paths of motion, with French subjects making fewer errors on path.

Graph 6. Cross-linguistic error rates in the free prose recall task



Twenty-four hours following stimulus visualisation and the free prose task, subjects were asked to perform a recognition task. This late recall task required subjects to answer 31 questions pertaining to stimulus details, ranging from grounds to props, causes of motion, time, figures, paths and manners. Again, the error analysis sought to reveal whether English speakers display better recall of manners of motion than French speakers – in line with language-based predictions in the domain of motion. Error rates strongly support this prediction, as shown in Graph 7.

Graph 7. Cross-linguistic error rates in the late recognition task



Graph 7 confirms differential memorisation of paths and manners by the French and the English subject sample groups. Interestingly, the path error rates show greater divergence in this task, with a ten point difference, illustrating better path recall by the French. However, the difference of interest rests with manner recall. A significant sixteen point difference is noticeable from Graph 7, pointing again to better recall of manners by English subjects.

The recall analyses have therefore demonstrated that French and English speakers talk differently about motion scenarios, and recall these scenarios differently too. Indeed, the French test sample displays better recall of paths and their endpoints, whereas the English

sample displays considerably better recall of manners of motion. These differences correlate with the conceptual representations receiving linguistic emphasis in each language. This correlation is therefore suggestive of relativistic effects in memory.

An interesting question to contemplate from this suggestive evidence concerns the kinds of entailments that may be drawn from the differences thus far observed. Upon consideration of linguistic data, Slobin (1996: 84) has suggested that "English speakers tend to assert actions, implying results, whereas Spanish speakers assert results, implying actions." Given that we now have preliminary evidence that such may be the case at the cognitive level too, I suggest asking two further questions:

> (a) do English speakers conceptualise motion in more dynamic and processual terms (given the dynamic and temporal dimensions of manners of motion), and
> (b) do French speakers conceptualise motion in more static and resultative terms (given the relative lack of attention to manners and the end-oriented dimension of paths, especially telic ones).

Inference

To examine these broader possibilities, I suggest returning to the Charlie Chaplin narratives for further analysis. Recall that the narratives yielded 1037 French statements and 947 English statements. These statements included objective descriptions and subjective comments. Objective descriptions were submitted to error analysis as they referred to stimulus details whose truth value could be objectively verified. Subjective comments, on the other hand, could not undergo such analysis. The subjectivity present in the narrative proves highly interesting, nonetheless, as these statements were largely inferential in nature. Besides, subjective statements constituted 20% of the total French statements and 15% of the English statements; that is, subjectivity was present to a significant extent in the narratives of both sample groups.

The type of inferences present in the narratives ranged across e.g.

- likely actions (past, imminent, or future), e.g.
  as if he's going to hang himself
- likely results of actions, e.g.
  basically the guy saves Charlie
- likely intentions/ goals, e.g.
  the man wants to kill himself
- likely thoughts, e.g.
  Charlie manages to put two and two together
- likely moods/ states, e.g.
  he's very serious and sad
- likely meanings, e.g.
  sort of says 'good night, how are you?'

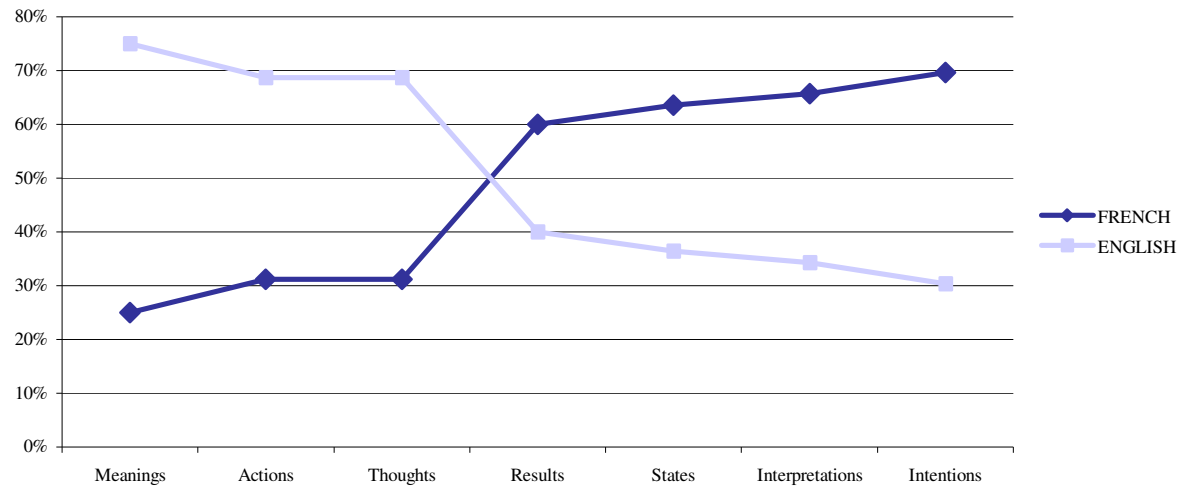
- likely interpretations of others' actions or words, e.g.
  and realisation dawns on him that the man is about to ....
- likely material details, e.g.
  the water must be quite shallow because they don't drown

The kind of information, as illustrated above, that is of an inferential nature is particularly interesting to linguistic relativity, because it offers rich glimpses at habitual ways of thinking about a given scene. These habitual ways of thinking are very individual. But according to the linguistic relativity hypothesis, they should also be partly influenced by the fashions of speaking in particular languages. Indeed, subjective statements may be dispensed of when narrating a tale. Hence, when they are employed, the information they encode reflects information that is highly salient and relevant to the narrator. If, indeed, habitual ways of thinking and of inferring are influenced by habitual ways of speaking, then we may expect that

(1) English speakers might make more inferential statements relating to likely 'active processes', e.g. actions, meanings, thoughts, and
(2) French speakers might make more inferential statements relating to likely 'resultative states', e.g. results of actions, interpretations, intentions, moods and states.

Graph 8 illustrates the distribution of inference types across the narratives of both language groups, and in so doing, suggests that the predictions in (1) and (2) are validated.

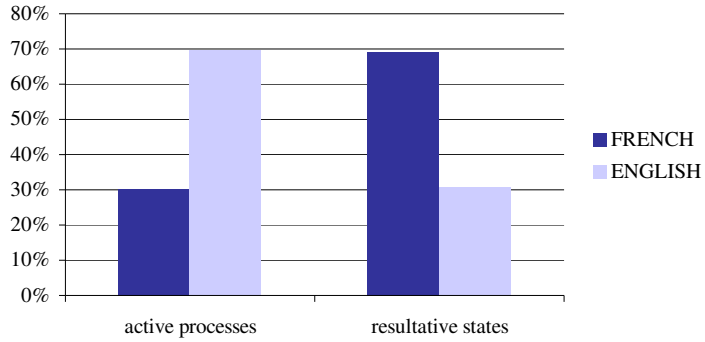
Graph 8. Cross-linguistic distribution of inference types in the narratives



Graph 8 demonstrates that both groups perform inferences in discourse. However, interestingly, each group differs in the type of information it infers. These differences appear

to be quite significant, as shown in Graph 9, where inferences pertaining to 'active processes' and to 'resultative states' respectively are conflated.

Graph 9. Cross-linguistic distribution of active versus resultative inference types



These results suggest considerable differences across the two language groups concerning their habitual ways of conceptualising and inferring motion dimensions. The English group infers information of a more dynamic and processual nature than does the French group, whose inferences relate more readily to the likely results of actions and to agentive mental states.

CONCLUSION

To conclude, this paper has made a number of contributions to the empirical study of relativity in the domain of motion. These contributions have been both methodological and empirical. Importantly, it has suggested that a choice of motion stimulus that takes context into account might better inform realistic conceptualisation than isolated and artificial stimuli. To illustrate this point, this paper has offered an exemplar of a motion scenario, itself consisting of several motion events, yet crucially embedding these motion events within a meaningful environment including other events, agent motivations, action consequences, psychological states, and cultural significance.

Besides, this paper has stressed the importance of domain understanding, independently of language, prior to relativistic applications. In the present study, this has been illustrated via an exploration of the potential universals in motion conceptualisation. Several fundamental motion components were identified to impact on conceptualisation, including figure type, path telicity, manner force dynamics, and motion causality.

Taking this understanding into account, the research reported in this paper has sought to implement a more sophisticated methodological approach to relativity testing than has so far been used in motion research. To this end, it has used a motion scenario to examine motion conceptualisation in memory (both immediate recall and late recognition) and in inferencing.

The results reported have suggested important differences across the experimental groups in linguistic and cognitive terms. To the set of relativistic questions asked earlier in (i)-(iii), we may thus answer as follows:

(iv) French and English subjects conceptualise the same motion scenario differently, i.e.

   a. French and English subjects talk about the scenario differently
   b. French and English subjects recall the scenario differently
   c. French and English subjects perform inferences relating to the scenario differently

(v) significant differences are apparent in their conceptualisations of the scenario, i.e.

   a. French subjects recall paths more accurately and draw more inferences concerning resultative states
   b. English subjects recall manners more accurately and draw more inferences concerning active processes

(vi) the cross-linguistic differences in conceptualisation correlate with the habitual language patterns found in French, which emphasise paths in motion event expression, and found in English, which emphasise attention to both paths and manners in motion event expression.

In other words, the findings reported in this study are strongly suggestive of differing cognitive styles in motion conceptualisation. These cognitive styles parallel linguistic differences very closely, and may thus suggest correlational evidence for linguistic relativity in the domain of motion, across the French and English speaking communities.

Finally, it is important to note that these results are interesting beyond their purport to linguistic relativity; indeed, they are non-negligeable when we consider the pervasiness of motion conceptualisation in daily human lives and also in the multiple conceptual projections based on this domain.

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