

Children's Comprehension of the Verbal Aspect in Serbian*

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The aim of the study was to investigate how Serbian native speaking preschool children comprehend perfective and imperfective aspect in comparison to adults. After watching animated movies with complete, incomplete and unstarted actions, the participants were asked questions with a perfective or imperfective verb form and responded by pointing to the event(s) that corresponded to each question. The results converged to a clear developmental trend in understanding of aspectual forms. The data indicate that the acquisition of perfective precedes the acquisition of imperfective: 3-year-olds typically understand only the meaning of perfective; most 5-year-olds have almost adult-like understanding of both aspectual forms, while 4-year-olds are a transitional group. Our results support the viewpoint that children's and adults' representations of this language category differ qualitatively, and we argue that mastering of aspect semantics is a long-term process that presupposes a certain level of cognitive and pragmatic development, and lasts throughout the preschool period.

Keywords: verbal aspect, language development, comprehension, Serbian language

Highlights:

- The first experimental study on verbal aspect comprehension in Serbian.
- Crucial changes in aspect comprehension happen between ages 3 and 5.
- The acquisition of perfective precedes the acquisition of imperfective.
- Support for discontinuity in children's and adults' aspect representations.

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The reason that the acquisition of verbal aspect and tense continues to drive researchers' attention for more than four decades is that it requires detangling of the roles of many factors involved. As Wagner (2012) points out, this is a demanding task for a cognitively immature child who has to struggle with abstract (non-observable) temporal categories, which are mutually intertwined, recognize its linguistic markers, and learn to map them to the adequate concepts. Even so, previous studies have revealed that in Slavic languages children start using these language categories early in their spontaneous production (Bar-Shalom, 2002; Bar-Shalom & Snyder, 2002; Gagarina, 2000, 2004; Gvozdev, 1949; Hržica, 2011; Putnik, 2009). However, a recent study in Serbian has shown that even older preschool children have not mastered an adultlike production of aspectual verb forms for an event description in an elicited production task (Savić et al., 2017). This leaves the important question of when pre-schoolers fully master the aspectual system still unanswered. In order to further explore this question, the study presented here compares the comprehension of Serbian perfective and imperfective verbs in preschool children and adults, aiming to investigate the differences in aspect semantics representations in different age groups. Given that verbal aspect in Serbian, as well as in other Slavic languages, is realized in lexical items, the study provides a prospect for discussion on item-based lexical learning, and the role of pragmatic and cognitive constraints in the acquisition of aspectual markers.

Verbal Aspect in the Serbian Language

Temporal properties of an event entail determination of *when* something happened – linguistically marked by tense, but also *how* it happened or was happening, i.e., how it configures and resides in a certain time interval – marked by verbal aspect. *Aspect* can also be defined as a non-deictic temporal category referring to the duration and inner temporal organization of an action, state or event denoted by a verb (Comrie, 1976; Dahl, 1987; Mrazović & Vukadinović, 1990; Peškovskij, 1956; Stanojčić et al., 1989). Different languages have different solutions for the linguistic marking of temporal concepts. While tense/aspect pairing is overlapped in some languages (e.g., Germanic and Romance), it is independent and morphologically differed in others (e.g., Slavic).

A relevant distinction within the aspect category is between grammatical (view-point) and lexical aspect (type of verbal situation, Aktionsart). The grammatical aspect locates events relative to a point-of-view (reference) time with two perspectives – perfective vs. imperfective, and it is often marked explicitly by linguistic devices, usually auxiliaries and/or inflectional and derivational morphology. The imperfective emphasizes the process of action unfolding (e.g., *She was making^{imperf} a cake for an hour*), while the perfective is focused on the action or event ending (e.g., *She made^{perf} a cake in an hour*).

In Serbian, as in other Slavic languages, the aspectual value of a verb is an inherent part of a lemma and its semantics, and is independent of grammatical

context. For example, morphologically simple verbs like *dati* ‘give’, *baciti* ‘throw’ have perfective meaning, while verbs like *pisati* ‘write’, *zidati* ‘build’, also morphologically simple, have imperfective meaning. Derivational processes of perfectivization and imperfectivization realized by a prefix, suffix, or stem alternation modify the aspectual value of both perfective and imperfective verbs (Mrazović & Vukadinović, 1990; Stevanović, 1969; Stanojčić & Popović, 2000). Due to the derivational processes, many Serbian verbs gain an aspectual pair derived from the same stem: 1) *pisati* ‘write^{imperf}’ → *na-pisati* ‘write^{perf}’; 2) *dati* ‘give^{perf}’ → *da-va-ti* ‘give^{imperf}’.

In addition, the derivational processes can be a productive source of semantic change and lexical differentiation of verbs, optionally leading to the change of aspectual value, as in the following examples: 1) *pisati* ‘write^{imperf}’ → *pre-pisati* ‘copy^{perf}’ → *pre-pis-iva-ti* ‘copy^{imperf}’; 2) *baciti* ‘throw^{perf}’ → *bac-a-ti* ‘throw^{imperf}’ → *raz-bac-a-ti* ‘scatter^{perf}’.

In contrast to the grammatical aspect, the concept of lexical aspect (type of verbal situation, *Aktionsart*) concerns the inherent temporal structure of a situation determined by the predicate and the context. The main distinction is between telic and atelic predicates: telic predicates refer to events that have an intrinsic endpoint, and include achievements and accomplishments from Vendler’s classification (1967); atelic predicates, by contrast, refer to predicates that do not involve any goal and can end at any arbitrary time, and they include activities and states. There is an important interaction between grammatical aspect and *Aktionsart* in Slavic languages, but there is no consensus on the exact nature of that interaction. The traditional view, advocated by Brecht (1985), holds that Vendler’s classification overlaps with the distinction perfective/imperfective, but that it is relevant because it distinguishes between categories within perfectives and imperfectives. Perfectives include lexical classes of accomplishments and achievements, and imperfectives include verbs of activity and state. According to the advocates of the second view (Eckert, 1985; Filip, 1999; Paducheva, 1996; Braginsky & Rothstein, 2008), the lexical classes of verbs do not overlap with aspect. Braginsky and Rothstein (2008) argue that accomplishment verbs (*čital^{imperf} knigu* ‘read a book’ and *pročel^{perf} knigu* ‘read a book’) can be both perfective and imperfective, as well as activity (delimitiv) verbs (*guljal^{imperf}* ‘walk’ and *poguljal^{perf}* ‘walk-a-bit’). In our study, we follow the view advocated by Paducheva (1996) and Braginsky & Rothstein (2008). We are primarily interested in the comprehension of contrast between completeness and incompleteness, and how Serbian native speaking children match these meanings with perfective and imperfective forms. For this reason, only the simple aspectual pairs created by adding semantically empty prefixes to morphologically simple imperfective verbs (example 1, page 2) were used in this study. In other words, possible differences in the comprehension of aspectual contrasts produced by different derivational processes are not in our focus and will remain for future investigation.

The Acquisition of Verbal Aspect in Children

After many years of research in the field of verbal aspect acquisition and a period dominated by contradictory data and interpretations, an empirical finding stood out: until the age of around two and a half years, children tend to restrict the past tense and perfective markers to telic predicates, while limiting the present tense and imperfective markers to atelic predicates. This finding was confirmed through studies of spontaneous speech in many languages (English; Bloom et al., 1980; Harner, 1981; Greek; Stephany, 1981; Japanese; Shirai, 1998; Portuguese; De Lemos, 1981; German; Behrens, 1993; Turkish; Aksu-Koç, 1988; Mandarin Chinese; Li & Bowerman, 1998; Croatian; Hržica, 2011; Serbian; Putnik, 2009). Thus, although the categories of tense and aspect are formally and logically independent, children typically favor prototypical groupings of temporal-aspectual features. This grouping leads to a systematic under-extension, with children avoiding the use of other legitimate cross-group options, such as imperfective-telic-present or perfective-atelic-past combinations. That is, children often produce verbs such as *sleeping* (atelic and imperfective) and *fell* (telic and perfective), but rarely produce verbs such as *slept* (atelic and perfective) or *falling* (telic and imperfective).

Different theoretical approaches agree that children's under-extensions in the usage of aspectual forms reflect the semantic combinations which are the easiest to produce and understand. These approaches differ, however, in the way they explain this phenomenon and whether they see it as a manifestation of qualitative or only quantitative differences in the grammars of children and adults.

One of the first attempts to explain this phenomenon referred to the cognitive limitations of children at an early age (Antinucci & Miller, 1976; Bronchart & Sinclair, 1973). These authors claim that due to the fact that children do not have a developed concept of time, i.e. temporal deixes, they use the morphology of past tense to denote the properties that are relevant to them – the events with a visible ending. The implication of this approach would be that children's grammar is qualitatively different from adults' grammar.

A qualitatively different view of children's grammar as less general and less abstract compared to adults', is also advocated by the usage-based approach (Tomasello, 2000, 2003, 2009). According to this theory applied to the verbal aspect acquisition (Stoll, 2001, 2005), the child is initially introduced to aspect in a limited number of contexts in which it is most often used (imperfective-atelic-present, perfective-telic-past), but which are only the subset of the contextually possible functions of aspect. Only through use in different contexts, the child gradually begins to abstract the meaning of a specific aspectual form and generalize it to the common concept that adults have. Thus, according to this view, although a child at an early age adequately uses the aspect in some situations, it does not mean that she/he understands its full meaning yet.

However, an alternative viewpoint is also present among the researchers in this field. These authors argue for a continuity between children's and

adults' representations in the domain of verbal aspect. They suggest that the differences between the age groups reflect quantitative differences in how they handle difficult cases, not qualitative differences in the grammatical tools that are available to them (Wagner, 2009). Empirical support for this explanation was found in previous research where verbal aspect comprehension at early ages was experimentally investigated (Vinnitskaya & Wexler, 2001; Wagner, 2001; Weist, 1991; Weist et al., 1991; Weist et al., 1999). It was shown that in some tasks 3-year-olds and slightly younger children were able to understand cross-group pairs, particularly telic-imperfective combinations. These results were taken as support for the standpoint that children can understand more than they are able to produce. As a proponent of the information processing point of view, Wagner (2012) believes that the appropriate use of temporality requires children to consider and coordinate different sources of information: morphosyntactic forms, specific semantic interactions and extralinguistic factors (evaluation of truth conditions with respect to the world). The way in which this information is combined will make the tense-aspect groupings more or less difficult for processing, and to varying degrees accessible for production or comprehension.

The effect of the extralinguistic factors on children's competencies in the domain of verbal aspect production and comprehension has become especially interesting to researchers in the last two decades. This research led to the knowledge that children show different competencies in mastering aspect depending on the context in which it is being investigated (discourse and situational factors).

Vinnitskaya & Wexler (2001) found that children aged 3 to 6; 5 understand and use both aspectual forms in Russian, but that they do not understand their pragmatic properties, i.e., rules for their use in discourse: when the information about the action ending is new, adults will use the perfective form, but if it is already known, they will use imperfective. Precisely because of this, some researchers take the view that mastery of aspect is a long-lasting process of learning its narrative functions, such as contrasting between complete and incomplete events in language, which is high above the acquisition of bare linguistic labels.

Stoll (2001) examined the production of aspect in the Russian language at the ages of 2 to 6 years, and found that within the same level of discourse complexity there was no difference in the distributions of aspect forms between age groups, but that the distributions of aspect forms differ at different levels of discourse complexity. Only at the most complex level of narrative, prototypical groupings could be identified: past tense – perfective – telicity and present – imperfective – atelicity. In all other contexts, children generally used the past tense regardless of aspect.

Kazanina & Phillips (2007) in their study investigated whether and how children (ages 3 to 6) comprehend aspect in Russian, and showed that the comprehension of imperfective depends on the context within the task. Adding the adverb *while* to the imperfective sentences, in order to refer to the time interval to

which the children should compare the imperfective verb to, did help the children to connect the imperfective form with the incomplete action, and demonstrate adultlike behavior. Even though the study was conducted primarily to investigate the Imperfective Paradox from the linguistic perspective, it revealed developmental evidence that children's understanding of imperfective is weak unless supported by *while*-clause, which provides the additional temporal perspective. These findings could be interpreted in favor of a smooth transition from the childlike representation of the imperfective to the adultlike representation.

Additional evidence that children's comprehension of aspect is highly dependent on context was reported by García del Real et al. (2014), who explored the effects of different tasks used for its testing. Their results showed that in the truth-value judgement tasks, children's responses to the imperfective tend to be adultlike, while in the sentence-to-scene matching tasks and in the elicited production tasks, children's responses are not always adultlike.

To sum up, in the field of verbal aspect acquisition research, there still remains an open question of whether the differences in aspect representations between children and adults are of quantitative or qualitative nature. Also, the researchers have become aware that some extralinguistic factors (e.g., the type of task, the context within the task, the pragmatic demands of the task) can influence the investigation of aspect acquisition and have to be considered when analyzing the differences between children and adults.

Wagner (2009) points out that the fact that extralinguistic factors have more extreme effects on young children than adults is interesting and important, but for her it is not an argument against the continuity between children's and adults' representation of aspect. A valid argument, in her opinion, would be if the causes and the patterns of children's errors are found to be entirely different compared to those of adults.

Having in mind these previous findings, in our study we aimed to investigate two important issues that are still open to debate. One is the more general issue regarding continuity/discontinuity in the domain of aspect representations, which we investigated by using the tool that Wagner (2009) suggested – the error analysis. Although very informative in developmental studies, the error analysis has rarely been used in the studies of aspect acquisition. We used the task that is demanding from a pragmatic point of view (a variation of the task previously used by Wagner, 1998, 2001; Kazanina & Philips, 2007), and besides examining the quantitative differences in the number of correct/adultlike answers, we have thoroughly analyzed the different categories of errors and different patterns of errors present in responses of preschool children (3, 4, and 5 years). As we expected, the error analysis provided us with the important insights into the qualitative differences between the different ages, i.e. it enabled us to find typical error patterns in children's comprehension of aspectual forms at all ages, which brought additional evidence for the hypothesis of discontinuity. The other issue that we investigated in our study is more language specific and concerns the linguistic realization of aspect. It is the question of whether the lexical aspect

realization in Serbian (as in other Slavic languages) facilitates earlier mastering of its semantics compared to languages where it is syntactically realized (e.g., Romance, Germanic), or does the early and adequate usage of aspect in child language only mask the children's actual struggle with its complex meaning.

Usage of Aspect in Children's Production in Serbian

There are only a few empirical studies on the acquisition of verbal aspect in Serbian. The results of two corpora-based studies on spontaneous production at early ages (Putnik, 2009; Radulović, 1975) are in concordance with the studies in other Slavic languages, which show the early presence and adequate usage of aspect (Bar-Shalom, 2002; Bar-Shalom & Snyder, 2002; Gagarina, 2000, 2004; Gvozdev, 1949; Hržica, 2011).

The only experimental study on Serbian aspect production explored the preschoolers' and adults' elicited description of events presented in short animated movies with two or three characters involved in a sequence of several actions (Savić et al., 2017). Participants' responses to the question "What happened in the cartoon?" enabled the comparisons of the indicators of aspectual forms usage between 3-, 4-, 5-year-olds and adults' elicited production: the distribution of perfective and imperfective forms, the distribution of different types of verbal situation (activities, states, accomplishments, and achievements), the usage of aspectual pairs for the purpose of aspectual contrasting, and the quality of narrative structure.

The results revealed that 3-year-olds used perfective and imperfective forms in similar proportions as adults. However, the proportion of perfective increased with age and went beyond the proportion in the adults' elicited production, as if the children tried to mark the relevant changes in the events' progression by means of the tool at their disposal. The comparison also revealed an increase in the production of *achievements*, at the expense of the *activity* type of situation, with increasing age. Even though the quality of narrative structure regarding the perfective/imperfective contrasts continuously advanced with age, aspectual pairs as a direct contrasting tool were rarely used even by the 5-year-olds in the sample.

The findings from the production study revealed the developmental trend in usage of aspectual forms in Serbian. Children are primarily influenced by input statistical regularities in the acquisition of Serbian lexemes with an inherent aspectual value. However, learning how to use them in a functional way for the purpose of building a narrative seems to be a gradual process that lasts throughout the preschool period.

Present Study

As this is the first experimental study on aspect comprehension in Serbian, the main aim was to explore how preschool children comprehend perfective and imperfective verbs compared to adults. Previous research on aspect acquisition has shown that children produce aspectual forms early and easily in other

Slavic languages (Bar-Shalom, 2002; Bar-Shalom & Snyder, 2002; Brun, Avrutin & Babyonyshev, 1999; Gagarina, 2000; Gvozdev, 1949; Vinnitskaya & Wexler, 2001), as well as in Serbian (Putnik, 2009; Radulović, 1975; Savić et al., 2017). These results were attributed to the fact that aspectual value is an inherent semantic feature of each lexical item, which means that it is available for acquisition already in the phase of early vocabulary growth. However, some findings (Stoll, 2001; Van Hout, 2007) indicate that independent of how aspect is marked in a particular language, some meanings take longer to acquire than others, i.e., imperfective is acquired later compared to perfective. Accordingly, in this study we expected to find differences in comprehension of aspectual forms at different ages. The specific question that was addressed in this research is whether 3-, 4-, and 5-year-olds are capable of mapping the perfective forms with the complete events, and the imperfective ones with both the complete and incomplete events, as adults do. While expecting differences between children's and adults' comprehension, in accordance with the hypothesis of discontinuity (Stoll, 1998, 2001; Tomasello, 2003), it was necessary to investigate what meanings children ascribe to perfective and imperfective forms, and whether there are typical non-adultlike patterns in children's interpretation of aspectual forms. The findings were aimed to provide an insight into the pattern of typical errors that children are prone to, which gives a basis to discuss the qualitative/quantitative differences of aspectual representations between children and adults, and within the different preschool ages.

Slavic languages are particularly interesting in the field of aspect acquisition because of the morphological richness of their lexical items and the fact that aspect is an inherent part of verbs, which is not the case with Germanic and Romance syntactically realized aspectual forms. Precisely because of this, our study contributes to the clarification that Serbian lexically available and morphologically transparent aspectual forms do not necessarily facilitate the appropriate interpretation of their meaning, in spite of early occurrence in spontaneous production. It is probably the case that seemingly fluent usage of lexical items arises from the distributional properties of language input guiding children in their production, as suggested by Aksu-Koç (1998), Li & Shirai (2000), Shirai (1991). However, as the recent Serbian elicited production study revealed, even though pre-schoolers used both perfective and imperfective forms in the proportion comparable to the one found in adult language, the usage of aspectual pairs was very rare even at the age of 5 (Savić et al., 2017).

Another, potentially interesting, research question to explore in a morphologically rich language such as Serbian is whether the different ways of derivation (prefix, suffix, and stem alternation), which lead to verb perfectivization/imperfectivization, affect aspect acquisition. However, this language specific question was not the subject of our research, but instead we were interested in a linguistically more general one: whether the lexical realization of aspect in Serbian facilitates and accelerates its acquisition, or if the early and adequate usage in child language only mask the long and gradual process of the mastery of aspect semantics.

Method

Participants

The sample consisted of 40 children (20 boys and 20 girls), 3- to 5-year-olds attending a Belgrade kindergarten, and a convenience sample of 12 adults (Table 1)¹. The difference between the adjacent age groups was at least 6 months. The parents of all children received an information sheet about study aims and the procedure, and signed a written consent form. The study was approved by the Council for Ethical Issues, Department of Psychology, Faculty of Philosophy, University of Belgrade.

Table 1
Study sample description

Age	N of participants	N of male	N of female	Age range	Mean age
3 years	14	9	5	36–42 months	39 months
4 years	13	8	5	49–54 months	52 months
5 years	13	3	10	60–68 months	64 months
Adults	12	5	7	28–60 years	41 years

Procedure and Materials

The experimental paradigm was adopted from Kazanina & Philips (2007), also used previously by Wagner (1998, 2001), and Van der Feest & Van Hout (2002). The original procedure was modified – acting with puppets was replaced with short animated movies², which presented the unfolding of an action and its final result (incompleteness vs. completeness). We chose to use the animated movies because they enable a veridical presentation of the dynamic temporal structure of the events, which is crucial for aspect comprehension investigation, and reduce other sources of variability in the event presentation (experimenter's experience, children's interruptions/interactions, etc).

Nine short animated movies with short stories, which introduced the main characters and movie themes, were shown to each participant on a computer. The movies were presented in two randomized orders and the duration of each movie was between 30–37 seconds. The first movie was used as an exercise to introduce the participants to the testing procedure, task, and the experimenters. The experiment was performed in a separate, quiet room of the kindergarten, with each child individually. The entire procedure with one child lasted about 15 minutes. The analyses were performed on eight movies.

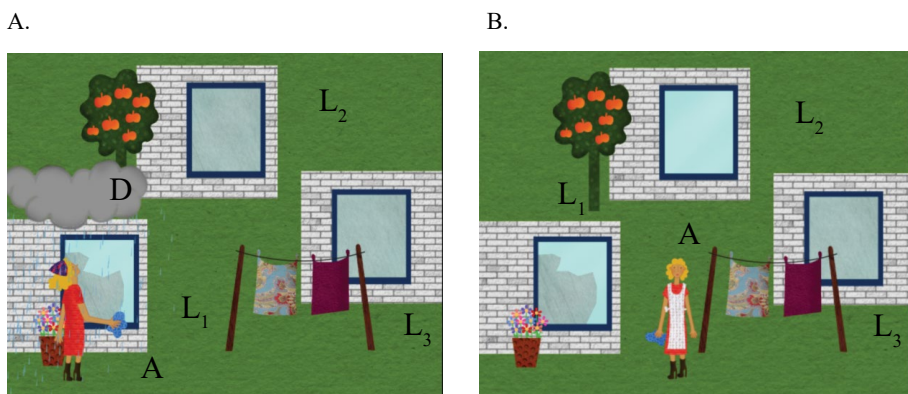
All the movies had an identical structure: three visually salient locations on the screen, e.g., a wall with a dirty window (locations L1, L2, L3), where each of them was perceptually marked with a characteristic object, e.g., L1 – flowerpot, L2 – apple tree, L3 – laundry string (Picture 1). The main character – A (e.g., a lady) passes each of these locations, always in the same order L1 – L2 – L3. Her intention is to perform a certain action on the L1 (e.g., wash

1 Since the number of participants per age group was relatively small, the post-hoc power analysis was performed in order to check whether the sample size was big enough. It showed that for the obtained effect size in our results with the sample size we used, and $p=0.01$, the power of our study is 0.9, which is higher than expected (0.8). We also calculated the sample size needed to obtain the effect size that we got: with expected power of 0.8, the analysis showed that the minimal number of participants per group should be 10. Since we had a minimum of 12 participants per age group, our sample size was sufficient for the reported effects.

2 The movies were made for the purpose of this study by Serbian author Iva Ćirić.

a window), and then to go to the other two locations (L2 and L3), with the same intention. However, at two of the three possible locations, a distractor (D, e.g., cloud pouring the rain) suddenly appears to interrupt or prevent the intended action, and then disappears. The consequence of this course of events is the following: at one location the character starts the action, but is interrupted and does not complete it (in this example L1 – incomplete, partly clean window, Picture 1.A); at the other location, the character succeeds to complete the action (e.g. wash a window, in this example L2 – complete, clean window, Picture 1.B); and at the third location, the character does not even start the action because the distractor appears before (in this example L3 – unstarted, dirty window, Picture 1.B).

Picture 1.



A. The arrangement of locations in the experiment (example when the distractor rain interrupts the washing of the window at L1 – incomplete action); B. The arrangement of locations in the experiment (the ending scene in the movie, L1– incomplete, L2 – complete, L3 – unstarted)

Locations where the action was completed, interrupted or unstarted were randomized in the experiment. The distractor always appeared at the location with the interrupted action, but its appearance at one of the two other locations (completed and unstarted action) was randomized³.

After each movie, the participants were asked questions. The order of the questions was always the same: two questions with an imperfective were followed by two with a perfective form. We opted for the same, instead of a randomized order of questions, because it follows the natural course of event unfolding to completion. The methodological implications of this decision are discussed in the section *Results*. In order to make sure that a child was able to memorize the events that happened at least in two locations, two control questions, which referred to the appearance of a distractor (cloud pouring the rain in our previous example), were asked at the end.

The exact formulations of all the questions are given in Table 2. The questions were posed while the ending scene of the movie was frozen on the screen (Picture 1.B). The participants' task was to answer each question by pointing to the location(s) on the screen. The children were not given any feedback after providing their answer, whether it was correct or incorrect.

³ The complete list of verbs, situations, characters and distractors for the movies is available from the authors.

Table 2
The formulation of the questions and examples of the target answers in the experiment

	Questions	Target answers (pointing to...)
Imperfective	<i>Gde je teta prala prozor?</i>	Complete+incomplete L1 Flowerpot L2 Apple tree
	‘Where was the lady washing the window?’	
	<i>Gde je još teta prala prozor?</i>	
	‘Where else was the lady washing the window?’	
Perfective	<i>Gde je teta oprala prozor?</i>	Complete L2 Apple tree Nowhere
	‘Where did the lady wash the window?’	
	<i>Gde je još teta oprala prozor?</i>	
	‘Where else did the lady wash the window?’	
Control	<i>Gde je bila kiša?</i>	L1 Flowerpot L3 Laundry string
	‘Where was the rain?’	
	<i>Gde je još bila kiša?</i>	
	‘Where else was the rain?’	

Because the study was primarily focused on meaning, the selection of verbs was aimed to keep their morpho-phonological characteristics simple and consistent between imperfective and perfective forms. We opted for transitive imperfective verbs and their aspectual pairs derived by perfectivizing prefixation (example 1, page 2). As we used semantically empty (grammatical) prefixes (*iz-*, *o-*, *na-*, *sa-*), the prefixation did not cause any semantic change in the selected verbs other than the change of the aspectual value (Appendix, Table 1). The verbs have incremental structure, so the Aktionsart of both, imperfective and perfective, predicates was accomplishment/telic (Braginsky & Rothstein, 2008). All the questions posed in the experiment were formulated in the past tense.

Coding of Answers

Children’s answers that corresponded to those of adult participants in the same situations (target answers, Table 2) were coded as correct. Given that imperfective verbs can refer to both complete and incomplete events, the correct answer for the imperfective pair of questions was pointing to both the complete and the incomplete/interrupted event (in any order). In contrast to that, the target answer for the perfective pair of questions was pointing to the complete event after the first perfective question, and withholding from pointing to any location, or replying with ‘*Nowhere*’ to the second perfective question. The correct answer to the control questions was the choice of the two locations where the distractor appeared.

Statistical Analysis

The analysis of variance (ANOVA) was performed on the number of children’s correct/incorrect answers. A qualitative analysis of errors was conducted for the purpose of a detailed overview of the error types and the meanings attributed to perfective and imperfective forms. Furthermore, in order to gain a more complete picture of the developmental change in aspect acquisition, we conducted a discriminant analysis (DA). The aim of this analysis was to create a linear combination (composition) of answers to the perfective, imperfective, and control questions in order to discriminate between different age groups in a perfect manner. This enables a nuanced insight into the patterns of children’s answers at different ages.

Predictions

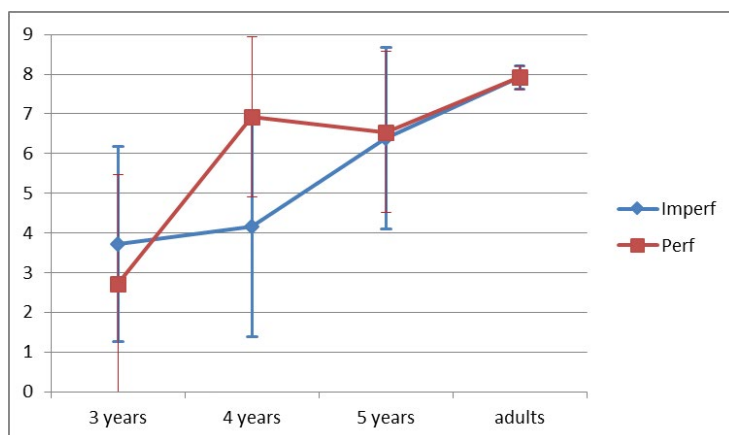
In accordance with the results of previous studies and the hypothesis of discontinuity (Stoll, 2001, Tomasello, 2003, 2009), we expected to find: a) a decrease in the number of errors to both perfective and imperfective questions with increasing age; b) a larger number of errors to the imperfective compared to the perfective questions in children (3–5 years); c) the presence of random errors – low-frequent, idiosyncratic answers, without a clear connection to the task and/or item; these errors are especially expected in 3-year-olds because of the task complexity and only emergent semantics of aspect at this age; d) the presence of erroneous attribution of only complete entailment to the imperfective form at all children's ages (especially younger), which reflects the development of imperfective semantics.

Results

A two-way repeated measures ANOVA, with factors age (3, 4, 5 years and adults) and verbal aspect (perfective/imperfective), was conducted on the number of correct answers. The analysis revealed a significant main effect of age ($F(3, 47) = 34.202, p < .001, \eta_p^2 = .681$). The Scheffe post-hoc tests showed significant differences between age 3 and all other ages ($p < .001$), 4 and adults ($p < .001$), and 5 and adults ($p = .042$). Only the difference between ages 4 and 5 was not statistically significant. The main effect of verbal aspect was not significant. The interaction between the verbal aspect and age was significant ($F(3, 48) = 2.849, p = .047, \eta_p^2 = .151$). Four-year-olds made a prominent progress in the comprehension of perfective questions in comparison to 3-year-olds ($p < .001$), which was not the case with the comprehension of imperfective (Figure 1; Table 2 in Appendix). Although no statistically significant difference was obtained on imperfective between the ages 4 and 5, there is a visible increasing trend in the number of correct answers between these ages. A much lower variance in the adults' answers indicates that, even at the age of 5, children still do not reliably understand the semantics of aspectual forms as adults do.

Figure 1

The average number of correct answers on perfective and imperfective across ages (maximum number of correct answers is 8; the error bars represent SD)



All the children were included in the analysis, no matter of their result on the control questions. The original idea was to conduct the analysis of covariance, with the number of correct answers on the control questions as a covariate. However, one of the assumptions of ANCOVA is that the covariate and independent variables (in our case age) are independent, so this analysis could not be performed. The discriminant analysis that we present later enabled us to check whether correct answering on the control questions had an important contribution to the discriminant function (Discriminant analysis I, Table 4).

Children's Understanding of Perfective and Imperfective Forms: Error Analysis

In order to explore children's understanding of perfective and imperfective semantics more thoroughly, an analysis of the types of errors in answers was performed. The aim was to investigate possibly systematic deviations in meaning that children of different ages attribute to either form, before completely mastering the semantics of aspectual contrasts.

Children's Interpretation of Perfective

The target (correct) answer for the perfective forms was pointing to the location of the complete event after the first question (e.g., "Where did the lady wash the window?"), and withholding from pointing to any, or replying with 'Nowhere' after the second question (e.g., "Where else did the lady wash the window?"). Withholding from pointing to any further location on a perfective item is an adultlike behaviour, and a good indicator of linguistic knowledge and resistance to pragmatic pressure imposed by the additional question "Where else...?". Having in mind the previous findings on early spontaneous usage of both perfective and imperfective verbs in the Slavic languages (Bar-Shalom, 2002; Bar-Shalom & Snyder, 2002; Gagarina, 2000, 2004; Hržica, 2011; Putnik, 2009), and better performance on the perfective than the imperfective items in the comprehension and elicited production studies from different languages (Garcia del Real et al, 2014; Kazanina & Philips, 2007; Stoll, 2001), one could expect fairly good performance on the comprehension of perfective forms even at the age of 3 years.

However, the children produced different types of answers, as presented in Figure 2 (the exact percentages are shown in the Appendix, Table 3): A. correct answer (choice of location with complete action); B. 6 types of errors: 2 types of errors of pointing to one location (incomplete action, unstarted action); 3 types of errors of pointing to two locations (complete and incomplete action, complete and unstarted action, incomplete and unstarted action); 1 type of error of pointing to all three locations; C. answer *don't know*.

Figure 2

The types of children's answers to perfective questions at different ages (ordered from the most frequent to the least frequent answers in 3-year-olds); arrows point to the type of error (choice of locations with complete and incomplete action) that will be further presented in Figure 3

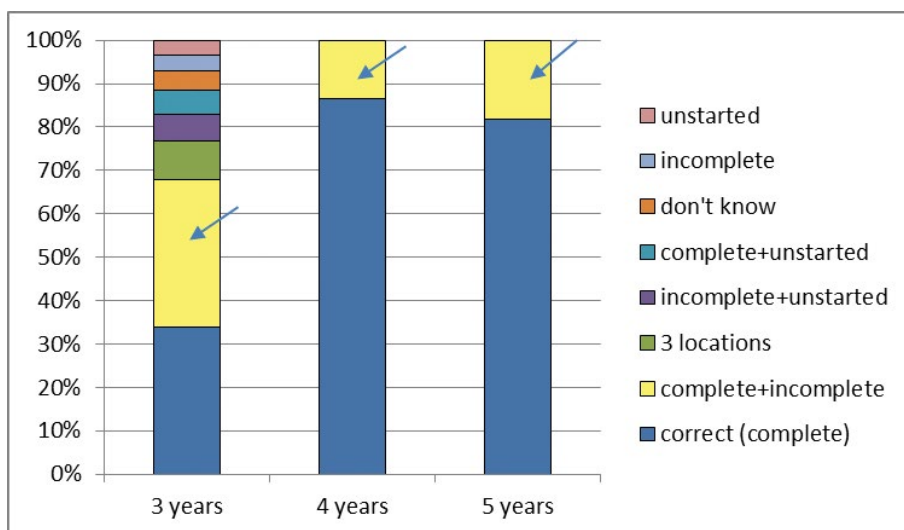


Figure 2 reveals that the proportion of correct answers on perfective is not high at the age of 3 (34%). Although 3-year-olds produced different types of errors, the most frequent type in comprehension of perfective was choosing two locations, one with the complete and one with the incomplete event. Moreover, this was the only type of error in answers of 4- and 5-year-olds, while most of the answers were correct (87% and 82%, respectively). The majority of errors on perfective at the age of 4 came from one child and at the age of 5 from two children (Appendix, Table 6 and 7).

In sum, besides the unsystematic errors made by 3-year-olds, children of all ages made one type of systematic error by choosing the locations with complete and incomplete action for perfective (arrows in Figure 2). This error was the most prominent at the youngest age. However, it could originate from the procedure itself, i.e., the pragmatic characteristics of the task. The experimenter's additional question ("Where else did the lady wash the window?") could impose social pressure on a child to show one more location, instead of saying "Nowhere".

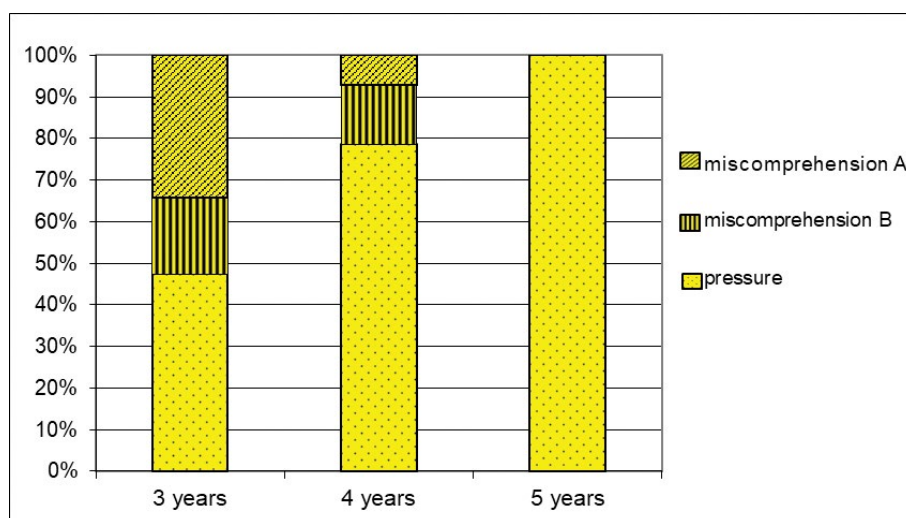
For this reason, we investigated the order in which the children chose the complete and incomplete events after the perfective questions. The yellow segments *complete+incomplete* in Figure 2 are decomposed and presented with more detail in Figure 3. This analysis reveals that some children made errors by spontaneously pointing to both complete and incomplete actions after the first perfective question – so they certainly did not understand the perfective form (*miscomprehension type A* – 34% of 3-year-olds', and 7% of 4-year-olds' errors). We can conclude the same if a child firstly pointed to the incomplete,

and then after the “Where else...?” question pointed to the complete action (*miscomprehension type B* – 19% of 3-year-olds’ errors, and 14% of 4-year-olds’). However, if a child correctly pointed to the location with the complete action, and only after the additional “Where else...?” question chose the incomplete one, this error might be triggered by the imposed “pressure”. This was observed in 47% of 3-year-olds’ errors, 79% of 4-year-olds’, and 100% of 5-year-olds’ errors. Interestingly, although Stoll (1998) used a different task in her study, she also found that for the sentences with a perfective verb some children chose both situations, complete and incomplete, and that younger children did this more often than the older ones.

Thus, even though the overall proportion of errors decreased with age (Figure 2), one type of error on the perfective form arose most probably as a consequence of the pragmatic characteristics of the task we used, confirming previous findings on the importance of the context in which aspect is being investigated (Garcia del Real et al., 2014; Kazanina & Philips, 2007; Stoll, 2001; Vinnitskaya & Wexler, 2001). Given that children were not provided with feedback on their answers, in our opinion, the *pressure* type of error would be present even if the order of perfective/imperfective questions had been randomised. The analysis further revealed that 3-year-olds also made some random errors that cannot be attributed to the task itself (e.g., choosing only incomplete, only unstarted, or all three locations), and that do not occur at older ages.

Figure 3

The order of pointing to complete and incomplete action in the condition of perfective forms (corresponding to the yellow segments in Figure 2): 1. miscomprehension type A (after the first question spontaneously opted for both complete and incomplete); 2. miscomprehension type B (first opted for incomplete, after Where else...? opted for complete); 3. social pressure (first correctly opted for complete, after Where else...? opted for incomplete)



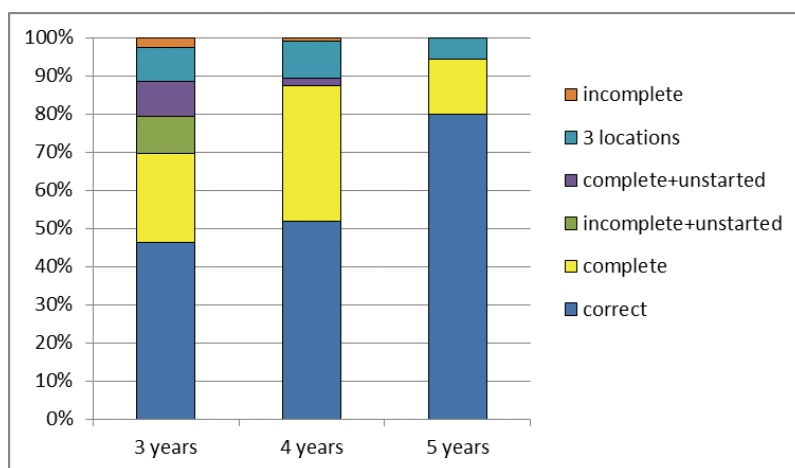
We may conclude that most of the 4- and 5-year-olds understand the meaning of perfective. Scarce errors made at these ages were a consequence of the pragmatic characteristics of the task, or insufficiently stabilized meaning of perfective. In contrast to that, in 3-year-olds, even if we take into account that the most common error on the perfective is a consequence of the characteristics of the task, only in 56% of their answers the perfective form was firstly associated with the complete action. This tells us that among 3-year-olds, there were those who did not understand the semantics of perfective at all, but instead answered randomly. A more complete picture concerning this will be provided in the results of the discriminant analysis.

Children's Interpretation of Imperfective

Some previous studies (Kazanina & Philips, 2007; Stoll, 2001; van Hout, 2008) have consistently shown that the meaning of the imperfective form is more difficult and acquired later compared to the perfective form. This is due to the fact that imperfective refers to both complete and incomplete entailment, while perfective only refers to complete events. In the current study, the target (adultlike) answer to the imperfective questions was choosing two locations, with the complete and the incomplete/interrupted event, in any order. The distribution of different types of answers to the imperfective questions across ages is shown in Figure 4 (the exact percentages are provided in the Appendix, Table 4): A. correct answer (both complete and incomplete action); B. 5 types of errors: 2 types of errors of pointing only to one location⁴ (complete action; incomplete action); 2 types of errors of pointing to two locations (complete and unstated action; incomplete and unstated action); 1 type of error of pointing to all three locations.

Figure 4

The types of children's answers to imperfective questions at different ages (ordered from the most frequent to the least frequent answers in 3-year-olds)



4 Participants did not make any errors of choosing only the location with the unstated action.

The percentage of correct answers on imperfective increases with age (3 years 46%, 4 years 52% and 5 years 80%), while the most frequent error for all ages was the choice of only the complete situation (yellow in graph, Figure 4). This was the only systematic error, and all the others were most probably a result of random guessing, because any consistent interpretation could not be found. The finding that children tend to relate imperfective telic predicates only to complete events is in line with the results of some other studies (Kazanina & Phillips, 2007; van Hout, 2005, 2007). In our opinion, this can indicate that in the transitive period of acquisition, imperfective can cover the same semantic space as perfective. In other words, in one phase of aspect acquisition, children may use both forms, perfective and imperfective, to mark what is presumably the most salient event – complete action. This finding can be seen as support for the hypothesis of discontinuity.

Children's Answers to the Control Questions

The answers to the control questions were also analysed. The control questions referred to the distractors that prevented the completion of the actions. Correct answering to those questions required the capacity to keep the attention on the task and remember two of the three locations where the distractor appeared. If properly answered, they indicated a child's adequate understanding and recall of the event ("Where was the rain? Where else was the rain?"). As expected, the number of correct answers increased with age ($F(3, 47) = 11.834$, $p < .001$, $\eta_p^2 = .425$). More importantly, 63% of 3-year-olds' responses were correct (Appendix, Figure 1), which is a much higher percentage than for the correct answers to perfective and imperfective verbs at age 3 (Figure 2 and 4). This shows that some children may have difficulties with perfective and/or imperfective forms even though they have the adequate cognitive abilities to cope with the task. The contribution of the abilities to cope with the task at different ages was further explored in the following discriminant analysis.

Developmental Change in Typical Comprehension of Aspectual Values

Although we have shown with ANOVA that there are significant age differences in the number of correct answers to particular questions, the analysis so far did not show: a. what are the typical error patterns that significantly discriminate the age groups, and b. how important is the contribution of the ability to cope with the task (indicated by correct answering to the control questions) to the overall pattern of answers at different ages. Thus, we explored several types of answers in the overall pattern of data, by means of two separate discriminant analyses, one on the correct answers and the other on the errors. These findings enhanced our knowledge on the contribution of different sources of variability and developmental change in comprehension of aspect.

Discriminant Analysis I

The criterion variable in the first discriminant analysis was age (3, 4, 5 years and adults), and the predictor variables were the following: a) the number of correct answers to perfective questions; b) the number of correct answers to imperfective questions; c) the number of correct answers to control questions.

Three discriminant functions were extracted (Table 3). Only the first function was statistically significant and covered 91.8% of variance.

Table 3

Discriminant analysis I. The tests of discriminant power of the functions

Discriminant function	Eigenvalue	% var	canon. R	Wilks' λ	χ^2	df	p
DF1	2.38	91.8	.84	.25	66.49	9	.000
DF2	.20	7.7	.40	.82	9.11	4	.058
DF3	.01	.50	.11	.99	.59	1	.443

Table 4 shows the content of the first discriminant function. The variable with the highest saturation is the number of correct answers to perfective, followed by the number of correct answers to the control questions, and the number of correct answers to imperfective with the least saturation.

Table 4

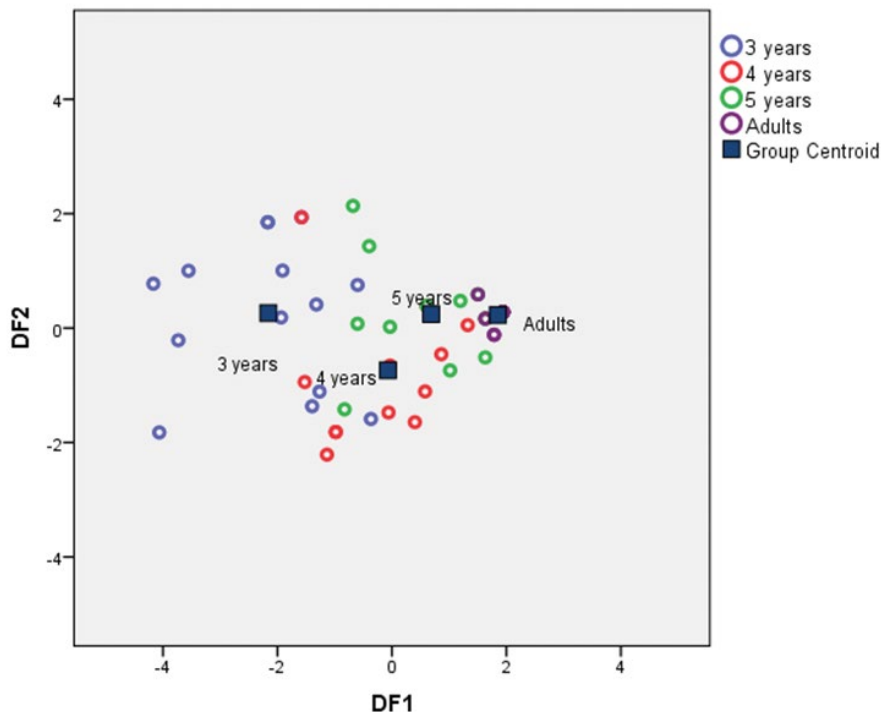
Discriminant analysis I. The coefficients of saturation of the discriminant function DF1

	DF1
N of correct answers to perfective questions	.638
N of correct answers to imperfective questions	.471
N of correct answers to control questions	.526

Figure 5. illustrates that DF1 discriminates well the 3-year-olds from the older children and adults, and also adults from children of all ages. Having in mind the saturation of this function (the correct answers to perfective, control and imperfective), we can recognize a clear developmental trend in mastering aspect semantics, along with the increase of cognitive ability to cope with the task (the capacity to pay attention to and memorize the locations of events). This finding also provides support for the hypothesis of discontinuity.

Figure 5

Discriminant analysis I – The differentiation of the different ages by canonical discriminant functions



The DF1 correctly classified 65.4% of participants into their age group (Appendix, Table 8). For 3-year-olds, and especially for adults, the prediction was quite accurate (only 28.5% of 3-year-olds were classified as older children). For 4-year-olds, and especially for 5-year-olds, the prediction was less successful: around 31% of 4-year-olds were classified as older, and 15% as younger; 23% of 5-year-olds as 4-year-olds, and 39% as adults.

Discriminant Analysis II

The second analysis had the same criterion variable (age groups 3, 4, 5 years and adults), and the following erroneous answers as predictor variables⁵: a) answer to imperfective: choice of the location with complete action; b) answer to imperfective: choice of all three locations; c) answer to perfective: choice of two locations, with complete and incomplete action.

Three discriminant functions were extracted (Table 5), but only the first function (DF1) was statistically significant (covered 91.7% of variance).

⁵ All variables with variance different from zero on all ages were included

Table 5
Discriminant analysis II. The tests of discriminant power of the functions

Discriminant function	Eigenvalue	% var	canon. R	Wilks' λ	χ^2	df	p
DF1	1.070	91.7	.719	.440	38.95	9	.000
DF2	.097	8.3	.297	.912	4.39	4	.356
DF3	.000	0	.004	1.00	.0019	1	.980

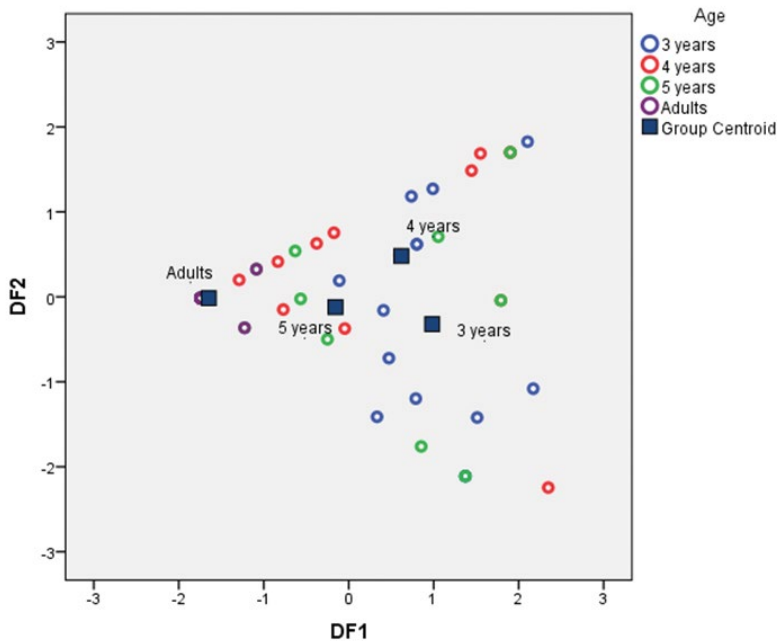
Table 6 shows that DF1 is saturated the most by the erroneous choice of both complete and incomplete action after the perfective question, followed by the erroneous choice of complete action after the imperfective question, and finally by the choice of all three locations after the imperfective question.

Table 6
Discriminant analysis II. The coefficients of saturation of the discriminant function

	DF1
Answer to imperfective: erroneous choice of location with complete action	.389
Answer to imperfective: erroneous choice of three locations	.275
Answer to perfective: erroneous choice of two locations, with complete and incomplete action	.433

Figure 6 illustrates that DF1 clearly separates different age groups. Adults are evidently distinguished well because they do not make any variance, while an expected developmental trend of error decrease is evident with increasing age.

Figure 6
Discriminant analysis II – The differentiation of the different ages by canonical discriminant functions



In the second analysis, the discriminant function DF1 was less accurate in classifying participants into their age groups – 53.8% were correctly classified (Appendix, Table 9). These results demonstrated a clear developmental trend in children's erroneous behaviour on the task: 3-year olds are most frequently incorrectly classified as 4-year-olds, 4-year-olds as 5-year-olds, and 5-year-olds as adults.

To sum up, the results of the discriminant analyses revealed a clear developmental change within the investigated age range. The combination of correct answers to perfective, control, and imperfective questions discriminates well between ages, especially between the 3-year-olds and the older participants. Two typical errors that children are prone to (the choice of complete and incomplete action for the perfective question, and the choice of only the complete action to imperfective) were also good predictors of the participants' age. Children's answers to perfective questions (correct and erroneous) attribute the most to the correct discrimination between different ages. It may be concluded that 3-year-olds are a group that has not mastered aspect yet and has the largest individual variability. Four- and five-year-olds are a transitional group compared to adults, because there are some children who are more advanced compared to their age, and some who are at the level of younger children concerning aspect comprehension. The ability to understand and recall the events (answers to the control questions) contributes partly to the discrimination between the age groups, but does not prevail the contribution of aspect comprehension.

Discussion

The findings of the presented study indicate that main changes in the acquisition of Serbian aspect happen in the investigated age range (3 to 5 years), and confirm earlier findings which show that the semantics of perfective is easier and acquired chronologically earlier than the semantics of imperfective (Kazanina & Philips, 2007; Stoll, 2001; van Hout, 2008). The results of the analysis of variance on answers to perfective/imperfective questions, the qualitative analysis of different error patterns, and two discriminant analyses with the correct and erroneous answers as predictor variables, all converged to a clear developmental trend in mastering of the aspectual contrast. Most of the 3-year-olds do not have adequate comprehension of either aspectual form. Unlike them, the 4-year-olds showed a high level of correct interpretation of the perfective forms, while having trouble with the understanding of imperfective. Adultlike comprehension of imperfective forms (including both complete and incomplete entailment) appeared dominantly at the age of 5.

The detailed qualitative analysis of errors revealed a clear difference between the random incorrect answers of 3-years-olds and systematic errors present at all ages to a different degree. Two types of systematic aspectual form miscomprehensions were recognized: a) attributing only complete entailment to the imperfective form in the transitional period (mostly 4-year-olds); b) attributing both complete and incomplete entailment to the perfective form.

The first type of miscomprehension can be considered, in our opinion, as an indicator of the transitional developmental phase when both aspectual forms, perfective and imperfective, refer only to complete action. Since the imperfective predicates in the stimuli questions were telic (according to Bragynsky and Rothstein, 2008), it seems that telicity guided the younger children's interpretation of imperfective form.

As our analysis showed, the other type of systematic error can be mostly ascribed to the pragmatic characteristics of the experimental task, i.e., the social pressure imposed by the "Where else...?" question posed by the experimenter. As expected, younger children are more susceptible to this kind of error, but even some of the 5-year-olds are not resistant to it. As the investigation of aspect acquisition is very sensitive to the pragmatic characteristics of the applied experimental tasks, we can consider complete mastering of a certain language category only if a child is able to perform like an adult in different pragmatic circumstances. We should have in mind that Stoll (1998), by using a different task (sentence-to-scene matching task), obtained similar results as we did: some younger children (2 and 3 years old) chose both pictures, with the complete and the incomplete event, for the perfective verb. Thus, the joint findings, at least for younger children, should not be treated entirely as a task artefact.

The results of the error analysis speak in favour of the hypothesis of discontinuity in the acquisition of aspect (Stoll, 1998, 2001), which argues that the representations of aspect in children and adults are qualitatively different. In the case of perfective, its meaning may be overextended in some 3-year-olds, referring to both complete and incomplete events. In the case of imperfective, the representation may be underextended and restricted only to complete events by most children up to the age of 5. The findings also support the usage-based theory (Tomasello, 2003), which advocates that children begin to acquire a language category in certain contexts and that is why its meaning may be narrower (imperfective meaning) or broader (perfective meaning in some 3-year-olds) than in adult language. Only through use in different contexts, its meaning is abstracted and generalized, and semantically better specified, thus becoming more adultlike.

Along with the acquisition of linguistic knowledge and pragmatic maturity, another relevant factor emerged for the successful discrimination between different ages in our task. This factor is of a cognitive nature (attention and memory processes), and represents the basis for correct answering to the control questions. The importance of this factor was recognized through discriminant analysis that extracted the function that differentiates the performance of 3-year-olds from the other ages in our experimental task: after correctly answering the perfective questions, the second highest saturation of this discriminant function came from correct answers to the control questions, and correct answers to the imperfective questions only after that.

As already explained, even though the Serbian aspectual forms can be derived by means of different morphological tools (prefix, suffix, and stem alternation) in this study we compared only the simple pairs: semantically empty

prefixes were added to morphologically simple imperfective verbs, which resulted in perfective forms phonologically consistent with their aspectual counterparts. Nevertheless, the formal transparency did not help since pre-schoolers struggled with the semantics of aspectual forms, especially imperfective. Our findings, cumulated with previous findings in Serbian, provide an insight into the way in which children understand and use aspectual forms in a language that offers grammatical meaning embedded in lexical items. This structural feature of Serbian enables the presence of aspectual forms in early language production, starting from the very first words. This is not the case with children of Germanic and Romance languages, because they first acquire lexemes, and only later start constructing multiword utterances with syntactic markers referring to contrasts between completeness and incompleteness. For this reason, the impression that can be drawn from the literature that children in Slavic languages acquire aspect earlier than children in Germanic and Romance languages is not adequate, as the early occurrence of verbal aspect markers in children's production does not necessarily imply their full mastery. The contribution of other morphological properties of the Serbian aspectual system remains to be thoroughly explored in the future.

As some authors would argue (Kazanina & Philips, 2007; Vinnitskaya & Wexler, 2001; Wagner, 2009, 2012), our results could also be interpreted in a different manner: some pre-schoolers showed adultlike competencies, while others did not, because they were sensitive to the characteristics of the task, i.e. its higher informational load. However, our analyses enabled us to explore the contribution of different sources of variance in our data and to gain a quantitative measure of the contribution of different error types in the discrimination between age groups. Even though the task was demanding from the pragmatic and cognitive point of view, low performance on perfective and imperfective questions cannot be solely attributed to the inability to cope with the task. As our discriminant analysis revealed, poor understanding/recall of the events (shown on the control questions) could explain only a part of the children's errors on aspectual forms, because the contribution of answers to the control questions was lower than the contribution of correct and incorrect answers to the perfective questions.

Conclusion

The current study goes further in the exploration of the acquisition process and reveals that Serbian lexically inherent aspectual forms, present early in the language production as part of the basic vocabulary, do not help in early disentangling of aspectual meanings. The children often attribute an aspectual value that is not completely in accordance with the standard language. The integration of the experimental data on aspect production and comprehension in Serbian indicates the existence of a complex and long lasting process of its acquisition.

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Dečije razumevanje glagolskog aspekta u srpskom jeziku

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Cilj ovog istraživanja bio je da se ispita kako deca predškolskog uzrasta kojima je srpski maternji jezik razumeju dve forme glagolskog aspekta: imperfektiv i perfektiv, u poređenju sa odraslima. Nakon gledanja animiranih filmova u kojima su prikazane situacije sa završenim, nezavršenim i nezapočetim akcijama, ispitanicima su postavljena pitanja sa perfektivnim i imperfektivnim glagolskim formama na koja je trebalo da odgovore pokazivanjem događaja koji odgovara(ju) svakom pitanju. Rezultati ukazuju na jasan razvojni trend u razumevanju aspekatskih formi. Podaci pokazuju da usvajanje perfektiva prethodi usvajanju imperfektiva: trogodišnjaci uglavnom razumeju samo značenje perfektiva; većina petogodišnjaka razume obe aspekatske forme slično odraslima, dok su četvorodišnjaci prelazna grupa. Naši rezultati govore u prilog stanovištu da se reprezentacije ove jezičke kategorije kvalitativno razlikuju kod dece i odraslih. Istraživanje navodi na zaključak da je ovladavanje semantikom glagolskog aspekta dugotrajan proces koji podrazumeva određeni nivo kognitivnog i pragmatiskog razvoja i koji traje tokom čitavog predškolskog perioda.

Ključne reči: glagolski aspekt, razvoj jezika, razumevanje, srpski jezik

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Appendix

Table 1*List of imperfective and perfective verbs used in the experiment*

	Meaning	Imperfective	Perfective (prefix+imperfective)
1	'cut a tree'	<i>seći drvo</i>	<i>i(z)-seći drvo</i>
2	'wash a car'	<i>prati kola</i>	<i>o-prati auto</i>
3	'clean a backyard'	<i>čistiti dvorište</i>	<i>o-čistiti dvorište</i>
4	'wipe a window'	<i>brisati prozor</i>	<i>o-brisati prozor</i>
5	'draw a car'	<i>crtati kola</i>	<i>na-crtati auto</i>
6	'paint a fence'	<i>bojiti ogradu</i>	<i>o-bojiti ogradu</i>
7	'build a house'	<i>zidati kuću</i>	<i>sa-zidati kuću</i>
8	'construct a castle'	<i>graditi dvorac</i>	<i>sa-graditi dvorac</i>
9	'make a snowman'	<i>praviti Sneška Belića</i>	<i>na-praviti Sneška Belića</i>

Table 2*The average number and standard deviations of the correct answers on questions with perfective and imperfective forms*

Age group	Imperfective		Perfective		N
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
3 years	3.7	2.5	2.7	2.8	14
4 years	4.2	2.8	6.9	2.0	13
5 years	6.4	2.3	6.5	2.0	13
Adults	7.9	0.3	7.9	0.3	12
Total	5.5	2.7	5.9	2.8	52

Table 3*The percentage of the different types of answers to perfective questions across ages*

Answers		3 years	4 years	5 years
Correct	complete	33.9	86.5	81.7
	complete+incomplete	33.9	13.5	18.3
	3 locations	8.9	0	0
Incorrect	incomplete+unstarted	6.3	0	0
	complete+unstarted	5.4	0	0
	incomplete	3.6	0	0
	unstarted	3.6	0	0
Don't know		4.5	0	0
Sum		100	100	100

Table 4
The percentage of different types of answers to imperfective questions across ages

Answers		3 years	4 years	5 years
Correct	complete+incomplete	46.5	51.9	79.8
	complete	23.2	35.6	14.4
	incomplete+unstarted	9.8	0	0
	complete+unstarted	8.9	1.9	0
Incorrect	3 locations	8.9	9.6	5.8
	incomplete	2.7	1	0
	unstarted	0	0	0
Sum		100	100	100

Figure 1
Four types of answers to the control questions per age group: A. two correct locations; B. one correct or incorrect location; C. two locations, one incorrect; D. three locations.

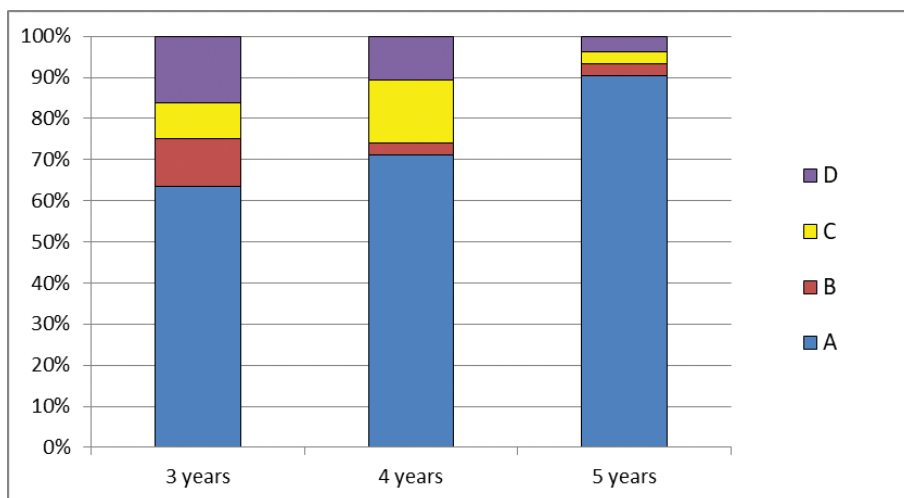


Table 5

The number of correct answers to perfective, imperfective and control questions for each child at the age of 3

Child	Age	Imperf	Perf	Cntrl
1	3;2	7	0	6
2	3;6	7	0	6
3	3;4	3	0	5
4	3;4	5	5	8
5	3;2	6	3	5
6	3;6	5	2	6
7	3;5	7	1	7
8	3;1	1	0	5
9	3;0	2	1	3
10	3;1	1	2	0
11	3;3	0	7	6
12	3;1	4	3	5
13	3;5	2	8	5
14	3;1	2	6	4
M	3;3	3,7	2,7	5,1

Table 6

The number of correct answers to perfective, imperfective and control questions for each child at the age of 4

Child	Age	Imperf	Perf	Cntrl
1	4;2	7	1	7
2	4;4	7	6	7
3	4;5	4	8	6
4	4;3	6	8	8
5	4;2	0	8	4
6	4;3	5	8	4
7	4;4	0	8	5
8	4;6	0	8	5
9	4;4	3	8	5
10	4;6	7	8	8
11	4;5	5	8	7
12	4;2	3	5	3
13	4;1	7	7	4
M	4;4	4,2	6,9	5,7

Table 7

The number of correct answers to perfective, imperfective and control questions for each child at the age of 5

Child	Age	Imperf	Perf	Cntrl
1	5;0	7	7	8
2	5;2	6	8	6
3	5;4	8	3	7
4	5;5	8	8	8
5	5;5	8	7	8
6	5;5	4	5	6
7	5;5	7	6	7
8	5;5	0	8	6
9	5;4	8	8	8
10	5;2	3	7	8
11	5;6	7	8	8
12	5;7	8	2	8
13	5;8	8	8	6
M	5;4	6,3	6,5	7,2

Table 8

Discriminant analysis 1 – The classification of participants into predicted age groups based on discriminant functions

		Predicted age group								Σ	
		3 years		4 years		5 years		Adults			
		N	%	N	%	N	%	N	%	N	%
Calendar age	3 years	10	71.4	3	21.4	1	7.2	0	0	14	100
	4 years	2	15.4	7	53.8	3	23.1	1	7.7	13	100
	5 years	0	0	3	23	5	38.5	5	38.5	13	100
	Adults	0	0	0	0	0	0	12	100	12	100

Table 9

Discriminant analysis 2 – The classification of participants into predicted age groups based on the discriminant functions

		Predicted age group								Σ	
		3 years		4 years		5 years		Adults			
		N	%	N	%	N	%	N	%	N	%
Calendar age	3 years	7	50	5	35.7	2	14.3	0	0	14	100
	4 years	2	15.4	6	46.2	4	30.8	1	7.7	13	100
	5 years	3	23.1	2	15.4	3	23.1	5	38.4	13	100
	Adults	0	0	0	0	0	0	12	100	12	100