Expression and Perception of Endpoints during Language Acquisition: Three Studies on Czech

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ABSTRACT:
The description of goal-oriented motion events differs cross-linguistically. Speakers of languages with a *phasal* perspective (such as Russian) describe these events as a process, while speakers of languages with a *holistic* perspective (such as Czech) emphasize the final state of the event, i.e., an endpoint. For instance, when someone walks toward a house, Czech speakers are more likely to mention the house as an endpoint in their description than Russian speakers (Schmiedtová, 2013a). This paper investigates the prominence of endpoints during language acquisition of Czech preschoolers in three experiments. Firstly, we investigate the frequency of endpoint expression in Czech children (N=40) in an elicitation task compared to an interactive setting. Secondly, we compare the endpoint production of Czech children (n=25) with that of Russian children (n=25). Lastly, we examine whether visual fixations on endpoints increase in Czech children (n=75) with age. The results show that Czech children produced more endpoints in the interactive setting than in the elicitation task. We did not find a significant difference between the overall number of endpoints produced by Russian and Czech children. However, there were significant differences in the types of utterances in which the children were expressing them. The eye-tracking data did not show a gradual increase in attention to endpoints with age. Our findings suggest that parent–child interaction is crucial in directing children's attention toward endpoints. However, Czech children appear to be considerably independent in their production of endpoints. This study provides insights into how Czech children describe and perceive endpoints, a topic that has not been previously analyzed.

KEY WORDS:
first language acquisition, language-specific patterns, holistic and phasal perspective, cross-linguistic comparison

1 INTRODUCTION

The grammar of languages is selective, emphasizing some aspects of real-world situations more than others (Boroditsky, 2006). It has been argued that features that are grammaticalized and obligatory to express (like the category of aspect or grammatical gender in some languages) cause language speakers to pay closer attention to these features while using language or preparing language content (Sapir, 1921; Slobin, 1996). The current paper focuses on language-specific patterns in encoding and perceiving goal-oriented motion events.

A goal-oriented motion event is a situation where a figure moves toward an endpoint. Studies have shown that while describing a goal-oriented motion event, speakers of different languages focus on a different part of the scene (Carroll et al., 2011;

Mertins, 2018; Schmiedtová et al., 2011; Slobin, 1996; Talmy, 1985). While speakers of languages with the so-called 'phasal' perspective describe the scene as a process, speakers of the language with the so-called 'holistic' perspective emphasize the final state of the event in their description. For example, when someone is heading towards a house, 'holistic' speakers likely mention the house (endpoint) in their description, while 'phasal' speakers more probably leave it out. It was shown that the number of endpoints is consistently higher in descriptions from speakers of languages with a holistic perspective than from speakers of languages with a phasal perspective (Sahonenko & Schmiedtová, 2008; Schmiedtová, 2008, 2013b; Schmiedtová et al., 2011; von Stutterheim et al., 2012).

Such cross-linguistic differences are connected to the grammatical systems, particularly to the grammaticalized category of aspect. While aspectual languages tend to follow the phasal perspective, languages without aspectual categories conceptualize goal-oriented motion events holistically. Still, the conventional use of grammatical categories plays a significant role. As was shown, an aspectual language usually adopts the phasal perspective; however, Czech is an outlier. While the perfective and the imperfective are grammaticalized (more detail below), their usage differs from other Slavic languages, and Czech speakers conceptualize the goal-oriented motion events holistically (Schmiedtová, 2013a). We assume that this preference is acquired during language acquisition. It requires a substantial amount of input to follow the conventions and preferences of a particular language, as studies have shown (e.g., Bowerman & Choi, 2001 on classification; Lucy & Gaskins, 2001 on categorization).

The research on the acquisition of language-specific patterns has been inconsistent in determining when the language-specific patterns become prevalent in a child's production (see Section 2). In our previous research (Marklová et al., 2023a), we focused on the input itself; we discovered that in child-directed speech, Czech speakers produce the highest number of endpoints compared to Russian speakers and Russian-German speakers. This implies that the direct parental input is already rich in preferences concerning endpoints. However, the results of the experiment did not tell us whether preschoolers already follow the preferences. The current paper addresses this issue.

1.1 GOAL-ORIENTED MOTION EVENTS IN CZECH AND RUSSIAN

During the description of goal-oriented motion events, speakers follow the holistic or phasal perspective. Von Stutterheim and Nüse (2003) introduced these terms to delineate two contrasting approaches when discussing events: a speaker can either focus on the goal, and therefore describe the event holistically, or focus on the process of the event, and therefore describe the event in phasal perspective. Each language possesses tools for describing events from both perspectives. Nevertheless, research has revealed that speakers of different languages tend to consistently favor one perspective over the other. This inclination has been attributed to differences embedded within language grammar. The pivotal factor influencing the selection of a specific perspective has been identified as the grammaticalized aspect category (von Stutterheim & Nüse, 2003). This category marks the ongoingness or completion of an

event on the verb. Czech and Russian, which are the focus of the experiments in this paper, have formally similar aspectual systems: ongoingness is expressed by the simplex imperfective or secondary imperfective, and completion by the perfective form. Since the secondary imperfective form is incompatible with motion verbs, which are at the core of the motion events discussed in this paper, we will not elaborate on this form any further (for further information, see Schmiedtová et al., 2011). For an example of the aspectual categories in Czech (1) and Russian (2), see the following examples:

(1) a. *Zajíc běží do lesa.*
Hare run-IMPFV.3SG into the forest
'A hare is running into the forest.'
b. *Zajíc poběží do lesa.*
Hare run-PFV.3SG into the forest
'A hare will run into the forest.'

(2) a. *Zajac bežit v les.*
Hare run-IMPFV.3SG into the forest
'A hare is running into the forest.'
b. *Zajac pobežit v les.*
Hare run-PFV.3SG into the forest
'A hare will run into the forest.'

In (1a.) and (2a.), the simplex imperfective marks an ongoing event in the present tense. There are some differences in the usage of this form in Czech and Russian: while it has been shown that it is common in Russian to express such an event in a bare-verb phrase (i.e., *Zajac bežit.* 'A hare is running.'), such bare verb phrases tend to be supplemented by additional arguments, such as the information about the path (i.e., *Zajíc běží po poli.* 'A hare is running on through the field.') or endpoint (*Zajíc běží do lesa.* 'A hare is running to the forest.') (Schmiedtová et al., 2011). The expression of completion is presented in example (1b.) for Czech and (2b.) for Russian. The perfective form of motion verbs is created by adding a prefix to the simplex imperfective. This leads to a change in the tense since it shifts the verb's meaning into the future. However, it has been observed that Czech speakers use the perfective form also when describing an ongoing event. Therefore, the perfective, while formally expressing future tense, can also be used in the so-called here-and-now reading (Schmiedtová, 2008).[1] This shift in the usage of the aspectual forms was explained by Czech's long-term contact with German, a non-aspectual language with a tendency to emphasize endpoints (Mertins, 2018). These specifics of the Czech aspect led to its belonging to the languages with a holistic perspective, as will be discussed further.

Overall, speakers of non-aspectual languages show the holistic perspective, highlighting the endpoint while encoding goal-oriented motion events. Speakers of aspectual languages show the phasal perspective, which emphasizes the processual

1 Schmiedtová (2008) identified this phenomenon in the elicitation data of Czech native speakers.

characteristic of the event. Carroll and von Stutterheim (2006) explain why the absence of the aspectual category is linked to the expression of endpoints: speakers of aspectual languages connect the time of speaking with the time of the topic through aspectual markers, enabling them to directly establish ongoing events. That eliminates the requirement for one event to be portrayed as finished or limited before introducing another. Conversely, speakers without the aspectual category need to explicitly indicate the completion points or results of previous events to connect the topic time to the preceding time of the situation.

Czech has been employed in the cross-linguistic comparisons of languages with different perspectives and has been consistently categorized as a language with the holistic perspective. This means that the expression of endpoints by Czech speakers was significantly more frequent compared to 'phasal languages' such as English, Spanish, Dutch, Norwegian, or Russian (Carroll et al., 2011; Mertins, 2018; Schmiedtová et al., 2011). On the other hand, it was comparable to languages such as German or Dutch, which were identified as languages with the holistic perspective (Schmiedtová, 2013a).

Russian and Czech were directly compared in Schmiedtová (2013a). Speech data from Czech, Russian, and German adult speakers (N=83) who described video clips depicting goal-oriented motion events were examined. The results showed that Russian speakers expressed significantly fewer endpoints (22 in total) compared to Czech (52 in total) and German speakers (44 in total). The comparison between Russian and Czech speakers yielded a significant difference. Additionally, Russian speakers used bare-verb phrases significantly more often than Czech and German speakers (20 times compared to 4 and 5 times, respectively). Furthermore, it was observed that these perspectives also emerged outside of verbalization; the endpoints were emphasized by 'holistic' speakers also in memory tasks following verbalization and in visual attention preceding verbalization.

It is worth mentioning that the prominence of the perspective is strong enough to also be transferred into L2, as studies with highly proficient L2 speakers uncovered (Carroll & Lambert, 2003; Carroll & von Stutterheim, 2006; Sahonenko & Schmiedtová, 2008; Schmiedtová et al., 2011; van Ierland, 2009; von Stutterheim, 2003; von Stutterheim & Lambert, 2005). In a study conducted by Schmiedtová and Sahonenko (2008), the researchers examined how Russian and Czech speakers of L2 German verbalized goal-oriented motion events. The results showed that both groups used the encoding patterns of their first language when conceptualizing goal-oriented motion events in the target language.

1.2 ACQUISITION OF LANGUAGE-SPECIFIC PATTERNS

So far, there has been a lack of studies focusing on the acquisition of these perspectives (for a large cross-linguistic comparative work on event descriptions in language development, see Berman & Slobin, 1994). We follow an approach towards language acquisition which argues that it is input-driven (see Clark, 2016 for an overview). Language is seen as a product of social interaction, in which children receive cues about the conventional use of particular words, expressions, and constructions.

A child can only successfully acquire language with sufficient input (Arnon et al., 2014; Clark, 2016). Moreover, the language-specific patterns and idiosyncratic patterns found in caregivers' language use are reflected in their children's language use (Bowerman & Choi, 2001, 2003; Gopnik, 2001). Studies have shown that children's speech is more similar to their parents' speech than to other children's (Bowerman & Choi, 2003). However, from what age do children follow the language-specific patterns, such as the expression of endpoints? We ask this question in our three experiments focusing on the acquisition of holistic and phasal perspectives since the research on other language-specific preferences shows mixed results. Some studies recognized an influence even on the production of first words (Bowerman, 1996; Choi & Bowerman, 1991; Hickmann et al., 2009; Slobin et al., 2010), while others posited the grasp of language-specific conceptualization in the period of three to four years of age (Allen et al., 2007). For example, Choi (2006) identified that language-specific categorization of containment in Korean plays a role from an early age. Lucy's research on classifiers in Yucatec tracked that they are acquired gradually until approximately nine years of age (Lucy, 2004; Lucy & Gaskins, 2001).

Several studies have investigated the acquisition of conceptual perspectives for locomotion events, with a particular focus on the difference between satellite-framed and verb-framed languages and the emergence of differences in the description of such events. This research follows Talmy's (1985) lexicalization typology. Harr (2012) provides an overview of this research. It was uncovered that children are able to encode different elements of motion, i.e., path and manner, since the first language production (Mandler, 2007; Pulverman et al., 2008) and around three years of age, emphasizing the elements of the motion events according to the lexicalization patterns of their language (Choi & Bowerman, 1991; Oh, 2003; Ozcaliskan & Slobin, 1999; Özyürek et al., 2008; Papafragou et al., 2002). Hickmann and Hendriks (2010) observed various language-specific patterns during the description of motion events in children as young as two and a half years.

2 PRESENT STUDY

The current paper focuses on children's speech and visual attention regarding endpoints. Firstly, we analyze data from Czech children (aged 3–5) while describing picture representations of goal-oriented motion events in a non-interactive elicitation task. We compare them to Czech children who discuss the same stimuli in an interactive setting. We hypothesize that the interactive setting will affect children's production of endpoints since it encourages and leads their attention to them. We base this assumption on our previous research (Marklová et al., 2023a) and the rich literature concerning the role of interaction in language acquisition. Secondly, we compare the expression of endpoints in the Czech children from the 'interactive' group from the first experiment with data from Russian children recorded in the same setting and over the same stimuli. We expect the number of endpoints produced by Czech children to be higher than that produced by Russian children. We aim to conduct a thorough analysis of the child–parent conversations. Lastly, we

recorded the eye movements of Czech children who silently watched the same stimuli as in the first two experiments on the computer screen. We analyze if the fixation on endpoints increases with age. Online research methods such as eye-tracking can uncover unconscious processes that are not apparent through language production alone. That is particularly relevant for young children, as their language production abilities may not reflect their overall language abilities. By measuring eye movements, it is possible to gain valuable insights into whether language perspectives influence children's visual attention. This method has been employed in previous research on phasal and holistic perspectives and uncovered differences between adult speakers' visual perception (von Stutterheim et al., 2012). It has not been used with preschoolers yet.

We are interested in the following questions: Do Czech children follow the holistic preference while encoding motion events on their own, or do they need encouragement from their parents to do so? Do Czech children express more endpoints than Russian children when describing motion events in an interactive setting? Does the visual fixation of endpoints in Czech children increase with age? This paper describes the main findings observed in how Czech and Russian children discuss and perceive endpoints.

2.1 EXPERIMENT 1: CZECH CHILDREN'S PRODUCTION WITH AND WITHOUT INTERACTION

In the first experiment, we compared the expression of endpoints in the speech of Czech children in two settings. We presented picture stimuli depicting goal-oriented motion events in an elicitation task and active interaction with a caregiver. We were interested if the total amount of endpoints expressed by the children would be higher in the interactive setting since our previous study revealed a high number of endpoints in the child-directed speech of Czech parents and the tendency of parents to lead attention to them actively (that is, expressing them in the form of leading questions such as *Kam běží ten pes?* 'Where is the dog running to?').

2.1.1 PARTICIPANTS

Our analysis includes data from 45 children divided into two groups: an 'elicitation group' (n=20) and an 'interactive group' (n=25). The data for the elicitation group was collected between August 2021 and November 2022, while the data for the interactive group was obtained from a publicly available dataset (Marklová et al., 2023b). The parents of children from the elicitation group were paid 200 Czech crowns (approximately 8 euros) and they were recruited individually from the social network of the authors or by flyers in kindergartens. The parents of the children in the interactive group were recruited from the pool of participants in experiments at the Institute of Psychology, Academy of Science in Prague. Their participation was voluntary and without financial reward. The demographic information is displayed in Table 1.

	Elicitation group	Interactive group
gender	13 female, 7 male	15 female, 10 male
age	Ø 4;5 (range 2;9–5;11)	Ø 3;9 (range 2;6–5;8)

TABLE 1: Participants' overview.

FIGURE 1: Examples of the stimuli.

2.1.2 DESIGN AND MATERIALS

Ten pictures were used as stimuli in the elicitation task; six depicted goal-oriented motion events where an animal moves towards an endpoint of various prominence (see Figure 1). Four items depicted an animal/animals in a static position, and they served as fillers. The fillers were added to ensure that the children would not iterate the same sentence structure describing movement, which happened during the piloting phase (some children started to use the same verb for all animals, such as *koník běží* 'the horse is running', *čáp běží* 'the stork is running', etc.). The conversations over the fillers were not analyzed. The items were presented in linear randomized order. The collection was conducted by the parents and children in their natural environment (at home). The instructions and the stimuli were presented online via the LimeSurvey tool (LimeSurvey Project team, 2012). Parents were instructed to run the experiment with their children while they recorded them on a voice recorder. The experiment was self-paced. Each item was presented on a slide, and parents had to click on a button to skip to another picture. Their task was to ask the child *Co se děje na obrázku?* 'What is happening in the picture?' and let the child describe the picture without interventions. They were explicitly asked not to elaborate the child's answers, but they could encourage them with vague questions such as *A dál?* 'And then?' or *A co se ještě děje?* 'And what else is happening?'. There were individual situations when the parents did not follow the instructions completely (for example, when the child was very silent, the parents asked a few more targeted questions). Since these

situations were not frequent and in the majority of situations, the questions did not target the motion event (but for example, the properties of the animal), we did not exclude these transcripts from the analysis.

The interactive group data was taken from the larger dataset (Marklová et al., 2023b). The data was recorded, as in the elicitation task, in the natural environment by caregivers of the children. Each parent obtained 12 pictures depicting goal-oriented motion, which were part of a larger battery of 30 pictures.[2] The six critical stimuli in the elicitation task were from the same set. The items were printed in color on individual sheets of paper of A5 size. There was no prescript order of viewing that the parents had to follow. The pictures were rearranged in a random order for each parent–child pair. The parents were instructed to talk about the pictures with the children 'as naturally as possible', i.e., in an interactive way. However, it was highlighted that the goal is not to 'show off' the child's skills but rather to record a natural conversation between children and their parents. Parents were instructed to start with the question *Co se děje na obrázku?* 'What is happening in the picture?' and develop a conversation about the events depicted in the pictures.

2.1.3 TRANSCRIPTION, SEGMENTATION AND CODING CRITERIA

The audio data was transcribed at full length. We partitioned every transcript into discrete segments, which we refer to as "conversations". Each conversation targets one stimulus. Following this initial segmentation, we further divided these segments into individual utterances, with a focus on identifying those referring to locomotion events. A motion verb and optional verbal adjuncts determined these utterances. We followed the basic definition of motion verbs from Miller and Johnson-Laird (1976, p. 527): "verbs that describe how people and things change their places and their orientations in space". For specific or unclear instances, we consulted the literature focused on Czech motion verbs and their typology (Daneš & Hlavsa, 1981; Saicová Římalová, 2010). We considered the 'simple' usage of motion verbs in any tense (although the present tense was prevalent), and we also counted situations with a modal verb used with a motion verb, such as *koník chce běžet do stáje* 'the horse wants to run to the stable'. Most of the verbs produced by children were the basic verbs of motion; more than 70% of the analyzed verbs consisted of the lemmas *fly*, *run*, *go/walk*, and *jump* in the indicative present tense. See the following transcript of a segment from a conversation:

(3) A: hm. tak a co se tady děje? *em. so and what is happening here?*
CH: čáp a ten nevim co dělá *stork and I don't know what he is doing*
A: tak vidíš co dělá ne? *you see what he is doing don't you?*
CH: jo! <u>letí na komín</u> *yes!* <u>*(he is) flying onto the chimney!*</u>

The utterance which we identified as a motion event is underlined. We coded the endpoints when they occurred in the utterance (as in the transcript above). Endpoints

2 The set included a left-directional and right-directional variant of 15 original pictures.

are typically expressed by prepositional phrases (PPs). The typical prepositions in Russian are *к* 'to', *в* 'in', *на* 'to/on', *по направлению к* 'towards', in Czech *do* 'into', *k* 'to', *na* 'to/on':

(4) *Sobaka bežit v svoju budku.*
'The dog is running into his dog house.'
Ten pes běží do svojí boudy.
'The dog is running into his dog house.'

Questions targeting endpoints do so by the interrogative pronoun *куда* 'where to' in Russian, and *kam* 'where to' in Czech:

(5) *I kuda skačet lošaď?*
'And where is the horse running to?'
A kam ten kůň běží?
'And where is the horse running to?'

Each utterance containing an endpoint was also coded according to its type. This examination criterion comprised four categories: statement (example 4), answer, question (example 5) and repetition. Only answers to *wh*-questions directly targeting endpoints were categorized as 'answers', as in the following segment:

(6) A: líbí se mu to? no to možná by neutíkal. kam asi utíká? podívej *he likes it? he would maybe not run then. where is he running? look*
CH: do boudy. *into the dog house*

An example of repetition is displayed in the following:

(7) A: aha. takže koník běží domů *i see. so the horse is running home*
CH: jo, domů *yes, home*

These types of utterances were chosen because question–answer sequences are among the most prominent conversation sequences (Sacks et al., 1974), and repetitions and statements are important components of parent–child interaction (Sinclair & Fernández, 2021). The analysis of the type of utterance enabled us to analyze the specific features of child–parent communication in connection with how endpoints are expressed.

The conversations were transcribed by the authors of the publicly available dataset. To ensure the accuracy of the coding process, sixteen transcripts consisting of 717 utterances were independently coded by two proficient coders. Both coders possessed a strong command of the languages under analysis. Subsequently, intercoder reliability was assessed using Cohen's kappa index. The calculation involved dividing the number of actual matches by the total number of utterances. The resulting Cohen's kappa index value between the two coders was found to be 0.97. According to Landis and Koch's (1977) benchmarks for evaluating the strength

of agreement, this value indicates that the average agreement between the coders was "almost perfect".

2.1.4 RESULTS AND DISCUSSION

The analysis was performed using R Statistical Software 4.1.3 (R Core Team, 2022). A total of 240 conversations were analyzed (20 about each stimulus in each mode).[3] We classified each conversation into two categories: the endpoint either was or was not expressed by the child. Our approach did not focus on the frequency of endpoint expression within a single conversation, as this metric exhibited significant variation across different stimuli and among participants. Moreover, it was influenced by numerous factors that are beyond the scope of our investigation, including the length of the specific exchange, the timing of the endpoint introduction into the conversation, the level of the child's interest in the given image, and so forth. The primary objective of this study was to see if the endpoint was articulated at any point during the conversation. In the interactive group, children expressed endpoints in 81 conversations (there were 6 critical stimuli, with 0.68 mean proportional value per stimulus, SD=0.09). In the elicitation group, children expressed endpoints in 65 conversations (0.54 mean proportional value per stimulus, SD=0.12). We performed Pearson's Chi-squared test with Yates's continuity correction: $\chi 2 = 3.9347$, df = 1, p-value = 0.0473. The test uncovered a significant difference between the elicitation and interactive group for a significance level of 0.05. Therefore, we can conclude that in the interactive mode, children express the endpoint more often than in the free elicitation task. To have an insight into the patterns in the children's speech, we examined the type of utterances in which the endpoint was expressed. We analyzed the utterance where the child expressed the endpoint for the first time.

In the elicitation task, all children's utterances were statements since the parents were instructed not to ask specific or leading questions. On the other hand, the interactive setting can offer a better insight into the mechanism of interaction, which leads towards expressing endpoints more often than in the elicitation. The distribution of the utterance types is shown in Figure 2.

Statements dominated as the type of utterance (49 cases); however, answers followed (30 occasions). It was common that the parent asked an explicit *wh*-question targeting the endpoint very early in the conversation. Thus, the child was led towards expressing endpoints by the parent. Compare, for example, the following transcripts:

(8) A: a další, jo? *next one, ok?*
CH: dalsí. *next one.*
A: a co to je na obrázku? *and what is in the picture?*
CH: ňáká kosa. *some goat.*

3 Since the 25 children in the interactive group received a selection of the 12 stimuli from a larger dataset, this selection always included only part of the six target stimuli which we presented to the elicitation group. To gather 20 conversations about each stimulus, we needed the data from all 25 children.

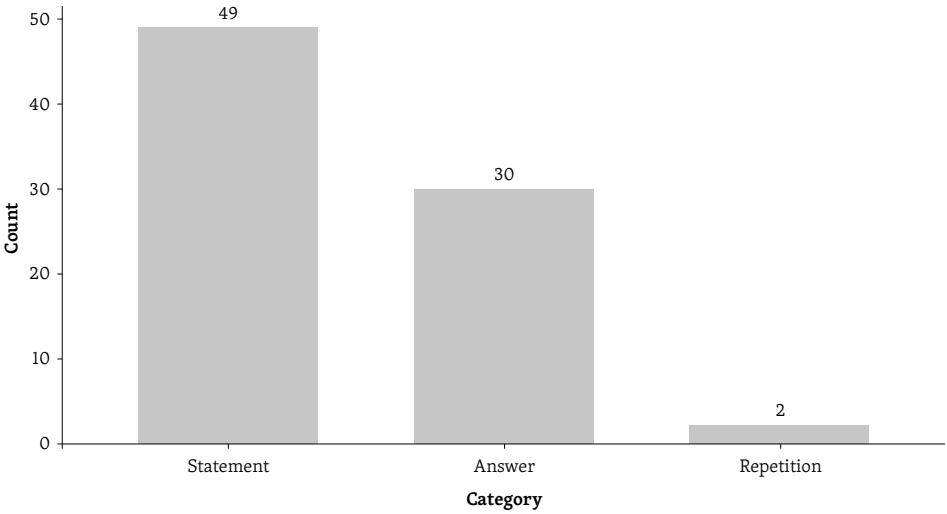

FIGURE 2: Type of utterances with endpoints in the interactive group.

A: ňáká koza*? some goat?*
CH: jo. *yes.*
A: hm, já si nejsem jistá, jesli je to koza, zlatíčko, dyž tady je psí bouda. *Em, I am not sure if it is a goat, darling, when there is a dog house.*
CH: bouda. *dog house.*
A: tak to asi bude pejsek. *so it will probably be a dog.*
CH: pejsek. *a dog.*
A: hm. Tak co dělá to zvířátko teda? *Em. So what does the animal do then?*
CH: utíká. *running.*
A: a kam utíká? *and where is it running to?*
CH: za myškou. *after a mouse.*
A: za myškou? Jo tady. *after a mouse? Ah here.*

(9) A: a co se děje na tomhle obrázku? *and what is happening in this picture?*
CH: prší. *it's raining.*
A: hm a co ještě? *em and what else?*
CH: skáče pes. *a dog is skipping.*
A: a co ještě? *and what else?*
CH: em a fouká. *em and blowing.*
A: a co se tam ještě děje? *and what else is happening there?*
CH: už asi nic. *probably nothing else.*

Both conversations were held over the same stimulus: a dog is running in the rain through the yard towards a doghouse. Conversation (8) is taken from the interactive group, and we can observe that the parent actively elaborates on the child's utterances and adds follow-up questions. In the last sequence, they asked first about

the general activity of the dog ('what is the animal doing?'), the child responded with a bare verb phrase ('(he is) running'), and the parent followed with a *wh*-question directly targeting the endpoint ('and where is (he) running to?'). To that, the child answers 'after a mouse', using a verbal adjunct expressing the purpose of the movement. On the other hand, example (9) was taken from the elicitation group. The parent kept asking only general questions and let the child choose the topics. Therefore, when the child said 'a dog is skipping', the parent followed with a generic 'and what else?' and the child moved to other actions in the picture. It should be mentioned that the conversations over each stimulus were, on average, longer in the interactive than in the elicitation group. They often included segments where the child and the parent fabulized imaginary stories about the animals. The segments about the activities of the animals were, on average, longer as well. We identify the reason to be that in the elicitation group, the child led the conversation and added the content, while in the interactive group, the parent did. Example (9) demonstrates that the child did not comment on more parts of the motion events even when prompted to say more. We assume that the directed questions from parents are essential for the child to start focusing on endpoints.

The interaction significantly increases the number of endpoints in children's speech. However, does the general focus on endpoints follow the holistic preference? To answer this question, we proceeded to the next step to compare the Czech interactive group with a group of Russian children.

2.2 EXPERIMENT 2: CZECH AND RUSSIAN CHILDREN IN AN INTERACTIVE SETTING

The second experiment compares the expression of endpoints by Czech and Russian children in an interactive setting. Russian is a language which has consistently been shown to follow a phasal perspective. Thus, comparing the prevalence of endpoints in the children's speech might uncover if preschoolers already follow the perspectives of their respective languages. We hypothesized that Czech children would produce more endpoints overall than Russian children. Since the first experiment uncovered the important role of question–answer pairs in the overall number of endpoints expressed by the children, we were interested if Russian and Czech children express the endpoints in similar types of utterances.

2.2.1 PARTICIPANTS

The transcripts of 50 child–parent interactions from the publicly available database (Marklová et al., 2023b) were used in the experiment. There were 25 Czech and 25 Russian monolingual pairs. The Czech group was the same as in Experiment 1 (see Table 1). However, we used conversations over all 30 stimuli this time (see below). The Russian parent–child pairs were recruited in Moscow kindergarten by their preschool teacher. There were 8 girls and 17 boys (4;6 years on average, range 3;0–5;11 years).

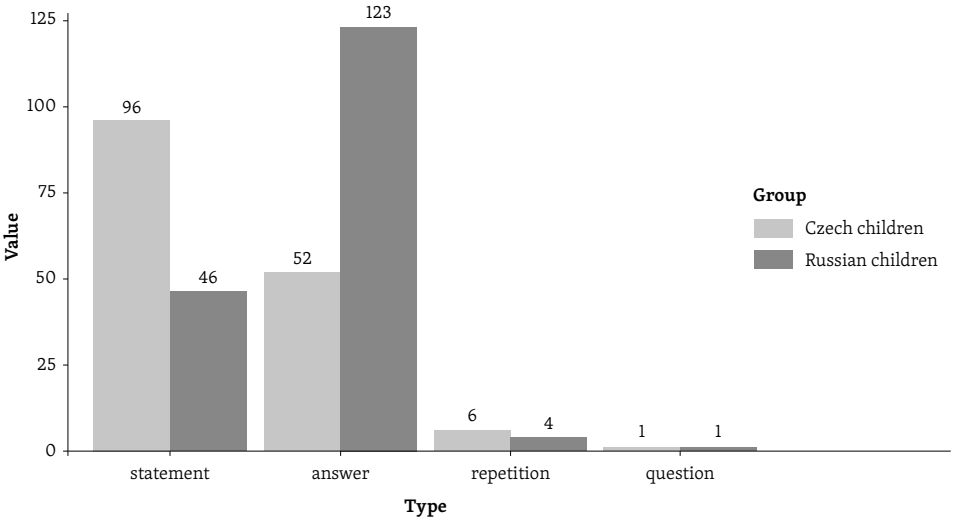

FIGURE 3: Type of utterance in children's speech.

2.2.2 DESIGN AND MATERIALS

Thirty picture stimuli were used in the experiment (including the critical stimuli from Experiment 1). All of them depicted an animal or animals performing a goal-oriented motion event. The endpoints were of different prominence. The procedure was the same as for the interactive group in Experiment 1. All conversations over picture stimuli were held in Czech or Russian, respectively.

2.2.3 TRANSCRIPTION, SEGMENTATION AND CODING CRITERIA

The segmentation and coding followed the same criteria as described in 2.1.3.

2.2.4 RESULTS AND DISCUSSION

In the interaction with a parent, while describing the pictures, Czech children showed the following behavior: Out of the 300 descriptions of pictures with motion events, the endpoint was expressed in 155 (mean proportional value=0.52; SD=2.84). Russian children, on the other hand, expressed the endpoint in 174 cases (mean proportional value=0.58; SD=2.51). To determine if there was a statistically significant difference between the two groups, we performed Pearson's Chi-squared test with Yates's continuity correction with the following results: $\chi 2 = 2.1804$, df = 1, p-value = 0.1398. This result is not significant with the level of significance set on 0.05. The analysis was performed using R Statistical Software 4.1.3 (R Core Team, 2022).

While the total number of endpoints expressed by Czech and Russian children does not differ significantly, the proportions of utterance types uncover profound differences (see Figure 3).

We performed additional pairwise comparisons to identify which utterance types show a significant difference between the two speaker groups. Bonferroni correction was used to adjust for multiple comparisons. We uncovered a significant difference in the proportion of answers between the Russian and Czech speakers ($p < 0.001$, Bonferroni-adjusted), as well as significant differences in the proportion of statements and situations where the endpoint was not uttered (both $p < 0.001$, Bonferroni-adjusted). There were no significant differences in the proportion of repetition or question utterances between the two groups (both $p > 0.05$, Bonferroni-adjusted).

In Experiment 1, we found a statistically significant difference between the elicitation and interactive group, with children from the latter group expressing the endpoint more often. In a third of the cases, they did it as an answer to a question from the parent. In the second experiment, we found that compared to Czech children, Russian children expressed the endpoint in an answer significantly more often. The interpretation might be that the Czech children still express more endpoints when actively encouraged by parents, but their preference for expressing the endpoint has already been developed. For Russian children, answering parents' questions was the primary way to express the endpoint. The common challenge with offline behavioral data could also explain this discrepancy in results. While the data were gathered using the same instructions and principles, ensuring a consistent environment for data collection proved challenging. Specifically, Russian parents were recruited for the experiment through a kindergarten teacher, while Czech parents were invited to participate by an undergraduate student. This recruitment process may have influenced the parents' attitudes toward the recordings. The Russian parents may have felt pressure to perform well, resulting in a more interrogatory conversational style compared to the Czech parents. Additionally, cultural differences and individual preferences may also have played a role. Furthermore, it is essential to note that some preferences evident in comprehension may not be observable in the production of preschoolers.

Therefore, we decided to shift our attention from offline methods to online methods.

2.3 EXPERIMENT 3: INSIGHT INTO EYE MOVEMENTS OF CZECH CHILDREN

In our third experiment, we explored the eye movements of Czech children while they were watching pictures depicting goal-oriented motion events. Eye-tracking has the advantage of providing spontaneous online measurements of unconscious processes, which offline methods might not uncover (Holmqvist & Andersson, 2017). Eye-tracking has already revealed language-specific influence on eye movements in language-specific perspectives in adult speakers (von Stutterheim et al., 2012). We were interested if there is increasing attention on the area of the endpoint by Czech children with increasing age. We conducted an exploratory eye-tracking experiment with the same critical stimuli as in Experiment 1 (2.1). We used fixation time and entry time into the endpoint area as the measurements. Fixation time quantifies the total duration of fixations within the endpoint area, summing the durations of all fixations within that area in milliseconds. The entry time records the time of the first entry into the endpoint area.

2.3.1 PARTICIPANTS

75 Czech monolingual children participated in the eye-tracking study. Twenty-two were excluded because of a low tracking ratio (under 70%). The tracking ratio expresses the proportion of time when the eye-tracker records the gaze during the experiment. Children are commonly more challenging to track than adults due to body movements. It is recommended to exclude participants with a low tracking ratio; we chose the level of 70% as a benchmark for inclusion before the data analysis started (see, e.g., Riege et al., 2021 for comparison). Written informed consent was obtained prior to the experiment from each child's parent or legal representative, and there was no financial reward for attending the experiment. All children attended a public kindergarten in Děčín (Czech Republic), and the data was collected in January–February 2019. The children were between 3;1 to 7;1 years old (4;6 on average).

2.3.2 DESIGN AND MATERIALS

Eighteen images were used as experiment items. Six were critical items, and they were identical to those in Experiment 1. Twelve served as fillers depicting an animal or animals in a static position, as in Figure 1 — fillers. The fillers were included to hide the purpose of the study, and there were twice as many of them as the critical items, following the standard convention. The eye gaze recorded during filler observation was not analyzed. The critical stimuli depicted an animal performing a goal-oriented motion event.

A remote eye-tracking device with SMI Technology was used to record the eye gaze. The sampling rate was 250 Hz. The monitor was 40" with a 16:10 ratio. Calibration was carried out for each participant before the experiment. SMI Experiment Center recorded eye movement time-locked.

The participants were given oral instructions in Czech. They were instructed to watch a series of pictures on a computer screen. They were told to observe the pictures silently and pick their favorite one in the end. They were explicitly told that no other task would follow and that they would see all the pictures again on one screen in the end, so participants did not need to memorize them. We were not interested in the results of this question since it served only experimental purposes, namely keeping the participants' attention and giving them reassurance about the unnecessity of memorizing the pictures. The instruction was designed to suppress a possible preparation for verbalization or memorizing of the content of the pictures.

The participants were seated in front of the monitor at a distance of approximately 60–65 cm. After the instructions were given, participants were given a chance to ask for clarification if needed. Then the calibration phase started. Immediately afterward, the presentation of the stimuli began. Each stimulus was displayed for six seconds. The fixation cross appeared between every two stimuli, and it was activated by 250 ms of uninterrupted fixation of the cross. The stimuli were presented in semi-randomized order (with a critical stimulus preceded by two fillers as a control).

2.3.3 RESULTS AND DISCUSSION

The endpoint areas were predetermined for each stimulus prior to the recordings. These regions conformed to the shapes of the endpoints, with consistent overlapping along the sides. The areas were not marked for the participants during the stimuli presentation. Regression models were used to test the influence of age on fixation time and entry time in a group of participants. The analysis was performed using R Statistical Software 4.1.3 (R Core Team, 2022). The results showed no significant influence of age on fixation time (p = 0.5917) or entry time (p = 0.3083) with a level of significance of p = 0.05. The details can be seen in Table 2 for the fixation time and Table 3 for the entry time.

	Estimate	**Std. Error**	**t value**	**Pr(>|t|)**
(Intercept)	294,93	92,56	3,186	0.00182 **
Age	–10,35	19,25	–0,538	0,59166

TABLE 2: Regression analysis results for Fixation Time (ms) on Age.
Residual standard error: 192.8 on 126 degrees of freedom
Multiple R-squared: 0.00229, Adjusted R-squared: -0.005628
F-statistic: 0.2892 on 1 and 126 DF, p-value: 0.5917

	Estimate	**Std. Error**	**t value**	**Pr(>|t|)**
(Intercept)	1992	726,3	2,743	0.00698 **
Age	154,5	151,1	1,023	0,30834

TABLE 3: Regression analysis results for Entry Time (ms) on Age.
Residual standard error: 1513 on 126 degrees of freedom
Multiple R-squared: 0.008235, Adjusted R-squared: 0.0003638
F-statistic: 1.046 on 1 and 126 DF, p-value: 0.3083

No correlation was found between the age of the children and the attention spent on the endpoint area. Therefore, we did not observe a progression of this tendency with increasing age.

As depicted in Figures 4 and 5, there is a substantial degree of inter-individual variability, and no discernible pattern of adherence can be identified across the various age groups.

There are several possible interpretations of our findings. We used the analysis of visual perception without the prompt for verbalization. There is mixed evidence about language influence in such a setting. It is possible that in this setting, the influence of the perspectives is not strong enough to be reflected in children's visual attention. Additionally, conducting eye-tracking experiments with children has several limitations. The high variability in eye movements might not allow us to see a general pattern. There is also a possibility that the visual attention into the area of the endpoint simply does not increase any more after approximately 2;6 years of age. This could either suggest that the influence of preferences is already established or that

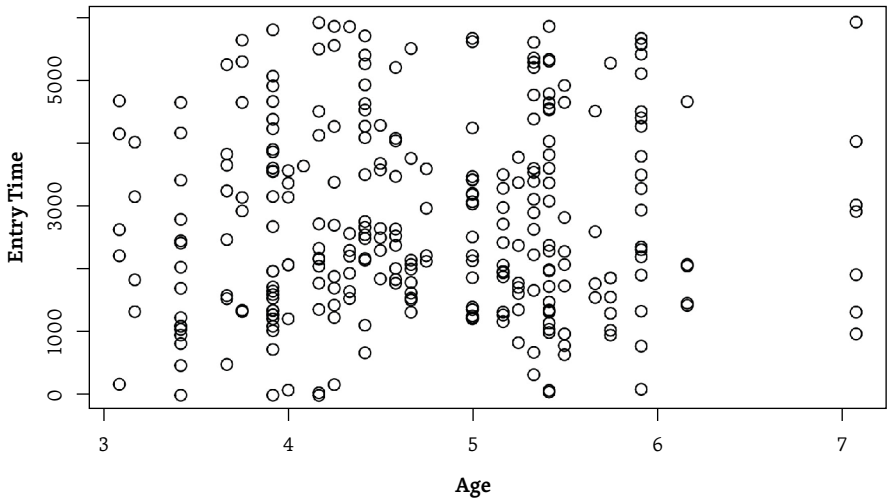

FIGURE 4: Entry time into the endpoint area. Each point represents one participant. The x-axis depicts the age of the children in years, and the y-axis the entry time in ms.

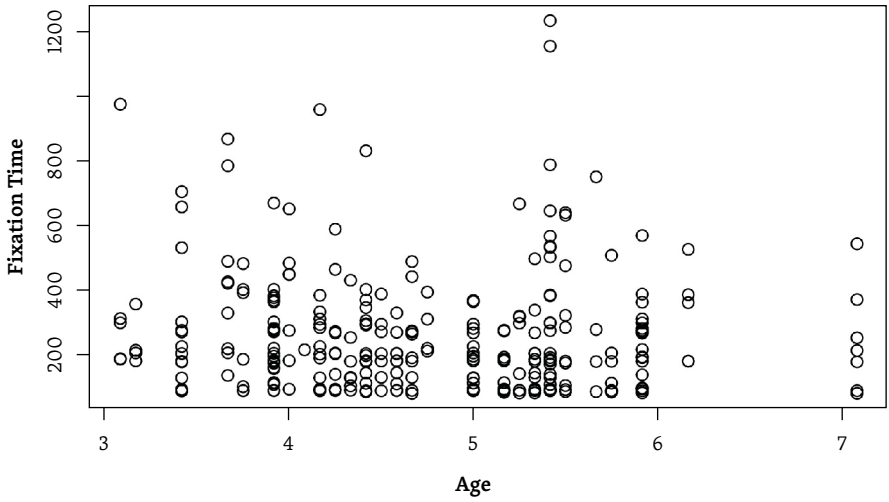

FIGURE 5: Fixation time in the endpoint area. Each point represents one participant. The x-axis depicts the age of the children in years, and the y-axis the fixation time in ms.

the influence on visual perception would be visible later in development. Overall, these potential explanations highlight the complex nature of visual perception in young children and suggest the need for further research to fully clarify the underlying mechanisms involved.

3. GENERAL DISCUSSION

In this paper, we presented three experiments with a common focus on the prominence of endpoints in Czech preschoolers. Firstly, we compared the speech production of Czech children during an elicitation task and active interaction over stimuli depicting goal-oriented motion events. We found a significant difference between these two groups: The active interaction led to the expression of more endpoints than the elicitation. When analyzing the types of utterances in the interactive group, we discovered that in 30 out of 81 cases, children expressed the endpoint in a direct answer to a parent's *wh*-question targeting it. We hypothesized that the interactive setting is essential in leading children's attention to the endpoints. To assess the prominence of the holistic perspective in Czech children in general, we conducted an experiment comparing the Czech children with a group of Russian children. We discovered that while the expression of endpoints was comparable in both groups, Russian children expressed the endpoint in answers much more often than Czech children. This might indicate that while the number of endpoints in the elicitation of Czech children is lower than when they talk interactively with their parents, they are still very independent in their production. That would align with studies showing the language-specific preferences in 3-year-old children describing motion events (e.g., Choi & Bowerman, 1991; Harr, 2012; Hickmann & Hendriks, 2010; Oh, 2003). We assume that in Czech preschoolers, the preference for expressing endpoints already plays a role in spontaneous speech. This needs to be supported by elicitation data from Russian children. The ambition to collect comparative data from Russian children has been interrupted by external circumstances, which led to our inability to collect data in Russia as was initially planned.

In our third experiment, we offered a first insight into the eye movements of Czech children while they observe pictures depicting goal-oriented motion events. We were interested if the fixation on endpoints increases with the age of the children. In the free-viewing task, we did not find such a pattern. Our data showed significant variability in children's eye-gaze, but it did not follow a general pattern. While there is evidence that the effect of the holistic perspective also influences other processes than verbalization, such as memory tasks and visual fixation (von Stutterheim et al., 2012), there is only scattered evidence of a language-specific effect on processes that do not precede or follow language use. For example, Lucy and Gaskins (2001) observed that language-specific patterns affected the grouping of various objects. While speakers of Yucatec preferred grouping based on material, English speakers preferred grouping based on shape. This follows the Yucatec requirement of unitizers for nouns based on materials. McDonough et al. (2000) found differences in the fixation time of Korean and English speakers in observing pictures depicting categories of containment. For Korean speakers, it was easier to recognize tight-fit and loose-fit distinctions in the presented pictures because this distinction is grammaticalized in their language. Levinson's (1996) "turn-table" experiments on spatial relations uncovered that speakers of languages with an absolute frame of reference, such as Tzeltal, adhere to this principle even in non-linguistic tasks, such as in arranging an array of objects. The rare studies on visual perception of goal-oriented motion events with

no verbalization following the stimuli presentation brought mixed evidence: while Flecken et al. (2014) claimed an effect on visual fixation, Marklová et al. (2023) did not find any. Additionally, Athanasopoulos et al. (2015) brought evidence of the effect of aspectual systems in similarity judgment tasks. We chose the method of presenting the pictures depicting goal-oriented motion events without a prompt for description because we expected that with verbalization, the results would likely be similar to the results of the elicitation task since the children would follow the desired verbalization (see Carroll et al., 2011 for the seeing for speaking hypothesis). However, the methodology we used might not be able to uncover the unconscious processes in full scope. For further research, we aim to conduct a comparative eye-tracking study to see if differences appear when comparing Czech and Russian children.

There are several implications we can draw from our results. Firstly, while we did not find a significant difference between the Russian and Czech children while comparing the total number of endpoints, an asymmetry in the statements about the endpoint in the two children's groups was found. The Czech children were more independent in their expression of endpoints than Russian children. This might suggest that the holistic and phasal perspectives play a role in children's production from early on. In the context of research on the acquisition of various language-specific features, we assume that, similarly to the acquisition of lexicalization patterns (Ozcaliskan & Slobin, 1999; Papafragou et al., 2002), children follow the perspective of their language from early language production. Additional evidence is required to support this assumption, such as comparing Czech children in an elicitation setting with Russian children. Secondly, the interaction between a child and a caregiver drives how endpoints are expressed in children's speech. It affects the number of expressed endpoints, as was shown in Experiment 1, and the type of utterance in which the endpoints are expressed (see Experiment 2). The discrepancy in the type of utterances in Czech and Russian children suggests that the interaction around the endpoints was profoundly different in these two groups. Follow-up studies focusing on the expression of endpoints in children acquiring phasal and holistic languages, both in interaction and in independent elicitation, are needed to understand which patterns are language-specific and which are rooted in cultural or social conventions. Thirdly, we offered an insight into the role of holistic preference in the visual perception of Czech preschoolers. We wanted to see the development of fixation on the endpoint in the eye movements, but we did not find evidence for that. Studies with adult participants uncovered that the preference for the holistic vs. phasal perspective in native speakers of Czech and Russian is systematic and remains in highly proficient speakers of L2 (von Stutterheim, 2003). Therefore, it is deeply anchored in the habits of the speakers. This might also explain the insignificant results of the eye-tracking Experiment 3, since the preference for eye movements might already be strong as early as at three years of age. However, the experiment has too many limitations to make such a conclusion, namely the large intra-individual variability. Based on our results, we conclude that there is no evidence that the visual attention on endpoints increases with age.

In conclusion, the present study sheds light on the role of language-specific perspective in shaping Czech-speaking children's speech production and visual

perception. However, to gain a more comprehensive understanding of this phenomenon, follow-up studies comparing Czech children with those speaking a language with a phasal perspective are crucial. The present paper is the first step towards exploring the effects of holistic and phasal perspectives on children's speech production and visual perception.

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