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Katerina Fibigerova, Michèle Guidetti. Iconicity in Gesture: How Czech Children and Adults Use Iconic Gestures to Deal with a Gap between Mental and Linguistic Representations of Motion Events. Sara Lenninger; Olga Fischer; Christina Ljungberg; Elzbieta Tabakowska. Iconicity in Cognition and across Semiotic Systems, John Benjamins Publishing Company, pp.245-264, 2022, 9789027211439. 10.1075/ill.18.12fib . hal-03481228

HAL Id: hal-03481228

<https://univ-tlse2.hal.science/hal-03481228>

Submitted on 12 Sep 2022

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Iconicity in Gesture: How Czech Children and Adults Use Iconic Gestures to Deal with a Gap between Mental and Linguistic Representations of Motion Events

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Abstract

Our paper contributes to the discussion about iconicity by bringing attention to iconic co-speech gestures. We investigate their role in situations where mental representation becomes difficult to fully express through words only. For instance, when Czech speakers describe Motion, the lexicon most often does not allow them to verbalize Path of Motion without indicating Manner of Motion at the same time.

In this context, we asked 72 Czech children and adults to watch and describe Motion video clips where Manner was visually backgrounded in favor of Path. Although adults found a way to verbalize Path without Manner more often than children, Czech participants altogether typically verbalized both Path and Manner but they preferred to gesture about Path only. Gesturing about both Path and Manner was generally marginal and more used by adults than by children. When it occurred, gesturally conveyed Manner tended to be different from spoken Manner and closer to actually viewed Manner. We discuss the ability of creative non-arbitrary iconic gesture to modulate verbal content so that the final polysemiotic message is more satisfactory than the verbal message alone would be.

1. Iconic Gesture, Speech, and Mind

When people talk, they often use gestures to accompany their speech. These gestures are called ‘gesticulation’ (Kendon 2004, 2009), ‘co-verbal’ gestures (McNeill 1992, 2005) or ‘illustrators’ (Ekman and Friesen 1969). They are understood as movements, positions and orientations of different parts of the body (hands, arms, head, legs, the whole body) that express utterance related meaning. In other words, gestures are non-verbal body actions that, in a semiotic perspective and terminology (Peirce 1960), are ‘signs’ (Nöth 1990).

Among the variety of different types of gestures, we focus on iconic gestures (McNeill 1992) that have also been called ‘physiographic’ gestures (Efron 1972) or ‘kinetographs’ and ‘pictographs’ (Ekman and Friesen 1969). In the Peircean classification, they belong to ‘icons’, a category of signs where the relation between *representamen* and object is based on the principle of resemblance (Peirce 1960). As McNeill’s iconic gestures (in contrast to what he calls ‘metaphoric gestures’) represent concrete (not abstract) objects, we can refine the definition even more by talking about ‘image’ (Peirce 1960) or ‘direct iconicity’ (Poggi 2008).

These qualities explain the role of iconic gesture in relation to (1) speech as the main tool of expression, (2) the mental content that has to be expressed and (3) the cognitive processes that underlie the expression of mental content.

First, speech and gesture are two different semiotic systems but there is evidence that they work together in a complementary way (Kendon 2004; Kita 2000; McNeill 1992, 2005). As language is based on a digital, symbolic and arbitrary code while iconic gestures are analogous, non-conventional spontaneous creations, it seems that speech and gesture – when produced simultaneously – have the potential to complement each other, and therefore to form a polysemiotic message that is actually richer than the verbal message alone.

Second, it seems that different forms of external representation, i.e. words and iconic gestures, are related to different forms of internal/mental representation that have been extensively discussed in the literature (Fodor 1978; Johnson-Laird 1983; Paivio 1986). In this view, words are more suitable to express abstractions, categorizations and generalizations while iconic gestures easily depict concrete, visuo-spatial and spatio-motoric contents (Kita 2000; McNeill 1992, 2005).

Third, previous studies revealed that connections between gesture and speech are not only observable at more superficial levels but they are actually anchored at deeper levels. Gesture and speech seem to be synchronous in time, semantic reference and pragmatic aspects (McNeill 1992). They manifest through shared cognitive functions and processes, developmental stages and trajectories, and also pathologies (for more details and further theoretical differences, see De Ruiter 2000; Kita and Özyürek 2003; McNeill 2005). From another theoretical perspective, iconic gesture, by virtue of its image-like quality, is seen as able to decrease the cognitive load of speaking and therefore can be helpful in situations where speakers have a hard time, for whatever reason, expressing their idea in words (Goldin-Meadow et al. 2001; Kita 2000; Melinger and Kita 2007; Morsella and Krauss 2004).

2. Gesturing When Talking about Motion Events

Many studies interested in the gesture-speech-mind relation address the question of the impact of the language, through speech, on co-speech gesture. For instance, a whole research domain is dedicated to the investigation of the gestures that accompany verbal descriptions of Motion events – e.g. a speaker moves his/her hand from one to the other side and quickly wiggles his/her fingers while saying ‘I saw a tiny squirrel running across the street’ – that are actually lexicalized differently in different languages.

Motion events, and especially ‘translocation’ (Levinson and Wilkins 2006) and ‘boundary-crossing’, have been extensively investigated in linguistics. According to the traditional theoretical framework developed by Talmy (1985, 2000), languages differ in how they lexicalize the core conceptual element of Motion, which is ‘Path’ (e.g. up, down, across, around, into). In ‘satellite-framed languages’, e.g. Germanic, Slavic or Finno-Ugric languages, Path is typically encoded in verb satellites which are mainly verb particles (see Example 1 from English) or verb prefixes (see Example 2 from Czech). Verbs themselves or verb roots (in the case of prefixed verbs) then provide other information about Motion, such as the ‘Manner’ of moving (e.g. walking, running, jumping, swimming, flying). In ‘verb-framed languages’, e.g. Romance languages, Japanese, Turkish or Korean, Path is encoded in the verb itself (see Example 3 from French). If Manner of Motion needs to be expressed as well, it can be conveyed through a second verb in gerund form (e.g. ‘running’) or by other constructions (e.g. ‘quickly/slowly’, ‘on a bike / by car’, ‘a runner/swimmer’).

- (1) A squirrel ran **across** the street.
- (2) *Veverka přeběhla silnici.*
squirrel **cross.ran** street
‘A squirrel ran across the street.’
- (3) *Un écureuil a traversé la rue en courant.*
a squirrel has **crossed** the street by running
‘A squirrel ran across the street.’

Since this original binary typology, there has been evidence that more than two ways can be used to talk about Motion, that several patterns can coexist within the same language, and that languages can be positioned on a scale going from high to low Manner-oriented (e.g. Najdu, Zlatev, Duggirala, Van De Wejler, Devylder and Blomberg 2018; Slobin 2004, 2006). The frequency of linguistic patterns available in a given language then depends on how much (cognitive) effort is needed for each pattern to be applied to a concrete situation (Slobin 2004, 2006). This phenomenon has been very well documented in the domain of boundary-crossing Motion events. While speakers of satellite-framed languages tend to indicate both elements of Motion, speakers of verb-framed languages prefer to talk about Path alone. This allows them to avoid cognitively more demanding lexico-syntactic constructions related to the additional expression of Manner. Path is preferred over Manner because, according to Talmy (1985, 2000), it constitutes the main element in the conceptualization of Motion while Manner is a secondary one. In other words, it is easier, in translocation and especially in boundary-crossing events, to conceive of Motion without information about Manner than without information about Path. However, if Manner of Motion becomes somehow salient – typically when the Manner of moving is not implicit or evident by itself (e.g., humans usually walk, birds usually fly) – speakers of verb-framed languages will be more likely to verbalize/specify Manner as well.

In gesture studies, when considering all the reported cross-language differences in lexico-syntactic rules and actual speech practices, the question that naturally follows is whether iconic gesture – when it is co-verbal – somehow reflects these language specificities. While the question is clear, the answers vary. Some studies conclude that gesture related to the expression of Motion is language specific arguing that speakers of satellite-framed languages include Path and Manner in a single clause and also in a single gesture, while speakers of verb-framed languages separate Path and Manner into two different clauses and also into two different gestures (Özyürek et al. 2005, 2008). Other studies report the opposite showing that, in both language types, speakers prefer to gesture about Path only and that gesturing about both Path and Manner is not more widespread in satellite-framed languages than in verb-framed languages (Fibigerova and Guidetti 2018; Fibigerova, Guidetti and Šulová 2012; Hickmann, Hendrix and Gullberg 2011).

Another but related question addresses the actual role of gesture in relation to speech/language on one hand and to thought/mind on the other hand. From an asemantic perspective, the observed differences between co-occurring verbal and gestural representation of Motion can be interpreted in terms of complementarity. First, some studies have shown that processing gesture is cognitively less demanding than processing conventionalized speech endowed with codes and rules (Goldin-Meadow et al. 2001). Second, gesture can be viewed as a tool used by speakers to do what cannot be done in their language or – in a less strict formulation – what is too difficult for them to do at a given moment through the available words (Kita 2000; McNeill 1992; Melinger and Kita 2007; Morsella and Krauss 2004). For instance, when French speakers need to express Manner, they sometimes do so gesturally rather than verbally which results in a combination of a Path verb with a Manner gesture (Gullberg, Hendrix and Hickmann 2008). On the other hand, while Czech speakers tend to indicate both Path and Manner in speech, they prefer to gesture about Path only (Fibigerova and Guidetti 2018; Fibigerova, Guidetti and Šulová 2012). McNeill and Duncan (2000) hypothesize that such a behaviour is a way of downplaying the omnipresence of spoken Manner in highly Manner-oriented languages such as Czech or Russian. However, a similar preference for Path-only gestures was found even in less Manner-oriented satellite-framed languages, namely English (Hickmann, Hendrix and Gullberg 2011). A possible explanation is built on the hypothesis that gesture depicts the core element of mental representation (McNeill 1992, 2005). If one considers that the core element of the concept of

Motion/Translocation is Path, as said earlier, than the tendency to gesture about Path – Path rather than Manner and Path only rather than Path and Manner together – seems evident.

3. The Present Study: Focus on Speakers of Czech

Czech is a Slavic language spoken by 10 million people living mainly in the Czech republic situated in Central Europe. According to the typology presented above, Czech belongs to satellite-framed languages. However, it also has specificities that make it different from some other languages of the same type such as English (Malá 2015; Martinková 2018).

For instance, English Motion verbs typically encode Manner but speakers can also describe Motion (1) indicating only Manner if they use verbs such as ‘to walk’, ‘to run’ or ‘to jump’, (2) indicating Path only if they use verbs such as ‘to arrive’, ‘to enter’ or ‘to cross’, or even (3) without indicating Path/Manner if they use deictic verbs such as ‘to go’ or ‘to come’. In contrast to English, the possibility of avoiding Manner is much less available in Czech because its lexicon does not include many non-Manner verbs (Pokorný 2010). As indicated earlier, Czech, as well as several other Slavic languages, is a highly Manner-oriented language. Speakers can easily express Manner without Path (e.g. *běžet* ‘to run’) but it may be very difficult to express Path but not Manner (e.g. no true equivalent for ‘to cross’). There are some verbs that could be considered as having no information about the Manner of Motion (e.g. *stoupat* ‘to ascend’, *klesat* ‘to descend’, *přemístit se* ‘to move / to change place’, *dostat se* ‘to get to’, *vydat se* ‘to go forth’). However, they are mostly very context-specific and tend to occur in adult vocabulary. For example, the verb *stoupat* ‘to ascend’ will be used in rather formal language, similarly to its English equivalent. In everyday language, however, while English speakers can use another Path-only verb, namely ‘to go up’, Czech speakers need to add Manner. For this, they typically use a Path-and-Manner verb (e.g. *vyjít* ‘to walk up’) where Path is conveyed in a prefix (e.g. *vy-*‘up’) attached to a Manner verb (e.g. *jit* ‘to walk’). Alternatively, they combine a Manner verb with an adverb of place (e.g. *jit nahoru* ‘to walk upwards’).

This particular specificity/limit of the Czech language provides a perfect setup for our study. We explain our reasoning as follows. It has already been explored, as shown above, how speakers of verb-framed languages such as French deal with the situation that ‘forces’ them to focus on Manner while they naturally tend to pay attention to Path of Motion (Gullberg, Hendrix and Hickmann 2008). Applying the same logic, we wondered what would happen when we “force” Czech speakers to defocus from Manner while expression of the Manner of Motion is almost obligatory in their language. As said previously, we already know how Czech speakers describe and gesture about Motion events when Manner of Motion is a relevant piece of information (Fibigerova and Guidetti 2018; Fibigerova, Guidetti and Šulová 2012). But what will happen when Manner is not (as) relevant anymore?

We suppose that such a situation would create a kind of gap between the actual mental representation of Motion and available linguistic tools allowing expression of this particular mental image, and we ask about effects of such a situation on (1) verbal description of Motion and (2) intervention of co-speech iconic gesture. As only-Path/non-Manner vocabulary is much less developed in children than in adults, effect of age is to consider as well. For this purpose, we will observe verbal and gestural behavior of native monolingual speakers aged between 5 and 30 years, using cross-sectional methodology.

4. Methodology

Our study was based on data from 72 Czech natives, divided in 3 equal-sized (N=24) age groups: 5-year-old children, 10-year-old children and 20-35-year-old adults. The participants were typically developing monolinguals (exposed to foreign languages at school and university, but not considered as bilinguals or early bilinguals).

With a view to eliciting verbal and gestural descriptions of Motion, a specific video-stimuli-based experimental task was designed. Using the Adobe Flash CS4 program, we created 1 training and 10 experimental several-second-long video clips with a similar structure (see Figure 1). A character (baptized Pixi) appears on the screen, performs the target motion – a translocation - and leaves the screen that goes black. In terms of Path, we included 2 upward, 2 downward, 2 crossing, 2 go-through, and 2 go-around motions. In contrast to Path that varies from video to video, the Manner of Motion is identical in all the video clips. Thus, Path visually dominates Manner.

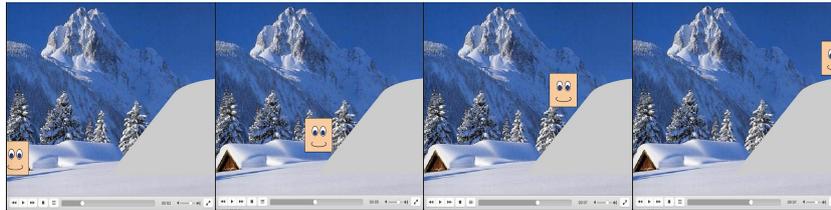


Figure 1. Pixi is ascending a snowy hill.

Moreover, in contrast to the easily identifiable Path, the Manner is more difficult to describe. It is a continuous and smooth motion, neither too slow nor too fast. The character does not touch the ground but moves so close to it that the motion does not tend to be considered as flying. The character's appearance is equally difficult to describe. Pixi was actually designed as a light-orange cube with no arms or legs, or wings, having only a cubic body/head with two eyes and a big smile. The idea was to minimize all possible associations with natural types of Motion such as walking, jumping, flying, rolling, and so on. None of the video clips show a water background in order to exclude possible associations with swimming or floating. To sum up, Pixi's motion is a kind of gliding slightly above the surface. But most importantly, Pixi's motion is definitely hard to depict in Czech because the Czech lexicon does not include any single item – a Motion verb or adverb – that would be truly appropriate to label such a Manner of Motion.

In order to test the effect of this particular condition on the verbal/gestural behavior of Czech speakers, a control condition was created with another set of video stimuli designed by Hickmann (2006) (see Figure 2). This time, the characters are different human figures and animals that perform natural movements such as walking, crawling, jumping or running. However, the trajectory is always the same in all the 12 video clips (2 training ones and 10 experimental ones). Therefore, Manner is not only easy to identify and to label but it also visually dominates Path.

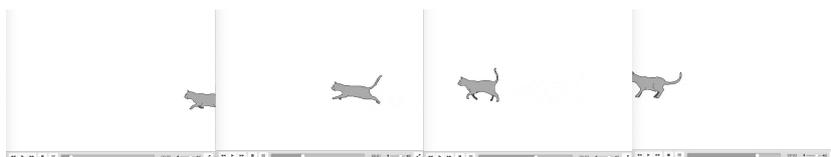


Figure 2. A cat is jumping.

The participation in our study consisted of individual sessions including the experimenter, the participant and an assistant. The instruction was to watch short video clips

played on the laptop one by one by the experimenter and, each time the screen went black between two clips, to tell the story to an assistant. The assistant was sitting behind the laptop so that he/she obviously could not see what happened and was holding a paper and pen. The participant was told that the assistant's task was to listen to the participant in order to find the story-corresponding picture among several pictures on his/her paper. During the session, the assistant was instructed to ask several predefined questions, not related to Motion events (e.g. "What is the color of the cat?"). The idea of our settings was 1) to create a kind of natural communicative situation that would elicit a spontaneous use of gestures, and 2) to give the whole situation a reason/goal/purpose so that the participant felt engaged in providing precise and detailed descriptions, hopefully including iconic gestures. Otherwise, no specific instruction regarding the use of gesture or the focus on Motion events was given. Each participant was exposed to both video stimuli sets that were presented in a counterbalanced order (half of the participants in each age group started with the Pixi set and continued with the Humans&Animals set, while the other half watched the video sets in the opposite order).

The videotaped sessions provided the data for subsequent transcription and annotation in ELAN. The coding focused on the semantic content of the polysemiotic descriptions of the viewed Motions. For speech, we first identified all the descriptions (typically single-clausal but also multi-clausal) that were semantically related to target Motions. Then, depending on the type of information provided, they were annotated as follows. (A) 'Path-only' provides information about direction (e.g. upward, leftward), boundary-crossing (e.g. entering, crossing) or trajectory shape (e.g. around, zigzagging). (B) 'Manner-only' relates to motor pattern (e.g., jumping, skipping), rate of motion (e.g. walking, running), force dynamics (e.g. stepping, tramping), attitude (e.g. ambling, strolling), and instrument (e.g. skiing, riding a bike). (C) 'Path-and-Manner' is a combination of the two (e.g. a cat jumping across the road). Considering the nature of our video stimuli and following some previous studies, deictic verbs (e.g., going, coming) that do not contain any specific Path or Manner were excluded from subsequent analyses.

For gesture data, we first identified all the gestures that satisfied the definition of being a specific movement, position or orientation of a finger, hand, arm, leg, head, upper or whole body that, produced during target-related verbal description, illustrated some aspect of that target Motion. Then, depending on the type of information provided, they were annotated as follows. (A) 'Path-only' when a single spatial excursion was performed (e.g., raising the hand to express an upward motion). (B) 'Manner-only' if a gesture involved enactment (e.g. miming a jump with the speaker's whole body) or agitated and repeated movement of a specifically shaped hand (e.g., grasping hand with wiggling fingers to express the cat's moving legs). (C) 'Path-and-Manner' when both of them were combined in a single gesture (e.g., slow raising of the arm while keeping the hand flat to illustrate Pixi continuously gliding up the hill without changing its frozen body posture). Annotating 20% of the data by two independent coders resulted in a high inter-rater reliability (Cohen's kappa was .81 ($p < .001$)).

Finally, after having annotated speech and gesture separately, we focused on coding the gesture-speech relation. For each couple of simultaneously produced gesture and verbal description, we decided whether they conveyed (A) the same type of information about Motion (e.g., both Path and Manner appeared in speech as well as in gesture or speech and only showed Path) or (B) not (e.g., both Path and Manner appeared in speech but gesture was only about Path).

5. Questions and Hypotheses

Based on current knowledge (presented in Section 1) and in line with our reasoning (detailed in Sections 2 and 3), three main questions and the corresponding hypotheses were formulated for the purpose of our study.

The first question asked about the impact of the degree of Manner saliency on the verbal description of Motion. Do Czech speakers experience Motion events with less/no salient Manner as more difficult to describe than Motion events with less/no salient Path? We assumed that – because of the lack of a semantically fitting Manner verb in conjunction with the limited availability of non-Manner verbs in the Czech lexicon – our participants would manifest some difficulties during the Pixi task (where Manner of Motion is visually and cognitively backgrounded) in comparison to the Humans&Animals task (where the backgrounded Motion component is Path). One way of quantifying and measuring such difficulties would be to focus on the number of actually described target Motion events versus the number of situations where these events were avoided/omitted by speakers from their descriptions. We therefore hypothesized that the proportion of actual target Motion descriptions collected in the Pixi set would be lower than in Humans&Animals. However, we assumed that this expected between-set difference would be more pronounced in younger participants and – as a growing vocabulary should increase the chances of finding a satisfactory verb to describe Pixi's very specific Motion – it would be less pronounced in older participants.

The second question concerned the frequency of iconic gestures. Do Czech speakers gesture more when dealing with difficult-to-describe Motion events? First of all, as reported in many developmental studies, the frequency of co-speech gesture would most likely increase from one age group to another. That being said, due to visuo-spatial characteristics of iconic gesture, and also in line with the theory of cognitive load decrease, the tendency to gesture should be more pronounced in the Pixi set than in Humans&Animals.

The third and last question focused on the gesture-speech semantic relation. How do Czech speakers integrate gestures into speech to make their descriptions of Motion as accurate as possible? Based on the general gesture-speech tandem theory and on previous studies of highly Manner-oriented languages, we expected our participants to produce iconic gestures, i.e., spontaneous image-like creations different from the predefined language code, allowing them to modulate their verbal message so that the final polysemiotic message corresponded to their mental representation of the viewed Motion event better than any verbal message alone. Lastly, as the frequency and diversity of iconic gestures as well as the mastery of gesture-speech synchrony increases with age, we thought that gesture-speech combinations would be more diversified in adults than in children.

6. Quantitative Results

In order to test the hypotheses related to our three questions, we analyzed distribution and variance of the collected, transcribed and annotated data consisting of 1571 verbal descriptions and 607 iconic gestures.

For the first hypothesis, a 2 (video sets) x 3 (age groups) ANOVA was conducted on the mean proportions of video clips where the target Motion was actually described (in contrast to the cases where the participant did not mention the target Motion viewed). We found an effect of both video set ($F(1,69)=59.627$, $p=.000$) and age ($F(2,69)=20.688$, $p=.000$) as well as an effect of their interaction ($F(2,69)=19.103$, $p=.000$).

The results, visualized in Figure 3, show that Czech speakers provided fewer target-Motion descriptions in Pixi ($M=.89$, $SD=.134$) than in Humans&Animals ($M=.99$, $SD=.025$). For the effect of age, *post hoc* tests revealed significant differences ($p=.000$) between 5-year-

old ($M=.88$, $SD=.092$) and 10-year-old children ($M=.96$, $SD=.057$) as well as between 5-year-old children and adults ($M=.98$, $SD=.029$). Age also interacted with the effect of the video sets so that the difference between video sets was present at the age of 5 but it weakened in older groups.

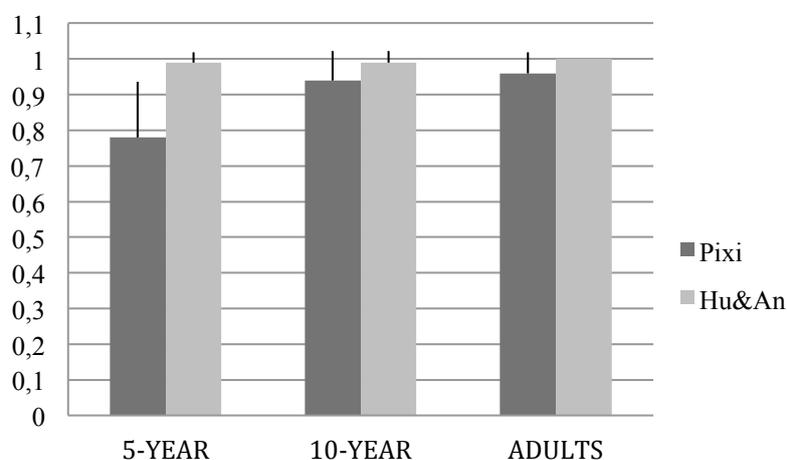


Figure 3. Mean proportions of actual target-motion descriptions.

To test the second hypothesis, a 2 (video sets) x 3 (age groups) ANOVA was performed on the mean proportions of iconic gestures per target Motion description. We found an effect of both video set ($F(1,69)=17.700$, $p=.000$) and age ($F(2,69)=16.145$, $p=.000$) but no interaction ($F(2,69)=1.433$, $p=.246$).

The results, shown in Figure 4, indicate that Czech speakers produced more gestures in Pixi ($M=.52$, $SD=.658$) than in Humans&Animals ($M=.31$, $SD=.437$). Regarding the age effect, *post hoc* tests revealed significant differences ($p=.000$) between adults ($M=.82$, $SD=.648$) and 5-year-old children ($M=.18$, $SD=.367$) as well as between adults and 10-year-old children ($M=.24$, $SD=.325$).

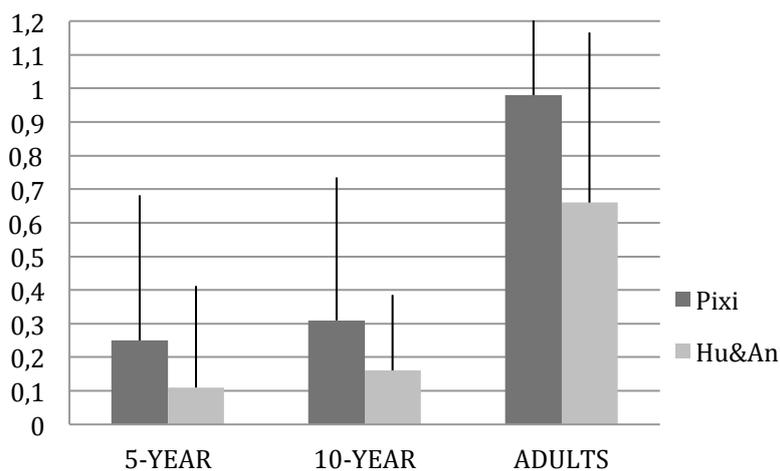


Figure 4. Mean proportions of iconic gestures per target motion description.

To test the third and last hypothesis, we decided to explore the gesture-speech relation in the Pixi video set, as this was expected to be more problematic for Czech speakers than the

Humans&Animals context. Figure 5 summarizes the distributions of the three main gesture-speech semantic patterns across the observed age groups.

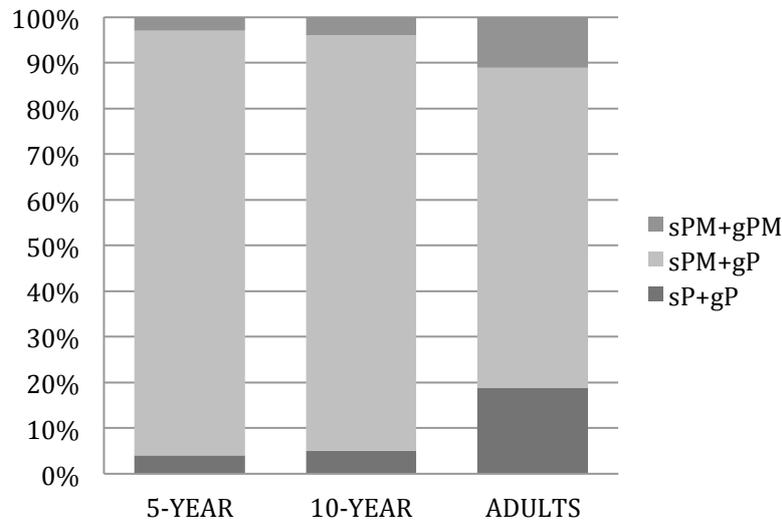


Figure 5. Distribution of speech-gesture patterns (s = speech, g = gesture, PM = path and manner, P = path only)

The most widespread pattern was ‘Path-and-Manner in speech + Path-only in gesture’ (93% in younger children, 91% in older children, and 63% in adults) which reflects the general tendency for Czech speakers to convey different elements of Motion in speech and gesture. For illustration, see Example 4 produced by a 5-year-old child.

- (4) *Pixi takhle oběhl sněhuláka nějak.*
 Pixi like.this **around**.ran snowman somehow
 ‘Pixi ran around a snowman like this.’

+ Both hands are joined (palms touching each other) and together draw a circle in the air, in the horizontal plane.

Much rarer but nevertheless observed alternatives were ‘Path-and-Manner in speech + Path-and-Manner in gesture’ (4% in younger children, 5% in older children, and 17% in adults) and ‘Path-only in speech + Path-only in gesture’ (3% in younger children, 4% in older children, and 10% in adults). The first one is illustrated in Example 5 produced by a 10-year-old child, and the second one in Example 6 produced by an adult participant. In both cases, gesture and speech provide the same type of information about Motion. The proportion of each alternative pattern increased in adult Motion descriptions.

- (5) *Po kopci se dostal nahoru.*
 on.and.by.the.means.of hill itself got **up**
 ‘(Pixi) went up the hill.’

+ Right hand with a pointing finger goes up and from the left to the right at the same time.

- (6) *Potom jakoby sklouznul z toho stolu.*
 then as.if **down**.slid from this table
 ‘Then (Pixi) as if slid down from the table.’

+ Left hand starts at the eye level and goes down while the fingers altogether form the letter C as if holding a cube (to represent Pixi’s body) by its bottom

and top without tilting it so that the bottom of the cube is carefully kept parallel to the ground (to show that Pixi maintains its frozen vertical position and fluent motion, although one would normally expect some acceleration or spinning in the air when the character goes over the edge of the table and falls down on the floor).

7. Analysis of the Results and Discussion

First, we investigated the impact of the degree of Manner saliency on the verbal description of Motion. The lower proportion of target-Motion descriptions collected in the Pixi video set in comparison to Humans&Animals suggests that Czech speakers experience some difficulties when asked to describe Motion in circumstances where the Manner component is not/less salient. For instance, participants totally omitted the target event and focused rather on the arrival/departure scene and on the background, or provided a non-direct/general description of the target event (e.g. Pixi was playing in the snow).

At the same time, the omission/avoidance strategy was less pronounced in older children and adults who handled target events in Pixi and A) successfully applied a Path-only/non-Manner verb (e.g. Pixi got first into and then out of the house), or B) made an effort to describe the particular Manner using more than one verb/clause (e.g. Pixi slid up onto the snow hill but he wasn't really sliding because his body wasn't touching the ground), or C) manifested hesitation, relativization and overall non-satisfaction with the verbal outcome, either through their body language (e.g. hesitant facial expression) and/or verbally (e.g. Pixi was *as if* climbing up onto a big snow hill; Pixi *kind of* jumped down from the table to the ground), while using an apparently not semantically totally appropriate but approximate Manner verb, respectively a Manner verb root in conjunction with a semantically appropriate Path prefix.

To sum up, the result obtained and additional observations validate our first hypothesis and together suggest that Czech speakers – 5-year-old children more than 10-year-old children and adults – actually experience Motion events with less/no salient Manner as more difficult to describe than Motion events with less/no salient Path.

Once we had established that the Pixi condition represented a real difficulty for Czech speakers, we addressed the second question related to the frequency of iconic gestures. From the ontogenetic perspective, our results corroborate those reported by previous studies (e.g. Colletta, Pellenq and Guidetti 2010). The fact that adult participants produced significantly more gestures than 5- and 10-year old children reflects the general increasing trajectory of iconic co-speech gesture development long after the onset of speech, and therefore indicates that iconicity, implemented through gesture, has its place and role even in already mastered speech produced by adult/experienced speakers.

Our comparison of gesture production in the Manner-salient vs. the Path-salient condition showed that Czech participants gestured more when describing Pixi's motions than when describing moving humans and animals. We interpret this outcome in line with the view of iconic gesture as playing a particular role in situations that are difficult to translate into words (Goldin-Meadow et al. 2001; Melinger and Kita 2007; Morsella and Krauss 2004).

As gesturing (versus not-gesturing) is a behavior that depends a lot on the situational and psychological context (Hostetter and Alibali 2008), an alternative explanation could be that speakers gestured more in Pixi than in Humans&Animals simply because they found the Pixi video clips more interesting – maybe due to the unusual appearance of the Pixi character (introduced to our participants as an alien) and the richer background scenery in comparison to Humans&Animals – and therefore became more involved in the narration. Although we

cannot totally exclude this possibility, the Pixi video clips were designed to be similar – and hence comparable – to Humans&Animals in narrative structure (beginning–middle–end) and overall appearance (cartoons). On the other hand, the difference in background scenery was intentional and crucial because, while landmarks are absent in Humans&Animals in order to visually background Path of Motion (and to focus on Manner), they are necessary in Pixi to foreground Path (and to defocus from Manner).

How exactly gesture works in those situations was investigated in our third and last question which focused on gesture-speech semantic relations. Starting from the idea that gesture depicts the core element of a mental representation (McNeill 1992, 2005) which, in the case of Motion events, is Path rather than Manner (Talmy 1985, 2000), we hypothesized that gestures might be the tool to reduce the gap between visually backgrounded Manner and therefore its less salient mental representation on the one hand, and over-represented Manner in the Czech Motion verb lexicon on the other hand, as suggested in the literature on gesture-speech relations in highly Manner-oriented languages (McNeill and Duncan 2000).

Three main gesture-speech semantic patterns were identified in the data collected from our participants in the Pixi condition. The largely predominant combination was ‘Path-and-Manner in speech + Path-only in gesture’. This finding is not surprising as it reflects a well-documented fact that Czech speakers systematically verbalize both Path and Manner and is in line with previous studies showing that speakers of satellite-framed languages, while they talk about both Motion components, tend to gesture about Path only (Fibigerova and Guidetti 2018; Fibigerova, Guidetti and Šulová 2012; Hickmann, Hendrix and Gullberg 2011). Such semantic non-redundancy is interpreted in terms of the functionality of gesture in relation to simultaneous speech. As gesture depicts the core element(s) of an expressed idea, its main function is to *focus on* what is really salient and relevant in the verbal message.

The other two patterns were much less common. They were almost marginal in the children’s Motion descriptions. However, in descriptions produced by adults, they represent more serious alternatives to the predominant pattern. Their common point is that both gesture and speech express the same type of information about Motion. The ‘Path-only in speech + Path-only in gesture’ pattern is based on Path-only/non-Manner verbs that, as already mentioned, are less frequent in Czech and belong rather to adult vocabulary. In our interpretation, this pattern occurred when speakers successfully found a way to avoid Manner in speech. In such a case, the function of gesture is simply to *reinforce* redundant verbal content. The ‘Path-and-Manner in speech + Path-and-Manner in gesture’ pattern implies complex Path-and-Manner gestures that are cross-linguistically less frequent than Path-only gestures and belong rather to the adult gesture repertoire (Fibigerova and Guidetti 2018; Fibigerova, Guidetti and Šulová 2012; Gullberg, Hendrix and Hickmann 2008; Hickmann, Hendrix and Gullberg 2011). In our data, Manner of Motion was more accurately represented in gestures than in words and, in contrast to speech, gesture never expressed Manner in a non-accurate way (e.g., speakers sometimes described Pixi’s motion in terms of ‘walking’ but never wiggled their fingers). We interpret such a non-redundancy as indicating that, when Czech speakers did not find a way to avoid Manner verbally and ended up using an unsatisfactory Manner label, they tried to *rectify/fix/correct* verbalized Manner through gesture.

To sum up, all three different patterns show that iconic gestures are used to express what is – in a given context and for a given individual – cognitively the most salient element. In addition to this and depending on what content was conveyed through speech and how satisfactory the verbal outcome is for the speaker, gesture seems to be able to bridge/reduce/overcome a potential gap between mental and verbal/linguistic representations.

8. Summary and Conclusion

Our aim was to contribute to the discussion about iconicity by bringing attention to iconic co-speech gestures. We were interested in the interplay between language and gesture as two different but connected semiotic systems, the links between forms of external and internal/mental representations, and lastly the ability of iconic gesture to decrease the cognitive load of speaking by virtue of its image-like quality. We wondered what would happen if iconic gesture was used to express a mental image that is not easy to translate into words because of the specificities/limits of the lexical and syntactical characteristics of a given language, but that would be easy to represent analogously.

To find such a difficult-to-verbalize image we drew inspiration from studies on the expression of the concept of Motion in different languages. Given that Czech speakers, who typically verbalize Path and Manner of Motion jointly, might experience difficulties when trying to express Path without Manner, we wondered whether and how they would use gestures to deal with such a situation.

For this purpose, we collected data from 72 five-year-old, ten-year-old and adult Czech native monolinguals that consisted of polysemiotic descriptions of Motion events, elicited by two qualitatively different sets of specially designed video stimuli. We summarize our findings, obtained with analysis of variance, descriptive analysis of data distribution and additional observations, as follows.

In a Czech-language-friendly situation where Manner of Motion is visually foregrounded, cognitively more salient than Path, and verbally easy to label, Czech speakers – both adults and children – provide verbal descriptions of Motion events successfully, with a semantically appropriate Manner verb or verb root, and with no apparent difficulties. At the same time, they accompany their verbal descriptions with iconic gestures whose frequency increases with age.

In contrast, in a Czech-language-not-friendly situation where Manner of Motion is visually backgrounded, cognitively less salient than Path, and verbally difficult to label, Czech speakers – both adults and children – tend to totally omit/avoid talking about Motion. The fact that the Path of the Motion is visually foregrounded and cognitively salient is not always a sufficient condition for Czech speakers to actually verbalize that Motion because there are not enough verbs available in the Czech lexicon to describe Path without including Manner.

If Czech speakers do not find an applicable Path-only/non-Manner verb, which is difficult at all ages but especially for children, they have to express both Path and Manner of Motion and they do so typically through a prefixed Path-and-Manner verb. While a Path prefix is always chosen in a semantically appropriate way, the choice of a semantically appropriate Manner verb seems to be a more difficult task and is often accompanied by hesitation, relativization and overall non-satisfaction with the final result, particularly in adults.

Gesturing becomes more frequent in this context than in the Czech-language-friendly one, both for children and for adults. Gestures predominantly express Path only, regardless of whether speakers find a way to verbally avoid Manner and express only Path of Motion or end up verbalizing both elements of Motion. However, when both elements of Motion are verbalized, although speakers prefer to gesture about Path only, sometimes – in adults rather than in children – Manner of Motion appears in gesture as well. In this case, the gestured Manner seems to be more semantically appropriate than Manner conveyed in the simultaneous speech.

To conclude, our investigation of polysemiotic descriptions of Motion events in Czech language allows us to say that (1) iconic gesture is an important means of expression and

communication whose frequency continues to increase long after the onset of speech, (2) speech and iconic gesture together convey a complex and coherent representation of actual mental content that is more accurate than verbal representation alone, (3) the role of iconic gesture becomes particularly important when language – endowed with a large and fascinating expressive power but also limited by its arbitrary code and rules – does not provide the requisite tools to express a particular idea in a particular situation by a particular speaker, and finally (4) iconic gesture, by virtue of its imagistic nature that makes it more flexible to use and cognitively less demanding to process than speech, seems to be the tool that allows speakers to modulate the verbal content, and thus to overcome the limits of their speech and/or their language.

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