Significances (Signifying), 1(2), 33-54.
DOI : https://doi.org/10.52497/signifiances.v1i2.99.

Perspective taking in language : When bodily involvement impacts motion events' descriptions

Aurélie Barnabé[1]

Abstract

*Speakers' linguistic apprehension of the world tends to be circumscribed by the language they use, a language that mirrors speech habits, structured by lexical and morphosyntactic patterns. To this respect, when structuring the domain of space through language, English verbs and satellites foreground the action and background the purpose (*swim across *a river), whereas French linguistic features foreground the aim and background the act (*traverser *la rivière* à la nage*); both linguistic patterns giving hence precisions on the relationship held between the speaker and his body according to what is preferentially highlighted in the language used. These linguistic patterns illustrate the Talmian typology which opposes satellite-framed languages like English, to verb-framed languages like French. To further investigate this typology, distinguishing phrases structured differently to refer to motion events (Talmy, 2000) according to the type of language used, an experiment soliciting English and French spoken corpora aims at demonstrating whether the affiliation of a language to a specific language type (e.g. English as a satellite-framed language) determines or not the embedding of the language examined to this specific affiliation, once the speech is actually implemented in discursive contexts.*

Keywords: Talmy's theory; language embedding; sensorimotor interactions

Résumé

*L'appréhension linguistique des locuteurs du monde tend à être circonscrite par la langue qu'ils utilisent, une langue qui reflète les habitudes de la parole, structurée par des motifs lexicaux et morphosyntaxiques. À cet égard, lors de la structuration du domaine de l'espace à travers la langue, les verbes et les satellites anglais mettent en avant l'action et fondent le but (*swim across *a river), alors que les schémas linguistiques du français mettent en avant le but et placent l'action en arrière-plan (*traverser *la rivière* à la nage*) ; les deux modèles linguistiques donnent donc des précisions sur la relation entre le locuteur et son corps selon ce qui est préférentiellement mis en évidence dans la langue utilisée. Ces modèles linguistiques illustrent la typologie talmienne qui oppose les* satellite-framed languages *comme l'anglais, aux* verb-framed languages *comme le français. Pour approfondir cette typologie, on distingue les phrases différemment pour se référer à des événements de mouvement (Talmy, 2000) selon le type de langue utilisé, une expérience sollicitant des « corps parlants » anglais et français vise à démontrer si l'affiliation d'une langue à un type de langue spécifique (par exemple, l'anglais en tant que langue satellitaire) détermine ou non l'incorporation de la langue examinée à cette affiliation spécifique, une fois que le discours est effectivement mis en œuvre dans des contextes discursifs.*

Mots-clés : Théorie de Talmy ; incorporation de la langue ; interactions sensorimotrices ; *repraesentare*

[1] Clermont Auvergne University, France. Laboratoire de Recherche sur le Langage (EA 999). E-mail : aurelie.barnabe@uca.fr.

Introduction

This article examines linguistic perspective-taking in English and French spoken corpora to identify the perspectives adopted by speakers when delineating motion phenomena within a spatial environment. In their descriptions, speakers are meant to depict entities moving along paths, in contexts in which participants are submitted to different physical constraints pertaining to bodily experience. This experiment investigates the data collected after interviewing 60 French and English 20 year-old speakers and 60 French children from six to ten years old. Descriptions are scrutinized through marks identifying speakers' embodied and non-embodied perspectives in a contrastive perspective, underlining the differences occurring with speakers' age difference.

This experiment relies on the dichotomy that opposes English as a satellite-framed language [S-language[2]] and French as a verb-framed language [V-language[3]] (Talmy 2000a; Matsumoto, 1996a; Slobin, 2004), also known as the Talmian typology (Talmy 2000a). This typology illustrates a dynamic approach of syntax in cognitive linguistics as it refers to two perception processes: satellite-framed languages (Slobin 2003, 2004) specify manner of motion through the verb's semantics (e.g. *the bird hopped into the room*), which then gives us access to a particular representation of space, considered through the embodied simulated act of motion. In comparison, verb-framed languages (Slobin 1996a, 2004) highlight the aim of motion through the verb (e.g. *l'oiseau entra dans la pièce en sautillant*), the target (e.g. *entra*) preceding the act of motion (e.g. *en sautillant*).

In this study, focusing on linguistic structuring of perspectives when delineating motion phenomena, we are assessing speakers' syntactic and lexical approach to reveal perspective-taking. The prominence of the body being central in satellite-framed languages like English through the verb semantics (with the embodied simulated act of motion), as compared to verb-framed languages like French, we are wondering whether the dichotomy that opposes both languages remains through the lexical and syntactic approach to refer to perspective.

The depictions collected to this effect are presented as follows: (i) a first group of accounts reveals the participants' descriptions after experiencing motion while (ii) a second assortment of reports corresponds to the speakers' depictions performed after a *stationary experience*[4]. Recent experiments tested the hypothesis according to which sensorimotor processes contribute to elaborating meaning and hence influence linguistic data (Barnabé, 2015). If several experiments dealt with the link between language and action (Zwaan & Taylor, 2006) and the role of sensorimotor processing in semantics (Meteyard *et al*., 2012), the above-mentioned hypothesis has not been tested though some other linguistic experimental work assessing the effects of sensorimotor processes on language use. Consequently, the hypothesis first dealt with in Barnabé's research (2015) is further examined through the experiments related to perspective-taking in the present paper.

This hypothesis, examined through *experienced-based* corpora demonstrates that the speaker is apprehended, not as representing the world, but as *enacting* it. Indeed, the speaker's body and the sensorimotor apparatus are at stake in the concerns of this experiment and the data collected are not interpreted as the *representation* of the body in the cognitive sense, but as a processual system of action contributing to *repraesentare* in the Latin sense ("making

[2] Satellite-framed languages include English, German, Dutch, Celtic, Russian, Mandarin, Slavic, Chinese, Finno-ugric languages, Ojibwa, and Warlpiri.
[3] Verb-framed languages comprise Spanish, French, Italian, Turkish, Hebrew, Korean, Japanese, Greek, Tamil, Semitic, Turkic, Basque, Polynesian, Bantu, a few Mayan languages and Nez Perce language.
[4] Both types of experiments are further detailed in section *I.1.* below.

present") the linguistic fact. Focusing on the actual effects sensorimotor processes can have on linguistic data, language is not scrutinised through the standpoint of representation through the cognitive paradigm, but it is apprehended through the enactive paradigm. Cognitivism refers to a spectatorial conception of language, a conception in which the speaker – as an observer of the external world – internally apprehends the world through a psychological representationalist device encoded through language forms (lexical items, syntactic constructions etc.).

On the other hand, enactivism sees the agent as a dynamic living organism that will engage bodily in physical matter, produce perturbation on both sides (interiority and exteriority) with action and engagement constituting the world that is being brought forth, including the subject herself, emerging from a pre-subjective agent. Enactivism has an actorial conception of the emerging subject. This paradigm suggests an embodied theory of language in which the emergence of meaning results from heterogeneous criteria among which bodily parameters, linguistic and non-linguistic variables (Varela *et al.*, 1993). The hypothesis defended in this paper – according to which the experiential and sensorimotor dimensions contribute to structuring and elaborating linguistic meaning – is located at the crossroads of the two paradigms aforementioned: cognitivism and enactivism, which are normally considered as incompatible.

This experimentation is an attempt or a step forward to bridge the gap between the two approaches. Previous experiments (Barnabé, 2015) demonstrate that speakers' multisensory bodily sensations can modify the linguistic structuring of motion phenomena, hence promoting a language directly tied to the body. This experimentation's data examine the effects of speakers' multimodal perceptions on their linguistic identification of the perspectives adopted when depicting motion phenomena. Through this experiment, we wonder to which extent speakers' bodily involvement initiating their descriptions can be correlatively mirrored in their speech acts. The role of the body being at stake in the experiments performed, the enactive background is exposed and discussed in the following sections while observing the results gathered. The latter constitute a preliminary outcome of some novel experimentation.

In the first part of this article, the methodology of the experiment and the concerns considered are exposed. In the second section, the egocentric perspective and the ambiguity it underlies are explored through prepositional phrases. The neurological fact designated by "mirror matching" (Grèzes *et al.*, 200 3; Decety, 2002) is defined and the corpora demonstrate how this phenomenon can be enacted through linguistic items. In the third part, reference frames correlating with perspectives are exemplified through some of the corpora's samples. Statistics indicate whether speakers favour some perspective(s) in their reports. In the last section, the ambiguous usage of the self-referential pronoun "I" is displayed, and the data considered identify the way speakers' proprioceptive load can be enacted through the linguistic structuring of their depictions.

1. The Talmian typology examined through *experienced-based* corpora

1.1. Embodiment revealed in spatial description: Methodology

Previous studies (Slobin, 1996a, 2004; Matsumoto, 1996) showed that motion events (Talmy, 2000a) are parsed differently when encoded through French, as a verb-framed language or when structured through English, as a satellite-framed language. Both syntactic patterns illustrate the dichotomy epitomized through the Talmian typology (Talmy, 2000a). The selected dichotomy is not scrutinized through the divergent syntactic patterns French and English data usually display. Both languages' depictions are here explored through the perspectives identified by space markers in the reports collected. This experimentation relies on the hypothesis according to which speakers' sensorimotor processes can have significant effects on the linguistic arrangement of path descriptions; they are hence most likely to bias the perspective(s) adopted by speakers when depicting motion phenomena.

The concept of *embodiment* is emphasized to see the extent to which depictions can be loaded with body references, which do not correspond to the *representation* of the body in the cognitive sense, as aforementioned. The *embodiment* we are dealing with does not refer to the binary, mental, symbolical copy of experience. This concept is explored through the significant role played by the body in speech acts, hence tackling issues pertaining to non-verbal parameters. The experiential protocol defining the experimentation is exposed as follows:

Different experiments are submitted to 60 French and English 20-year-old participants[5] and to 60 French children[6] who are between six and ten years old. Each experiment involves the presence of two participants: one listening to audio-taped instructions (cf. Table 1) meant to guide her way through the settings in a spatial environment while the second is asked to describe the motion of the first. Whatever the speakers' age and the native language used, all participants listen to exactly the same commands[7]. The latter are meant to make the first participant[8] go through a couple of paths in a room and through various entities scattered on the floor.

At the beginning of the experiment, the first participant – participant 1– is to get inside a hoop that marks the starting point of the experiment. Six commands then direct her movement (cf. Table 1: column entitled "Order") in the room. While some instructions charge participants to follow one path only, other directives make them go through two itineraries (cf. column entitled "Paths to follow"):

[5] The participants volunteered to take part to the descriptive task suggested. The experiment, achieved in 2014, takes into account 30 French descriptions and 30 English reports delivered by native individuals studying English and French at university.

[6] This test, performed in 2016, will be compared to a similar experiment planned to occur with English-speaking children in 2017.

[7] English commands – presented in Table 1 – are translated into French for French speakers (cf. Appendix, TABLE 1'). If directives are phrased through simpler syntactic structures for children, the motion events to be performed are the same, compared to the motion phenomena required when soliciting adults.

[8] In the article, participants expected to narrate their partners' motion performance are referred to as *speakers* or *observers*, while those achieving the spatial progress are qualified as *agents* or *partners*.

order [1]	Paths to follow [2]	Paths [3]	INSTRUCTIONS
1	1	1	First, you will follow the blue path and pick up 2 different-coloured balls.
	1	2	You're going to set the balls down in the orange hoop that is next to the umbrella.
2	2	3-4	Next, you will get back inside the hoop where you started and follow the white path. Once again, you will pick up 2 different-coloured balls.
	1	5	And you're going to set the balls down in the orange hoop that is next to the umbrella.
3	2	6-7	Next, you will get back inside the hoop where you started and follow the yellow path. You'll choose one of the 2 balls at the end of the path
	1	8	which you will set down in the orange hoop beside the umbrella.
4	2	9-10	Next, you will get back inside the hoop where you started and you will walk beside the ropes and pick up 2 objects of your choice.
	1	11	You will put them down in the hoop next to the umbrella.
5	1	12	Then, from the hoop next to the umbrella, you will follow the orange path. You'll choose one of the 2 Frisbees at the end of the path,
	1	13	which you will set down in the hoop next to the umbrella.
6	2	14	Finally, you will be back in the hoop that marks the starting point. You will pick it up and put it on the table of your choice.

Table 1: Instructions of the experiment

[1] Order of instruction
[2] Number of paths to follow per instruction
[3] Total of the paths to follow in the experiment

The present experimentation is divided into two sub-experiments, i.e. *Test n°1* and *Test n°2*, as developed in the following section.

1.2. "Dynamic" and "static" descriptions

In the first test, "participant 1" and "participant 2" both listen to the aforementioned audiotaped instructions. "Participant 1" has to walk along fifteen paths. Once she has finished moving along the paths, "participant 2" is then expected to imitate the spatial progress performed by "participant 1". The latter is then charged to describe the spatial progress

experienced by "participant 2". Consequently, "participant 1" – asked to walk along fifteen itineraries – is then made to depict the motion performance of "participant 2" along the identical paths she went through before. Thus, "participant 1" goes through a dynamic bodily experience *before* describing her partner's progress. The description delivered by "participant 1" is hence qualified as *dynamic*; her depiction being initiated by a dynamic bodily experience.

In the second test, "participant 1" only listens to the aforementioned audiotaped directives, which are meant to make her progress along fifteen paths. Before she starts, "participant 2", unaware of the motion occurrences "participant 1" has to perform, is asked to depict her partner's spatial progress[9]. Consequently, "participant 2" has to describe the itineraries "participant 1" follows *without* going through a dynamic bodily experience before, which targets the "static" feature of this test.

Half of the depictions collected display data resulting from speakers experiencing dynamic bodily postures before narrating agents' motion performance, hence illustrating *dynamic* descriptions. Correlatively, the other half exhibits corpora highlighting participants going through a stationary bodily experience before describing their partners' physical acts, hence representing *static* delineations. Seeking to demonstrate whether static or dynamic bodily experience brings about effects on the perspective adopted by speakers to structure motion events represents a non-linguistic variable. The next section explores the extent to which bodily experience initiating the depictions impacts on speaker's selection of perspectives.

2. The ambiguity of egocentric perspective(s) revealed through prepositional phrases

2.1. Perspectives: definition

A perspective refers to a specific point of view and it implies the knowledge that someone else may have a different viewpoint. Perspective is not necessarily mental. Apes deliberately change their position to be able to look around obstacles and share what a human experimenter can see (Tomasello *et al*., 1998). This reflects the basic understanding that a physical or mental effort is sometimes necessary to understand someone else's view of the world (Frith & Frith, 2007). One does not always have to physically change one's location to achieve someone else's alignment. Instead, one can simply imagine it, for example, in another location, i.e., outside our own body through a mental operation to imagine someone else's perspective (Kessler and Rutherford, 2010).

Such mental operation corresponds to a process of movement simulation of one's body rotation. Perspective-taking hence requires different types of efforts. It accordingly requests the use of various linguistic units to identify diverse viewpoints, as demonstrated in the next section. There are different Embodied Cognition accounts of language processing, and researchers in this field place varying importance on the role of sensorimotor processing in semantics (Meteyard *et al*., 2012).

In the experiment, the spatial environment to be described relies on situation models: they represent the integration of knowledge about events and situations into a coherent, existing

[9] In both tests, the speaker made to describe her partner's motion is unaware of the target of the experiment. Once the investigation done, her willingness to cooperate to the linguistic project is guaranteed through an official certificate.

framework (*ibid.*). These models reveal the basis for language simulations, through which speakers linguistically adopt particular perspectives. Language simulations are related to mental simulations, concerned with the online action-perspective taking about a particular act (Zwaan, 2008). Situation models and language simulations define features of embodied theories of language (Beveridge and Pickering, 2013).

Language simulations used to describe motion events offer two perspectives: spatial-perspective and action-perspective. Spatial-perspective taking corresponds to the perspective through which speakers conceive spatial relations, while action-perspective coincides with the perspective through which speakers simulate a described action, as if they were performing that action. The "nesting" of action simulations within situation models is what links spatial- and action-perspective taking in language (*ibid.*).

Language simulations favour the use of an embodied perspective, namely an "embodied" process in the sense that it relies on the posture and action repertoire of the body (Kessler and Rutherford, 2010). Embodiment is here scrutinized through the use of pronouns and articles inserted in prepositional phrases in the depictions analysed. This study aims at specifying from whose perspective the actions attended by speakers are linguistically simulated. The following perspectives can be qualified as embodied:

(1) [23] He is then picking up the balls situated *to his left*. [BrE, 16] [10]

(2) [15] Elle repart *sur sa droite* vers le chemin blanc [FR, 3]

In (1) and (2), the agents' body is at issue through the determiners *his* and *sa*, inserted in the prepositional phrases (PP) *to his left* (cf. (1)) and *sur sa droite* (cf. (2)). In this sense, speakers' perspectives to structure motion phenomena exhibit embodied features.

2.2. From *ego-centred* to *partner-centred* viewpoints: the case of "mirror matching"

Embodied theories of language often make the narrow assumption that describing actions involves adopting the perspective of the agent performing that action. It has been argued that language users can adopt embodied action-perspectives other than that of the agent, including that of an observer (Beveridge & Pickering, 2013). This question is at issue in the depictions considered: does the action depicted mostly correlate with the speaker's perspective if she imagined herself performing it, or are the acts described from agents' viewpoints? Theories of action understanding have argued that the same mental representations are involved in both performing and perceiving actions (Prinz & Hommel, 2002). These mental representations appear to be enacted through binary linguistic representations when speakers depict agents' motion performance, as they alternatively resort to ego-centred[11] and partner-centred perspectives. Occurrences (3) and (4) exemplify this binary process:

(3) [13] Il les place au fond de la salle *sur sa droite* juste *devant lui*. [FR, 6]

(4) [8] She's picking up the two novels around the white path *to my right*. [AmE, 28]

The perspectives displayed in both occurrences are embodied, but the body reference differs in (3) and (4). Instance (3) targets the perspective adopted by the agent (cf. *sa droite, devant lui*), while occurrence (4) reveals the *speaker-centred* perspective (cf. *to my right*). This

[10] The examples extracted from speakers' descriptions are all preceded by a figure as in "[23]" (cf. (1)), corresponding to the 23rd clause uttered by the speaker. The depictions' clauses have been separated and numbered to make the analysis easier. At the end of each clause, the type of language used is specified through "BrE" for British English, "AmE" for American English, and "FR" for French. The last number between brackets (cf. [BrE, 16]) refers to the order of speakers interviewed.

[11] The "ego" here considered correlates with the speaker's.

observation highlights speakers' linguistic intermingling of ego-centred and partner-centred perspectives within the depictions. Although agents' perspectives seem in many cases the most natural candidates (cf. (3)), other perspectives are often adopted (*Ibid.*), as illustrated by occurrence (4). More complex instances exemplify the blending of several perspectives within a sentence:

(5) [18] She is moving to the left,

[19] going through the blue path,

[20] and picking up the book in front of her. [BrE, 22].

In clause [18], *the left* corresponds to the speaker's, but *this left* differs from the agent's *left* when described by the speaker. However, in clause[20], *in front of her* unambiguously targets the agent's *front*.

The data demonstrate that speakers tend to favour their own perspective. In depictions revealing language users' combination of both viewpoints, an average of 61% of French and English reports highlight speakers' preference for their own perspective, with a majority of PP identifying the entities they are depicting situated relative to their own body. This observation concerns both languages examined, as evidenced by Table 2, which takes into account 60 French and English descriptions[12]:

	PP indicating speaker-centred perspective	PP indicating partner-centred perspective
English	68%	32%
French	54%	46%

Table 2: *ego-centred* and *partner-centred* perspectives revealed through prepositional phrases in English and in French
(PP: Prepositional Phrases)

The data exhibited in Table 2 expose the ratio of PP targeting ego-centred and partner-centred perspectives in French and English accounts.

Describing motion in space necessarily establishes a link between perceptual and motor systems. Such findings are echoed by recent neurological research showing evidence of "mirror matching", where regions of the motor system that are activated when performing an action are also activated when passively perceiving an action (Grèzes *et al.*, 2003). Much research argues that the perceiver of an action mentally simulates executing that action herself (Decety, 2002). This simulation theory has counterparts in simulation theories of mind that propose that understanding another person involves simulating their mental activity (Gallese & Goldman, 1998). The corpora demonstrate that the simulation theory occurring at a mental level accordingly seems to arise at a linguistic level. The next section develops the extent to which "mirror matching" is echoed in linguistic facts.

[12] Children's corpora are not considered in this analysis.

2.3. The ambiguity of the egocentric perspective

In the descriptions collected, the issue examined pertains to the way speakers' linguistic items conform to their perspective, to agents', or to both. When starting the descriptions, speakers and agents adopt the same perspective, considering their physical posture in the visual display they are situated in. In most cases, once the agent starts her motion performance (cf. Table 1), the speaker's first occurrences are phrased through her perspective, which naturally matches the agent's:

(6) [13] She's picking up a ball on the right. [BrE, 20]

In (6), the speaker's *right* coincides with the agent's *right*, hence the PP *on the right* revealing both participants' identical visual alignments. The embodied perspective here targets the speaker's and the agent's viewpoints. The viewpoint adopted can be said to refer to the "egocentric perspective", but with some ambiguity related to the accurate *ego*'s identity, as *the* does not precisely spotlight the speaker's or the agent's *ego*.
Occurrence (7) also illustrates the egocentric perspective, which slightly differs from the one in (6). For this reason, we will not refer to "the" egocentric perspective in the following examples, but to sub-egocentric perspectives, linguistically exemplified as follows:

(7) [9] He's picking up a book on his left hand side. [GB, 29]

This occurrence refers to the agent's perspective, as evidenced by the possessive determiner *his*, implying that the speaker adapted his description to the agent's bodily posture and revealed her partner's egocentric perspective. At this stage of the experiment, the agent's *left hand side* still coincides with the speaker's *left hand side*. So if the speaker had uttered "He's picking up a book on *the* left hand side", as in (6), the sentence would actually not have differed from (7) considering both participants' perspectives singled out. Occurrences (6) and (7) evince the ambivalent use of the term "egocentric" when applied to perspectives: if the speaker's egocentric perspective reciprocally corresponds to that of the agent (cf. (6), (7)), these identical viewpoints are not necessarily expressed through equivalent linguistic items as two *egos* are identified.

The following occurrence enhances the ambiguity of the term "egocentric" related to perspectives:

(8) [18] She's picking up a Frisbee on the left. [AmE, 28]

In (8), *the left* equals the speaker's left, the PP *on the left* hence conforming to the speaker's viewpoint and diagnosing her egocentric perspective. But *the left* pinpointed by the speaker does not match the agent's left. At this stage of the experiment, the Frisbee that has to be picked up involves the rotation of the agent's body, and once her body rotated, the Frisbee is located *in front of her* (but not *to her left*). Occurrence (8) indicates that the speaker linguistically sticks to her egocentric perspective but does not adapt to the agent's. The same scene is narrated by all speakers who alternatively depict it with occurrences identical to (8) and with differently structured instances, as in:

(9) [19] Paul is picking up a Frisbee located in front of him. [BrE, 15]

Example (9) features similar visual details exposed in (8). But speakers and agents' visual alignments necessarily vary because of the agents' body rotation; so speakers' perspectives cannot correlate with agents' viewpoints throughout the experiment. Agents' body rotation seems to impose a mental effort relative to observers' spatial conceptualization of the scene at a pre-linguistic level since speakers' reports manifest linguistic intermingling of both egocentric perspectives. If the latter are targeted as "egocentric", the specific *ego* spotlighted has to be mentioned so that one knows whose perspective is dealt with. Instances (8) and (9)

exemplify the binary process underlain by perception and action, linguistically revealed by speakers.

Instances (6) and (8) highlight the ambiguity exhibited by the "egocentric perspective", disclosed through both examples' use of the article *the*, which neutralizes the ego signified by the speaker. Table 3 shows the ratio of PP structured with the English and French articles *the* and *le/la/les*, which either target speakers' egocentric perspective or rather identify agents' viewpoint.

	PP targeting *SPEAKER-CENTRED PERSPECTIVE*	PP targeting *PARTNER-CENTRED PERSPECTIVE*
English *"the"*	53%	47%
French *"le/la /les"*	58,5%	41,5%

Table 3: ego-centred and partner-centred perspectives revealed through PP exhibiting "the" in English and "le/la/les" in French
(PP: Prepositional Phrases)

A majority of PP inserted in descriptions reveals speakers' egocentric perspective in English and French. Conversely, in situations where an observer depicts an agent's actions, it has been argued that an internal simulation of the described action is transcribed through language, as if the observer were performing that action herself (Borghi & Scorolli, 2009). The assumption according to which the "egocentric" perspective correlates with the agent's perspective (Beveridge & Pickering, 2013: 577) is hence challenged at a linguistic degree. If the link between language processing and sensorimotor activation (Meteyard *et al.*, 2012) exists, the data show that depictions of agents' motion performance are not automatically captured through agents' perspective since speakers' viewpoints are also taken into account. Perspectives appear to be also conveyed through non-embodied lines of sight, as developed in the next section.

3. Perspectives and their corresponding reference frames

3.1. Egocentric and allocentric references

Perspectives adopted by speakers correlatively coincide with the use of linguistic reference frames (Berthoz, 1997). Levinson distinguished three of them, among which the intrinsic, the absolute, and the relative reference frame (Levinson, 2003). In intrinsic reference frames, the position of an object is described relative to a reference object (e.g. *The window is above the door*). In absolute reference frames, the position of an object is described in terms of stable environmental features (e.g. *The ship is south of the island*). Within relative reference frames (e.g. *The car is to my left*), one can adopt an egocentric or an allocentric perspective (Beveridge & Pickering, 2013). The terms egocentric and allocentric have well-established meanings in the spatial literature: egocentric means conceptualizing space from your own point of view, and allocentric signifies conceptualizing space from another's point of view (Berthoz, 2013).

Alternative uses of intrinsic and relative reference frames are observed in speakers' reports. This section mainly spotlights the perspectives adopted by speakers selecting relative reference frames, hence singling out egocentric or allocentric perspectives. In the literature on Embodied Cognition, researchers often use egocentric to refer to *putting oneself in someone else's shoes* (Beveridge and Pickering, 2013). The term "egocentric" tells us that speakers are putting themselves in somebody else's shoes, but crucially not whose shoes (*Ibid.*), as demonstrated by occurrences in section 2.3.

Similarly, researchers often speak of "situated simulations" (Marino *et al.*, 2012) or "sensorimotor experience" (Pecher *et al.*, 2009) without specifying from whose perspective this simulation or resonance occurs. Such theories account for our manual examination of the data's perspectives which cannot be labelled as "egocentric", relying on PP like *on the right-hand side*, which alternatively matches the speaker's *right* or the agent's, as in:

(10) [7] There's an umbrella in front of her, on the right-hand side, located next to the windows. [AmE, 3]

In (10), *in front of her* identifies the agent's perspective. The observer hence considers her partner's body to locate the *umbrella* and thus linguistically display the agent's line of sight. But the detail the speaker adds (i.e. *on the right-hand side*) correlates with her own *right*, the PP hence sticking to the speaker's egocentric perspective. The PP *next to the windows* represents a third topological indication that equates with the intrinsic reference frame. The *umbrella* is actually located relative to the distance separating it from entities included in the spatial area, i.e. *the windows*. The PP *next to the windows* is hence revealed through a non-embodied perspective equalling an intrinsic reference frame.
Occurrence (10) exemplifies the combination of three reference frames within a single clause: the reference frame correlating with the speaker's egocentric perspective, the one matching the agent's viewpoint, and an intrinsic reference frame. Egocentric perspective can hence be plural, alternatively targeting speakers' and agents' visual alignment, thus displaying *sub-egocentric* perspectives. It further demonstrates that perspective-taking can vary within a single occurrence through alternative embodied and non-embodied viewpoints.

3.2. Does speakers' linguistic processing subserve preferred perspectives?

As speakers adopt various types of perspectives within single clauses and hence within single descriptions, we may wonder whether their reports favor specific perspectives. As previously mentioned, many embodied accounts of language assume that if a perspective is adopted for action language, the agent's perspective tends to be selected in priority (Wu and Barsalou, 2009). It actually seems to be the case in the starting lines of each description, whatever the language used and whatever the speakers' age.

As aforementioned, in the first instructions (cf. Table 1), agents and speakers are identically positioned in the room, hence sharing similar perspectives. Every act agents perform are hence narrated through the observers' viewpoint, the latter necessarily matching the agent's. But from the fourth instruction onwards (*idem*), the directives requested to agents impose the rotation of their body. Consequently, while keeping on depicting agents, speakers either stick to their perspectives or adapt their language processing to the agents' body rotation. The mental switch achieved by their internal spatial map is hence linguistically enacted through the selection of prepositional units conforming to the agents' viewpoint. In this case, PP used like *in front of him* (cf. 2.3, (9)) uncovers the ambiguity left through phrases including articles like *the* (cf. 2.3, (8)).

But the data include very few accounts reporting agent's physical acts in a correspondingly linguistic, adjustable way. Table 4 displays the ratio of French and English reports perfectly matching the partners' perspective: 4% of the depictions only are featured by this linguistic pattern in English against 7% of them in French. Adopting the linguistic, reciprocal, embodied agents' perspective seems to be easily processed at the beginning of the description, when the observer's perspective and the agents' are aligned. But sticking to the agent's viewpoint without changing position herself makes it seemingly difficult for the speaker to keep an accurate linguistic depiction fixed on the agent's perspective. Likewise, only 14% of English reports are communicated through the exclusive speakers' perspective, against 20% of them in French.

	1. SPEAKERS' PERSPECTIVE	2. PARTNERS' PERSPECTIVE	3. PERSPECTIVES' BLEND	Total
ENGLISH	4	1	25	30
ENGLISH	14%	4%	82%	100%
FRENCH	6	2	22	30
FRENCH	20%	7%	73%	100%

Table 4: French and English descriptions correlating with (1) agents' embodied or (2) speakers' embodied perspective and (3) reports blending embodied and non-embodied perspectives

"Total" corresponds to the whole descriptions examined, i.e. 30 English reports and 30 French accounts.

What the table mainly highlights is the blend of perspectives (cf. [3]), which identify embodied[13] and non-embodied[14] viewpoints. The combination of perspectives is reported through a majority of descriptions in both languages, with 82% of English accounts against 73% of them in French; suggesting that speakers mostly intermingle perspectives in their reports. While attending similar scenes, some speakers tend to stick to the agents' perspective (cf. [2]) whereas others keep fixed on theirs (cf. [1]), but this situation rarely occurs since most observers continuously select alternative viewpoints (cf. [3]), with a preference for speaker-centred perspectives (cf. 2.3., Table 3), also used with intrinsic reference frames (cf. 3.1). The assumption according to which observers' depictions of agents' motion events rely on the agents' perspective exclusively is hence not warranted at a linguistic level, and speakers do not seem to favour particular perspectives. Perspective-taking appears be a flexible process, specifically when dealing with egocentric perspective.

3.3. The ambiguity of the personal pronoun "je" in French

A particular example illustrating this flexible process is manifested through children's ambiguous use of the personal pronoun "je" in French. Evidence that language users mostly

[13] i.e. *speaker-centred* and *partner-centred* perspectives.
[14] i.e. intrinsic reference frames.

tend to employ the agents' perspective (Pulvermüller, 2005) tackles the issue related to the personal pronouns speakers resort to when depicting agents' physical acts. The personal pronoun "il" or "elle" should be expected by French speakers depicting their partners' performance.

Surprisingly, French children's corpora reveal a tripartite reference when reporting agents' physical acts through the pronouns "il", "elle" and "je". This threefold pronominal mentioning first engenders issues pertaining to the accurate referent of the acts depicted; it secondly divulges the unexpected feature related to the usage of the personal pronoun "je", recurrently used in some depictions. Alternative personal pronouns can be observed within single depictions, as in:

(11) [4] Marie ramasse le ballon par terre,

[9] Je ramasse les deux livres posés à côté du chemin,

[12] Puis elle prend un Frisbee posé au sol. [FR, 8]

The peculiarity of (11) pertains to the ambiguous pointing at the subject element. The agent performing the various acts is manifestly called *Marie* (cf. clause [4]); her identity being echoed through the personal pronoun *elle* in clause [12]. But in clause [9], the seven-year-old child surprisingly refers to her partner's action (i.e. *Marie*) through the first-person pronoun *Je*, hence giving the impression to the hearer that the speaker herself is actually involved in the experiment. Consequently, one may wonder what triggers the speaker's use of the self-referential pronoun "je". It can be noted that the child describing the agent's acts first identified her partner through her accurate name, i.e. *Marie* (c.f. clause[4]).

These considerations attest that some children simulate the described actions from an egocentric perspective[15], while concurrently targeting their partners' viewpoint through third-person pronouns; and the whole pronouns used unexpectedly refer to the same individual. This linguistic reaction reveals the simulation of speakers attending agents' performances they are meant to describe. This phenomenon echoes the theory of "mirror matching" (cf. 2.3), which evidences that the link between perception and action affects our ability both to perceive stimuli and to perform actions (Kilner *et al.*, 2003). This binary process of perceiving acts and potentially performing them seems to be enacted through children's unexpected insertion of the self-referential pronoun "je" within some depictions.

The simulation effects underlain by "mirror matching" hence appear to concurrently affect children's speech linearity. This fact once again suggests that the third-person agents' motor representation of action language is not activated automatically. Children may sometimes omit the context and guidelines of the descriptive task, hence substituting the expected "il" or "elle" for the self-referential "je". A couple of reasons could be considered to account for this linguistic phenomenon, which can first be justified through the speakers' age. Actually, this process of linguistic simulation only concerns six- and seven-year-old children.

The pronouns' use may be presumed to vary according to a non-verbal variable. Pronouns' change within a single depiction may actually be assigned to the simultaneity occurring between the sentence uttered by the speaker and the act performed by the agent. When agents execute actions while being concomitantly depicted by children, the latter are likely to use the self-referential pronoun "je", fancying being the agent him/herself at the very moment of uttering the sentence. This excessive use of the pronoun "je" may be indicative of the speaker's preoccupation exclusively with him/herself (Joly & O'Kelly, 1989: 170-171), or with potential overestimation of his/her personality (Arnold, 2005: 202-203).

[15] *Egocentric* here refers to the speaker's perspective.

Reasons accounting for unexpected uses of the pronoun "je" may also be due to contextual implications this pronoun can be indexed to (Hrisonopulo, 2008: 4). The first-person pronoun is related to four different regularity contexts[16]: one of them evokes a typical communicative situation that can be defined as *perceptual context* (*ibid.*). This context is constituted by the "viewing scene", which is understood according to the way it is represented in Langacker (2000: 205) and specified in terms of the psychology of vision in Allott (2001). In Langacker's treatment of the "viewing scene", the latter contains two basic regions – the "onstage" region which delineates the focus of attention and the "offstage" region which makes the locus for the position of the (implicit) viewer (Langacker, 2000: 205).

The use of the pronoun "je" displays a close semantic relatedness to one of the regions of the "viewing scene". Indeed, the use of "je" signifies the speaker's conceptual position "onstage", the "onstage" region delineating the focus of attention (*ibid.*). This pronoun seems to blend the speaker's focus of attention and her virtual performance of the action described through the perception of the agent's various physical acts. This point is one of the reasons accounting for the unexpected use of the self-referential pronoun "je" in some of the speakers' descriptions.

Another context refers to the speaker's subjective experiences, which include a sense of agency, a sense of ownership for action and access to one's own self through one's immediate experience (Hrisonopulo, 2008: 4). In the experiment, this sense of ownership and immediate experience is revealed through the unexpected use of the first-person pronoun "je". Both contexts aforementioned seem to interplay and be enacted through a similar linguistic output corresponding to children's alternative use of "je" and third-person pronouns (i.e. "il", "elle") in their reports.

In other situations, when children linguistically point at the agents' motion performance, some of them tend to establish a period of time between their speech occurrence and the achievement of the agents' acts. This time interval corresponds to situations in which the child waits for the task to be completed by the agent to describe it. The temporal distance established between the agent's acts and the child's description lets some insight for the speaker to think the situation over at a pre-linguistic level. In such cases, children actually solicit the accurate and expected third-person pronouns, namely "il" or "elle". In other cases, as the tasks achieved by agents are repetitive, some children – getting quickly familiar with the situational pattern – start depicting agents' acts even before the latter begin their performance, which highlights the capacity of some children to anticipate the agents' acts. In such cases, children uniformly use the awaited third-person pronouns.

Among the corpora examined, only six- and seven-year-old children's reports are featured by the intermingling of personal pronouns: 21% of their descriptions are involved with the alternative use of third-person pronouns (i.e. *il/elle*) with the self-referential "je", while none of the other children interviewed manifest this language reaction. Consequently, the insertion of the self-referential pronoun "je" within children's depictions tends to occur with a certain age group. Apart from the present experiment, no other work of research can confirm this outcome; consequently further analyses will contribute to confirming or infirming the results gathered on the use of "je" with ulterior experiments displaying analogous frameworks.

Parameters favouring this trend seem to correspond to contexts in which agents carrying out the motion tasks are being simultaneously described by children who sound particularly involved in the descriptive exercise requested, showing self-centered communicative

[16] The term *regularity* is related to Violi's perspective on the use of self-person pronouns (Violi, 2000). The author claims that "words are always anchored and indexed to a *regularity* context which represents their structured semantic potential" (Violi, 2000: 116).

behaviors. Their unanticipated use of "je" suggests that they linguistically fancy performing the actions themselves, enacting the motion performance through linguistic items, hence activating their subjective, immediate experience linguistically. This unexpected use of "je" offers a degree of accessibility of the speaker's own mental experiences to introspection. Using self-referential pronouns when the context does not require it can be interpreted as "traces" of the speaker's internal(ized) operations, such as a perceptually and/or conceptually grounded judgments (Hrisonopulo, 2008: 5).

4. Extra-linguistic influence on speakers' perspective-taking

4.1. Impact of the proprioceptive load on pronouns' selection

The self-referent variation manifested through the plural use of the aforementioned pronouns "je", "il" and "elle" echoes action-language research, according to which the link between action and language tends to vary according to task demands (Zwaan & Taylor, 2006). In the present study, the task demands correspond to the two sub-experiments suggested to speakers and agents. In the first one – the "dynamic test" – both speakers and agents listen to the experiment directives. The latter are meant to guide the spatial progress of "participant 1" along fifteen paths.

"Participant 1" is then expected to narrate the spatial progress of "participant 2" along the identical itineraries she went through before (cf. 1.2). "Participant 1" hence turns from *agent* to *speaker* whereas "participant 2" plays the exclusive role of *agent*. In the second sub-experiment – the "static test" – speakers do not listen to the instructions before depicting agents who are aware of the recommended directives of the experiment. If instructions are meant to guide agents' progress in the spatial area, these directives are left unknown to speakers, who hence know little about the target of the experiment at the beginning of the test (cf. 1.2).

This nuance opposing both tests is likely to make the use of the self-referential pronoun "je" vary, taking into account speakers' memory of the instructions and their (un)ease to get familiar with the experiential situation. Actually, in the "dynamic" test, when depicting agents' acts – speakers first experience dynamic bodily sensations before describing their partners' motion performance along the paths – which is not the case for speakers in the "static" test. Correspondingly, the depictions collected are delivered by speakers who are not conditioned by analogous proprioceptive criteria according to the task they went through. Concerning six and seven-year-old children, these dissimilar proprioceptive factors are most likely to influence their linguistic structuring of the motion events they attend.

For example, children of that age bracket tend to recurrently insert the self-referential pronoun "je" in their descriptions after a dynamic experience, as in:

(11) [6] Léon marche sur le chemin bleu,

[7] Je ramasse les deux balles par terre,

[8] Je les pose dans le cerceau orange,

[9] Après, il revient dans le cerceau violet. [FR, 10]

This state of facts concerns speakers going through a dynamic experience, who do not seem to realize the confusing use of pronouns characterising their depictions. The sense of bodily recurrence developed through their dynamic experience seems to get enacted through the unanticipated reference of the pronoun "je", recalling speakers' previous sensorimotor

experience. This linguistic fact directly echoes the hypothesis according to which proprioceptive criteria influence children's linguistic accounts.
This language reaction also affects children going through a static experience. But in such cases, speakers tend to verbally manifest their surprise to use "je" in a mistaken way in the speech linearity of their account:

(12) [5] Alors Lucie, elle marche tout le long du chemin bleu,

[6] Elle ramasse les deux balles par terre,

[7] Et je les pose, euh non, *elle – elle* les pose (rires) dans le cerceau orange. [FR, 3]

After recurrently using the third-person pronoun *elle* mentioning *Lucie*, the speaker suddenly realizes her mistake before ending up clause [7]; emphasizing the inaccurate usage of "je" through the repetition of the appropriate pronoun to be used, namely *elle*. She accordingly laughs while concomitantly correcting her mistake (cf. *(rires)*). Children involved with identical situations similarly sound struck by surprise, but their lively reaction as in (13) only concerns speakers discovering the scene in the situational context pertaining to the static test.

This linguistic involvement of children in the experiments evidences the influence of proprioceptive variables on the perspectives adopted; the term *perspective* identifying here children's mental viewpoint rather than some spatial perspective. Combined uses of pronouns with six and seven-year-old children echo the data collected with language comprehenders, who usually adopt an embodied agent's perspective when comprehending action language, based on an internal simulation of performing that action (Barsalou, 2009).

4.2. Proprioceptive marks enacted through the descriptive task

Strong Embodied Cognition accounts assume that the agents' perspective is automatically activated for observers comprehending the scene, regardless of contextual factors (Pulvermüller, 2005). The data collected here challenge this postulate since the situational framework of the tests seems to have an impact on the linguistic items selected by speakers. Actually, speakers (whether children or adults) are aware of the presence of the experimenter while correlatively knowing that – when speaking – they do not have to linguistically adjust to the experimenter's viewpoint as they are told that their report is addressed to some hearer of the depiction, once recorded. Besides, the experimenter never interrupts the speaker's speech linearity. These contextual parameters, namely the experimenter's co-presence, her concomitant silence and the virtual hearer are likely to influence speakers' perspectives to describe the scene.

Speakers' awareness to be recorded without expecting any feedback can be assimilated to a virtual reality paradigm (Duran *et al*., 2011) with an addressee absent and/or unable to provide any response. In recent studies explored through such paradigms, speakers are more likely to adopt an allocentric perspective (cf. 3.1) as they are told that they are interacting with a virtual, rather than a real partner (*Ibid.*). Accordingly, their linguistic phrases are underlain by allocentric reference frames. But in the present experiment, very few depictions reveal exclusive allocentric viewpoints, which specifically highlight agents' perspectives (cf. Table 4, [2]).

Other speakers manifestly neglect the potential mutual comprehension of their unknown partners listening to the depictions once recorded, hence using a linguistic *ego-centered* perspective (cf. idem, [1]). As mentioned before, some other language users blend embodied and non-embodied perspectives (cf. idem, [3]). The various linguistic patterns observed can be elucidated through the fact that the experiment's contextual framework does not have to

conform to the *principle of least collaborative effort* (Clark and Wilkes-Gibbs, 1986) – the view that, in sharing responsibility for mutual understanding, conversational partners adapt their linguistic behaviour in ways that aim to minimize their collective effort and facilitate their coordination.

This observation echoes analyses reporting implicit influences playing a role in our "willingness" to take on the effort or not within the contextual situation (Tversky and Hard, 2009). Such influences can be detected in the depictions through adults' reports of identical scenes[17]:

(13) [25] And then he's walking back across the room to the purple hoop, zigzagging along the orange cones and looking right in front him. [BrE, 3]

(14) [16] He's walking back to the purple hoop. [BrE, 6]

Both sentences correspond to the description of two agents' identical motion performance, each occurrence being depicted by different speakers. In (14), the topological pattern is minutely described through the PP *back across the room, to the purple hoop,* and *along the orange cones*; the speaker even inserts details pertaining to the manner of the agent's motion (cf. *zigzagging[18], looking right in front him*). On the other hand, in (15), the delineation revealing the same spatial progress performed by some other agent only displays the necessary details identifying the directionality followed by the agent to reach the ending point i.e. *the purple hoop*, also mentioned in (14).

Accordingly, similar semantic contrasts are discerned in French depictions:

(15) [5] Puis elle marche le long du chemin blanc, ramasse deux balles de couleurs différentes situées au sol, une rose et une verte, qu'elle va déposer dans le cerceau orange situé au fond de la salle à côté du parapluie. [Fr, 23]

(16) [4] Il marche le long du chemin, ramasse deux balles et les pose dans le cerceau. [Fr, 28]

Both occurrences correspond to speakers' descriptions of the second directive agents go through (cf. Table 1). As suggested by Tversky (Tversky, 1991), the spatial relations between objects and the participant situated in the spatial area are expressed with various levels of granularity, from coarse grained, specifying only overall directions (cf. (17)), to fine grained, specifying exact distances (cf. (16)). If occurrences (16) and (17) do not really contrast in terms of detailed directions and distances, their difference is manifested through particulars pertaining to the spatial relations between objects and the agent.

Depictions featured by sentences like (14) and (16) tend to correspond to reports initiated by speakers' static experience. They hence discover the scene while depicting it, which seemingly makes them provide minute components of it. Conversely, speakers going through a dynamic experience linguistically structure points related to agents' motion performance, but details associated to the situational framework of the experiment are often backgrounded or omitted. Occurrences (15) and (17) illustrate such linguistic biases, both examples being delivered by speakers going through a dynamic experience[19].

Agents' dynamic experience initiating their depictions can hence be assumed as guiding their focus of attention when they are turned to speakers. At a proprioceptive level, they are loaded with bodily recurrence, which tends to be enacted linguistically: they are inclined to verbally emphasize agents' repetitive gestures, hence recollecting their own previous experience. If

[17] The *willingness* to provide detailed reports or not is only tested through adults' French and English data.
[18] The spatial framework of the experiment is meant to incline agents to walk zigzaggingly. The remark related to the zigzagging way of the agent could hence have been expected by the speaker in (15) as well.
[19] In comparison, sentences (14) and (16) were delivered by speakers going through a static experience.

their reports tend to be motion-biased, they are usually less detailed than accounts expressed by speakers experiencing the static test.

Conclusion

In this study, the way space markers are selected by speakers to structure the notion of perspective is explored in contexts in which speakers are submitted to different bodily constraints. French and English corpora indicate the extent to which bodily involvement initiating speakers' descriptions is echoed in their speech acts. The notion of embodiment is studied through speakers' reference to embodied and non-embodied perspectives. The descriptions collected reveal that perspectives vary within speakers' reports, which highlights a flexible process at a linguistic level.

Neutral references of some linguistic units within prepositional phrases manifest observers' oscillation between *speaker-centred* and *partner-centred* perspectives, usually labelled as *egocentric* viewpoints. Speakers' variation between egocentric and allocentric reference frames (Berthoz, 2013) highlights the ambiguity of the underspecified term *egocentric*, which should be avoided when discussing perspective-taking; observers regularly switching between both reference frames (Watson *et al.*, 2004).

When targeting their own viewpoint or their partners' perspective, speakers resort to embodied perspectives, pointing at their body or their partner's. But the whole data mainly exhibit speakers' combination of perspectives, with accounts intermingling *ego-centred*, *partner-centred*, and non-embodied perspectives revealed through intrinsic reference frames. Most speakers alternatively resort to embodied and non-embodied perspectives, without favouring some particular viewpoint in the corpora examined. Nevertheless, the sub-experiments speakers submit to before delivering their reports seem to bias the selected perspectives.

For instance, in French accounts delivered by six- and seven-year-old children going through a dynamic experience, motor systems activated when perceiving agents' actions seem to get enacted through recurrent uses of the unexpected pronoun "je", alternatively employed with third-person pronouns identifying the accurate referents to be depicted. This observation enhances the phenomenon defined as "mirror matching" (cf. 2.3), which turns out to occur at a linguistic level. This language reaction highlights speakers' linguistic simulation of the actions observed, as if speakers – loaded with a previous dynamic experience – spontaneously enacted agents' performance through alternative pronouns' usages; blurring the status of the accurate referent to be described.

Comparatively, 20-year-old speakers' proprioceptive states seem to bias their selected perspective(s) after going through static or dynamic experiences. While speakers experiencing dynamic postures tend to emphasize agents' motion acts in their depictions, speakers experiencing a stationary state are rather inclined to depict an unfamiliar spatial environment, unaware of the motion occurrences to be performed within it. They do not experience motion before narrating the agents' performance and do not necessarily insist on agents' motion details; foregrounding, however, elements pertaining to the situational framework of the experiment.

Speakers' bodily involvement initiating their descriptions seems to be correlatively mirrored in their accounts in both languages examined and concerning different age groups, suggesting that proprioceptive features get actually enacted through linguistic items. If the perspectives adopted by children and adults comparatively differ through linguistically biased distinct patterns, the data evidence that perspective-taking manifests flexibility. The non-verbal variables represented by proprioceptive criteria impact speakers' perspective-taking and

demonstrate how embodiment is enacted in speakers' speech production; causing the emergence of perspective(s) biased by some pre-linguistic bodily experience.
Static and dynamic experiments demonstrate that speakers narrating motion in space seem to be enacting themselves either as observers, or as participants, or in-between. In other words, vicarious structures seem to co-enact alternative versions of both space and the subject. By "vicarious" structures, we are pointing at various linguistic strategies soliciting distinct lexical and syntactic tools to delineate a similar visual scene (Berthoz, 2013: 111). The various physical constraints speakers are submitted to seem to be at the stem of the vicarious linguistic patterns speakers select to depict analogous visual scenes. This observation reinforces the link that has been established in this experiment between language processing and speakers' sensorimotor activation. This preliminary result will be further detailed through additional experiments assessing sensorimotor activity on language use to confirm or infirm the results here gathered and theoretically deepen the relationship between language and bodily experience.

References

ALLOT, Robin (2001). *The Natural Origin of Language : The Structural Inter-Relation of Language, Visual Perception* and Action. Hertfordshire : Able Publishing.

ARNOLD, Irina V. (2005). *Stilistika. Sovremenny Anglijskij Jazyk (Stylistics of Modern English)*. Moscow : Nauka.

BARNABE, Aurélie. (2015). Les prépositions évaluées par le prisme du paradigme cognitif : vers une lecture enactive. *Corela*, *13*(2). Disponible en ligne sur http://corela.revues.org/4111.

BARSALOU, Lawrence W. (2009). Simulation, situated conceptualization, and prediction. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*, 1281-1289. DOI : 10.1098/rstb.2008.0319.

BERTHOZ, Alain (2013). *La Vicariance*. Paris : Odile Jacob.

BERTHOZ, Alain (1997). *Le Sens du mouvement.* Paris : Odile Jacob.

BEVERIDGE, Madeleine, E.L., and PICKERING, Martin J. (2013). "Perspective taking in language: integrating the spatial and action domains". *Frontiers in Human Neurosciences*, *7*(577). DOI: 10.3389/fnhum.2013.00577

BORGHI, A. M., and SCOROLLI, C. (2009). Language comprehension and dominant hand motion simulation. *Human Movement Science*, *28*, 12-27.

CLARK, Herbert H., WILKES-GIBBS Deanna (1986). Referring as a collaborative process. *Cognition*, *22*, 1-39. DOI : 10.1016/0010-0277(86)90010-7.

DECETY, Jean (2002). Neurophysiological evidence for simulation of action. In J. Dokic & J.Proust (eds.), *Simulation and Knowledge of Action* (p. 53-72). Amsterdam: John Benjamins.

DURAN, Nicholas D., *et al*. (2011). Listeners invest in an assumed other's perspective despite cognitive cost. *Cognition* 121, 22–40 10.1016/j.

FRITH, Chris D. and FRITH Uta (2007). Social cognition in humans. *Current Biol*ogy, *17*(16), R724–R732. DOI : 10.1016/j.cub.2007.05.068.

GALLESE, Vittorio & GOLDMAN Alvin (1998). Mirror neurons and the mind-reading. *Trends in Cognitive Sciences, 2*, 493-501. DOI : 10.1016/s1364-6613(98)01262-5.

GREZES Julie, *et al*. (2003). Activations related to "mirror" and "canonical" neurones in the human brain: an fMRI study. *NeuroImage*, *18*, 928-937. DOI : 10.1016/s1053-8119(03)00042-9.

HRISONOPULO, Katherine (2008). Beyond reference and designation: On interactive implications of the pronoun *I* in English. In *Lodz Papers in Pragmatics. 4*(2), 277-292. DOI: 10.2478/v10016-008-0006-2

JOLY, André & O'KELLY, Dairine. (1989). *L'Analyse Linguistique des Textes Anglais.* Paris: Éditions Nathan.

KESSLER, Klaus & Hannah RUTHERFORD, (2010). The two forms of visuo-spatial perspective taking are differently embodied by subserve different spatial prepositions. *Frontiers in Psychology, 1*(213), np. DOI: 10.3389/fpsyg.2010.00213.

KILNER, James M. *et al*. (2003). "An interference effect of observed biological movement on action". *Current Biology*, *13*, 522-525. DOI: 10.1016/s0960-9822(03)00165-9.

LANGACKER, Ronald W. (2000). *Grammar and Conceptualization.* Berlin and New York: Mouton de Gruyter.

LEVINSON, Stephen C. (2003). *Space and Language in Cognition: Explorations in Cognitive Diversity*. Cambridge: Cambridge University Press.

MARINO, B. F. M., *et al*. (2012). Language sensorimotor specificity modulates the motor system. *Cortex, 48*, 849-856. DOI: <10.1016/j.cortex.2010.12.003>.

MATSUMOTO, Yo (1996). How Abstract is Subjective Motion? A Comparison of Coverage Path Expressions and Acces Path Expressions. In A. Goldberg. *Conceptual Structures, Discourse and language*. (p. 359-373). CSLI Publications.

METEYARD, Lotte, *et al*. (2012). Coming of age: a review of embodiment and the neuroscience of semantics. *Cortex, 48*, 788–804 10.1016/j.

PECHER, Diane, *et al*. (2009). Language comprehenders retain implied shape and orientation of objects. In *Quartely Journal in Experimental Psychology*, *62*, 1108-1114. DOI : 10.1080/17470210802633255

PRINZ, Wolfgang, HOMMEL Bernhard (eds.) (2002). *Common Mechanisms in Perception and Action: Attention and Performance*, *XIV*. Oxford: Oxford University Press.

PULVERMÜLLER, Friedemann (2005). Brain mechanisms linking language and action. *Nature Reviews Neuroscience*, *6*, 576–582. DOI : 10.1038/nrn1706.

SLOBIN, Dan I. (1996a). From 'thought to language' to 'thinking for speaking. In J.J. Gumperz and S. C. Levinson (eds). *Rethinking Linguistic Relativity*. (p. 70-96). Cambridge: Cambridge University Press.

SLOBIN, Dan I. (2004). The many ways to search for a frog: Linguistic typology and the expression of motion events. In S. Strömqvist and L. Verhoeven (eds.) *Relating Events in Narrative: Vol.2. Typological and Contextual Perspectives*. (p. 219-257). Mahwah, N. J: Lawrence Erlbaum Associates Publishers.

TALMY, Leonard (2000a). *Toward a cognitive semantics: Concept Structuring Systems*. Vol.1. Cambridge, Mass.: The MIT Press.

TOMASELLO, Michael, *et al*. (1998). Five primate species follow the visual gaze of conspecifics. *Animal Behavior, 55*, 1063-1069. DOI : 10.1006/anbe.1997.0636.

TVERSKY, Barbara (1991). Spatial mental models. *The Psychology of learning and motivation*, *27*, 109-145.

TVERSKY, Barbara & HARD, Bridgette Martin (2009). Embodied and disembodied cognition: spatial perspective-taking. *Cognition*, *110*, 124-129.

VARELA, Francisco, THOMPSON, Evan & ROSCH, Eleanor (1993). *L'Inscription Corporelle de l'Esprit*. Paris : Éditions du Seuil.

VIOLI, Patrizia (2000). Prototypicality, typicality, and context. In L. Albertazzi (ed.) *Meaning and Cognition: A Multidisciplinary Approach* (p. 103-122). Amsterdam/Philadelphia: John Benjamins.

WATSON, Matthew E., *et al*. (2004). Alignment of reference frames in dialogue. In *Proceedings of the 26th Annual Conference of the Cognitive Science Society* (Mahwah, NJ: Lawrence Erlbaum), 1434-1439.

WU, Ling-Ling & BARSALOU Lawrence W. (2009). Perceptual simulation in conceptual combination: evidence from property generation. *Acta Psychologica* (Amst.), *132*, 173-189. DOI : 10.1016/j.actpsy.2009.02.002.

ZWAAN, Rolf A. (2008). Time in language, situation models, and mental simulations. *Language Learning*, *58*, 13-26. DOI : 10.1111/j.1467-9922.2008.00458.x.

ZWAAN, Rolf, A., and TAYLOR Lawrence, J. (2006). Seeing, acting, understanding: motor resonance in language comprehension. *Journal of Experimental Psychology: General*, *135*(1), 1-11. DOI : 10.1037/0096-3445.135.1.1.

Appendix

CONSIGNES	Chemins	Chemins à suivre [2]	Ordre
Premièrement, vous allez marcher le long du chemin bleu et ramasser deux balles de couleur différente.	1	1	1
Vous irez déposer ces balles dans le cerceau orange situé à côté du parapluie.	2	1	
Ensuite, vous reviendrez vous placer dans le cerceau qui marque le point de départ et marcherez le long du chemin blanc. Vous ramasserez de nouveau deux balles de couleur différente et	3-4	2	2
Vous irez déposer ces balles dans le cerceau orange situé à côté du parapluie.	5	1	
Ensuite, vous reviendrez vous placer dans le cerceau qui marque le point de départ, puis vous marcherez le long du chemin jaune. Vous choisirez un des deux ballons au bout du chemin.	6-7	2	3
Vous irez le déposer dans le cerceau situé à côté du parapluie.	8	1	
Vous reviendrez vous placer dans le cerceau qui marque le point de départ puis vous marcherez le long des cordes et ramasserez deux objets de votre choix qui se trouvent au sol.	9-10	2	4
Vous irez les déposer dans le cerceau à côté du parapluie.	11	1	
A partir du cerceau à côté du parapluie, vous marcherez ensuite le long du chemin orange, puis ramasserez un des deux frisbees au bout du chemin.	12	1	5
Vous irez le déposer dans le cerceau à côté du parapluie.	13	1	
Enfin, vous reviendrez au cerceau qui marque le point de départ. Vous ramasserez ce cerceau et vous irez le déposer sur la table de votre choix.	14-15	2	6

Table 1' : French instructions of the experiment

[1] Nombre total de chemins à suivre au cours de l'expérience (15 au total).
[2] Nombre de chemins à suivre par consigne (1 ou 2).
[3] Ordre des instructions (1, 2, 3, *etc.*).