A Developmental Perspective on the Imperfective Paradox

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Abstract

The names for whole objects are generally only used to refer to whole objects. In contrast, imperfective or progressive verb morphology makes it possible to use the name of a whole event to refer to an activity that is clearly not a complete instance of that event, leading to what is known as the Imperfective Paradox. For example, a sentence like ‘John was building a house’ does not entail that a house ever got built. The Imperfective Paradox has received a number of different treatments in the philosophical and linguistic literature. This article presents developmental evidence on the nature of the Imperfective Paradox, based on a series of 4 experiments conducted with Russian-speaking 3-5 year olds. Despite the fact that Russian is a language in which the morphological form of imperfectives is highly salient and used appropriately at a very young age, younger children show a clearly non-adultlike pattern of comprehension. These children are only willing to accept an imperfective predicate as a description of a past incomplete event when the sentence contains an explicit frame-of-reference that highlights a time interval that ends before the failure point of the event. These findings are taken as support for an account of the imperfective that makes use of temporal reference frames in solving the Imperfective Paradox.
A Developmental Perspective on the Imperfective Paradox

1 Introduction

Among the many challenges facing a child learning language, the task of learning arbitrary correspondences between word-forms and word-meanings is one of the largest and most well studied topics. It is well known that word classes like abstract or mass nouns, adjectives, and certain verb types present serious challenges, but difficulties arise even in supposedly ‘simple’ cases in which concrete categories like cats and trains can be explicitly taught by pointing to the relevant object (e.g., Quine, 1960; Macnamara, 1982; Gelman & Markman 1986; Landau, Smith, & Jones, 1988; Markman, 1989; Gleitman, 1990; Bloom & Kelemen, 1995; Bloom, 2000). One problem of particular relevance to the current study is that objects often do not appear in their full spatio-temporal extent. We can say ‘Rabbit!’ upon seeing just a couple of ears peeking from behind a tree or ‘Squirrel!’ upon seeing no more than a tail. Such cases might conceivably confuse a child learning the words of the language and lead to individuation of objects that differs from other speakers of the language, but in practice there seems to be little difficulty in understanding that count nouns refer to whole objects (Markman, 1989; Wagner & Carey, 2003).

The counterparts of count nouns in the event domain are telic events such as eat an apple or build a house, i.e., events that have a telos or endpoint. The problem for word-learning posed by incomplete events appears to be somewhat more serious than the problem posed by incomplete objects. It is common to use telic predicates in descriptions of incomplete events, and many languages have fully grammaticized tense-aspectual categories like the progressive or imperfective that eliminate completion entailments from the predicates that they mark. For example, progressive and imperfective forms can be used in the description of an event that is in progress at some point in time (and hence incomplete at that time), while making no commitment to the eventual outcome of the event. For this reason, progressive or imperfective predicates have often been characterized as reflecting the perspective of an ‘insider’, who sees a portion of the event but is oblivious to the endpoints of the event, contrasting with the perspective of an outside observer who can see the event in its entirety (Isačenko, 1968; Comrie, 1976; Smith, 1991). For example, the progressive sentence in (1) may be used to describe that part of a house-building event that was ongoing while Mary talked on the phone, with no assertion about the outcome of the house-building event.

(1) When Mary talked on the phone, John was building a (toy) house.

The use of a count noun when only a partial object is in view differs importantly from the use of progressive or imperfective verb forms to describe a part of an ongoing event. Speakers will use the name of a complete object to label an object that is only partially in view only if they believe that the remainder of the object is present, and merely occluded. So, if a speaker notices a dorsal fin approaching him in the ocean he might yell “Shark!” (and flee), but if the fin is not connected to a shark, the speaker will concede that he had not, in fact, seen a shark. In other words, the use of a count noun implies the speaker’s
belief that the corresponding object exists in its entirety. Relatedly, if upon seeing a human head and chest a speaker identifies the creature as a man, he will be surprised to see the body of a horse as more of the figure is uncovered; he will concede that he had seen a centaur rather than a man. In other words, the speaker’s use of a count noun implies an expectation that any occluded portion of the object consists of a normal, expected continuation of what is in view. In contrast, the use of a progressive or imperfective-marked predicate to describe a part of a telic event entails no commitment on the part of the speaker to the eventual completion of the event. For example, the progressive predicate crossing the street in (2) describes an event that was never completed, but a speaker would not conclude from John’s misfortune that he had never actually been crossing the street. In contrast, the simple past statement in (3) entails that the street crossing did reach completion.

(2) John was crossing the street, when he was hit by a truck.
(3) John crossed the street.

The fact that progressive or imperfective marking allows the name of a telic predicate to be applied to an incomplete event presents a puzzle that has been known to philosophers and semanticists at least since Aristotle (Metaphysics, Book IX, Chapter 6, reproduced in Aristotle, 1941). The problem has come to be known as the Imperfective Paradox (Kenny, 1963; Dowty, 1977, 1979), and encompasses two related questions. First, how is it that a telic predicate that is defined by its endpoint can fail to entail that the endpoint is reached? In other words, why are completion entailments suspended in progressive/imperfective statements? Second, how is it that an event can come to be labeled with a telic predicate when the endpoint defined by the predicate is not reached? In other words, how are sub-parts of events identified as being parts of specific larger events? These questions have received a number of different treatments in previous literature, which we summarize in Section 2. The aim of this paper is to contribute to an understanding of the nature of the Imperfective Paradox by investigating how its challenges are met by young children.

Following a review of previous studies on children’s understanding of imperfectives and progressives in Section 3, the studies in Section 4 focus on how Russian-speaking children understand the meaning of predicates marked with perfective and imperfective aspect. Russian is particularly appropriate for this kind of investigation, since grammatical aspect is highly salient in the language. A number of previous studies of the production and comprehension of aspect have suggested that children have some understanding of aspectual contrasts at an early age, but these studies have not specifically probed children’s understanding of the completion entailments of imperfectives. Results from our initial experiments suggest that Russian-speaking children incorrectly ascribe completion entailments to imperfectives. However, subsequent experiments indicate that the children’s problem lies not with their understanding of completion entailments, which turns out to be adultlike, but rather with their hypothesis on which temporal interval should be used to evaluate the imperfective and how this interval relates to the reference frame. The reference frame is a temporal interval that is salient in the discourse context, either due to an overt temporal modifier or due to extralinguistic information, and that is used to evaluate the truth-value of a
statement. The Russian developmental findings, together with parallel findings about adult Dutch in Section 5, are then used in Section 6 to motivate a revised account of the Imperfective Paradox that draws upon key insights of two competing accounts of the semantics of aspect.

2 Theories of the imperfective

The imperfective can be used in several types of situations, in what traditional grammars refer to as different ‘readings’ of the imperfective. The imperfective can be used to describe events that are in progress, events that are permanently incomplete, habitual or generic events, and iterative events (Isačenko, 1968; Comrie, 1976; Timberlake, 1985; Binnick, 1991). Theoretical accounts aim to provide a semantics for the imperfective that can derive each of these different uses from a common semantic representation, and in this study our focus is on the situations in which the imperfective is used to describe a part of an event, either because the event is in progress or because the event failed to reach its endpoint. Both of these situations reflect the fact that imperfective predicates lack completion entailments. The same is generally true of progressive predicates, and for the purposes of this paper we will freely use the English progressive as if it accurately translates the Russian imperfective. However, we acknowledge that there are important differences between imperfectives and progressives, although they lie beyond the scope of this study (cf., Klein, 1995; Filip, 1997, 2000; Zucchi, 1999).

There are two main classes of accounts of how the semantics of the imperfective suspends completion entailments, and numerous detailed variants within each subclass. We will briefly present the leading ideas behind the major theories of the imperfective, since they make predictions about where children might experience difficulty, and contribute to an explanation of the experimental results presented in Section 3.

We will refer to the first approach to how the imperfective suspends completion entailments as the ‘perspective-based’ approach. This approach, which is well represented in the syntactic and typological literature, treats tense and aspect as spatio-temporal predicates (Reichenbach, 1947; Comrie, 1976; Smith, 1991; Kamp & Reyle 1993; Klein 1994, 1995; Demirdache & Uribe-Etxebarria, 1997, 2000, 2005; Borik, 2002). The intuition of the ‘insider’ perspective on an event taken by the imperfective is operationalized by positing that the imperfective selectively focuses on a narrow temporal interval that excludes the endpoints of the event from view. As a consequence of viewing the event from the perspective of this narrow temporal interval, the imperfective makes no assertion about whether the event was completed. Thus, the suspension of completion entailments is derived. Importantly, the perspective-based approach posits that the use of an imperfective always entails the existence of a temporal interval, often referred to as the ‘assertion time’ or ‘perspective’, that defines the interval that the predicate applies to. This interval is related to the reference frame, which in turn may be explicit (as in the example of the when-clause in (1)), or derived implicitly from the discourse context.

The perspective-based approach straightforwardly captures the connection between the aspectual perspective, the temporal reference frame, and the lack of completion entailments. However, while the reliance on the notion of a narrow temporal perspective
successfully captures why imperfective predicates may be applied with no regard to the endpoints of an event, this approach begs the question of what licenses the use of a telic predicate when the endpoint of the event is not reached. We refer to this problem as the event-type problem, and under some approaches is considered to be the essence of the Imperfective Paradox (e.g., Dowty, 1979; Landman, 1992; Bonomi, 1997; Filip, 1997). The event-type problem can be illustrated using a description of a motion event, as in (4).

This sentence may be used in a situation where Mary, who was scheduled to give a talk in Boston, started in Washington DC, drove as far as New York City and had to stop there because her car broke down, so that she never actually reached Boston. How is it that the predicate was driving to Boston may be used to describe an event of driving only as far as New York City? In other words, what is the nature of the relation between the incomplete event and the imperfective/progressive form that describes it?

(4) Mary was driving from Washington DC to Boston.

Any account of the semantics of the imperfective/progressive must address the event-type problem. Its solution lies in formally describing how an incomplete event gets to be labeled by a particular predicate. Notice, however, that the appeal to narrow perspectives in the perspective-based approach captures the lack of completion entailments while leaving open the question of how a subpart of an incomplete Xing event qualifies as an event of type X.

The second type of approach to the Imperfective Paradox adopts the opposite strategy to the perspective-based approach. Whereas the perspective-based approach focuses on the question of why completion entailments are suspended, leaving the event-type problem unanswered, a second class of approaches takes the event-type problem as the starting point, and aims to derive the lack of completion entailments from their solution to the event-type problem. The idea is that if one knew why an incomplete event can be labeled by a given imperfective predicate, that would automatically explain why the imperfective lacks completion entailments. This class of approaches is well represented in the formal semantic and philosophical literature, and we will refer to these approaches collectively as ‘event-based approaches’, since their focus is on what qualifies a given event to receive a given predicate label (e.g., Dowty, 1979; Bach, 1986; Parsons, 1990; Landman, 1992).

Event-based approaches may be further divided into two sub-classes, the extensional and the intensional varieties, where the locus of the difference is the assumed denotation of a bare uninflected predicate. A clear example of the extensional approach is Parsons (1990), which takes the denotation of a bare predicate to include both complete and incomplete events in its denotation. In example (2), for example, the imperfective predicate was crossing the street is successfully used to describe an incomplete event of street-crossing, because “a verb such as ‘cross’ is true of all crossings independently of whether they culminate” (Parsons, 1990: 170). Thus, the theory assumes that speakers may directly classify even incomplete events as instances of the event in question, without consideration of how the event might have continued. This theory makes it possible to circumvent the Imperfective Paradox, but only at a price: it appears to require a listing of possible incomplete events under the denotation of any predicate. For
example, it would require that the denotation of the predicate *was driving to Boston* includes the event described in (4) in which Mary only made it as far as New York City.

The alternative version of the event-based approach is the intensional theory, which posits that telic predicates always refer to complete events that include their endpoints, but allows that with imperfective or progressive predicates the endpoint of the event may lie in some intended or imagined continuation of what occurred in the actual world (e.g., Bennett & Partee, 1972; Dowty, 1979; Landman, 1992). In Dowty’s terms, the progressive morpheme is treated as an operator that relates an incomplete event in the actual world to a complete version of that event in an *inertia world*, a possible world that coincides with the real world until immediately before the event interruption, and develops in a normal and expected fashion thereafter, as the real world would have developed if the event had not been interrupted. Thus, the claim is that the predicate *cross the street* in (2) refers only to a successful street-crossing event, and the progressive form of the predicate used in (2) is licensed because the speaker recognizes that John would have successfully reached the other side of the street if it were not for the unfortunate arrival of the truck. In order to project an inertia world, the speaker may draw upon knowledge of the agent’s intentions or upon his own hypothesis of what the natural outcome of the event should be or should have been.

In summary, the primary difference among the event-based approaches involves the denotation of a bare uninflected predicate: in the extensional view it is assumed to include both complete and incomplete events, but in the intensional view the denotation includes only complete events. Both event-based approaches share the primary goal of answering the event-type problem, i.e., how an incomplete event can be labeled by an imperfective predicate. Both also use their answer to this question to explain why imperfective predicates lack completion entailments. In so doing, the event-based approaches effectively eliminate any role for temporal reference frames or specific perspectives in accounting for the missing completion entailments. In this respect, they stand in sharp contrast with the perspective-based approach, which fully derives the lack of completion entailments from the special perspective introduced by an imperfective predicate. The fact that the event-based approaches can offer an answer to the event-type problem would appear to confer on them an decisive advantage over the perspective-based approach, although this comes at the price of failing to capture speakers’ intuitions about the special ‘inside’ perspective conveyed by the imperfective.

In what follows we evaluate these contrasting approaches to the Imperfective Paradox in light of a series of studies of what young children know about the semantics of the imperfective. Different theories allow for different possible predictions about where children might encounter difficulty in interpreting imperfectives, and thus developmental evidence may be used as a tool for investigating issues in semantics. Accordingly, in Section 6 we argue that a new approach to the imperfective that combines insights from both the perspective-based and event-based approaches is needed in order to account for the developmental data.

Perspective-based approaches stress the importance of appropriately locating the temporal perspective on the event and the relative ordering of that perspective with respect to the reference frame in accounting for the absence of completion entailments with the imperfective. Under approaches of this kind, we may suppose that children’s success in using the imperfective with incomplete events may depend on their ability to
compute the relevant alignment of temporal intervals. For example, we may assume that cases in which an ‘insider’ perspective on the event is provided by an explicit reference frame should be relatively easy for the child, such as when a while-clause provides such a perspective. Under event-based approaches, on the other hand, children’s success with imperfectives should not be affected by temporal reference frames or by the availability of an insider perspective on the event. This is because such theories derive the lack of completion entailments from their solution to the event-type problem (whether intensional or extensional in nature) and do not rely upon the notion of a temporal perspective. Instead, event-based approaches might predict that children should encounter difficulty if they cannot successfully recognize that a part of an event is an instance of the relevant complete event-type. In intensional approaches, difficulty may arise if children are unable to compute plausible continuations of events in situations where the completion of the event is counterfactual. In extensional approaches, difficulty may arise if the child fails to recognize an incomplete event as a member of the denotation of the corresponding imperfective predicate.

In a series of four experiments we investigated the comprehension of imperfective aspect in 3-5 year old Russian-speaking children. In order to establish whether the children were aware of the lack of completion entailments in the imperfective, we tested them in situations where the imperfective referred to a past incomplete event. A willingness to associate imperfective statements with past incomplete events would suggest that the child has a target-like representation of the semantics of the imperfective. Our experiments differed from one another in two main respects. First, we manipulated the presence or absence of an explicit temporal frame of reference for evaluation of the imperfective. Experiments 1 and 2 presented monoclusal sentences without an overt temporal modifier. In contrast, Experiments 3 and 4 used sentences that included an overt temporal modifier clause, similar to (1), that explicitly signaled an ‘insider’ perspective on the event described by the imperfective. The second point of variation across experiments concerned the counterfactuality of the event described by the imperfective, i.e., whether the event ultimately reached completion. In Experiments 1, 2 and 4 the imperfective referred to a counterfactual event, whereas in Experiment 3 the event was non-counterfactual. From the perspective of intensional theories of the imperfective, the status of the event as counterfactual or otherwise may be an important factor in children’s performance, since it determines whether or not children must look beyond the real world to find a complete version of the event in question.

There are two main advantages of choosing Russian for this study. First, Russian has a highly salient aspectual paradigm. Every past tense verb bears either perfective or imperfective aspect marking that is morphologically independent of the past tense suffix -l. Aspect is marked by a prefix, a suffix, or a stem change. For example, the imperfective form stroil’ ‘was building’ contrasts with the perfective form postroil’P ‘built’). Both past aspectual forms are synthetic.1 As in other languages past perfective forms entail the completion of the event described by the predicate, whereas the entailment is absent with imperfective forms. The second advantage of using Russian is that previous developmental studies on Russian have shown that at least the surface forms corresponding to the two aspectual categories are mastered early in development. This

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1 In what follows the superscript ‘I’ marks imperfective aspect, ‘P’ marks perfective aspect.
work sets the stage for an investigation of the meanings that children assign to these forms.

3 Previous research on the acquisition of aspectual distinctions

3.1. Previous research on development of aspect in Russian

Results from naturalistic production studies suggest that young Russian children produce both aspectual forms appropriately from as early as age 2 years (Gvozdev, 1961; Bar-Shalom & Snyder, 2002; Bar-Shalom, 2002). Importantly, these studies cite examples of aspectual minimal pairs produced by the same child at the same age, suggesting that children do not limit individual verbs to just a single aspectual form, e.g., narisovala\textsuperscript{P} vs. risoval\textsuperscript{I} ‘drew’ vs. ‘was drawing’ (both at age 2;05.21), kupila\textsuperscript{P} (2;05.21) vs. pokupali\textsuperscript{I} (2;05.23) ‘bought’ vs. ‘were buying’ (Bar-Shalom & Snyder, 2002).

Although naturalistic production studies provide only limited information about the meanings that children assign to the different aspectual forms, it is notable that even the youngest children use present imperfective predicates to describe ongoing events that develop in the here-and-now (Bar-Shalom & Snyder, 2002; Bar-Shalom, 2002). This form-meaning association has not, to our knowledge, been tested in comprehension studies with Russian children, but related studies in Dutch (van der Feest and van Hout, 2002) and Greek (Delidaki & Varlokosta, 2003) show that 3-4 year old children correctly match present imperfective predicates to ongoing events in comprehension tasks.

In the one previous experimental study of Russian children’s understanding of imperfectives, Vinnitskaya & Wexler (2001) presented a sentence-to-picture matching experiment that investigated comprehension of aspect by 3-, 5- and 6.5-year old children. The child’s task was to match a past perfective or imperfective sentence to one of three pictures. One picture depicted the result state of a completed event (e.g., for reading: a smiling girl sitting next to a closed book); another showed the same event in progress (e.g., a girl reading a book); the remaining picture depicted an unrelated action. In each trial the child heard either a perfective or imperfective sentence (\textit{(5a)} and \textit{(5b)} respectively) and had to match it to one of the pictures.

\begin{tabular}{ll}
\textit{(5a)} & Devochka prochitala\textsuperscript{P} knigu. \quad & b. Devochka chitala\textsuperscript{I} knigu. \\
& \textit{The girl read the book (completely).} & \textit{The girl was reading the book.} \\
\end{tabular}

Results showed that children in all three age-groups showed a strong preference to select the picture showing a completed action on perfective trials and the in-progress picture on imperfective trials, replicating earlier results from a similar study on Polish children by Weist and colleagues that we discuss below (Weist, Wysocka, & Lyytinen, 1991).

Vinnitskaya and Wexler conclude from their results that Russian children possess adultlike knowledge of the completion entailments of perfective and imperfective forms. However, this conclusion may be premature for a couple of reasons. First, the children rarely associated the imperfective sentence with the picture showing a completed event, despite the fact that this choice is fully acceptable for adults. Failure to match the
imperfective with complete events may reflect a non-adultlike semantics that restricts imperfectives to incomplete events, or it may reflect an artifact of the specific task design used. Second, the picture-matching task used in the experiment made it difficult to directly test children’s understanding of the completion entailments of the imperfective. This is because the picture that children most commonly associated with imperfective statements depicted an event that was in progress, with no indication of its eventual outcome. Thus, the endpoint of the event was non-counterfactual, and the study did not show that children are willing to associate an imperfective with an event that explicitly fails to reach completion. In the studies below we use designs that provide stronger tests of whether children understand the completion entailments of imperfectives.

3.2. Previous research on development of aspect in other languages

A number of previous studies in languages other than Russian have investigated children’s interpretation of imperfectives and progressives. These studies have yielded important findings, but leave open the question of what children understand about the completion entailments of imperfectives and progressives.

An influential study by Weist and colleagues (Weist et al., 1991) presents the results of a two-choice sentence-picture matching task with Polish, English and Finnish-speaking children. Children were shown a drawing of a completed event, and another picture that depicted the same event in-progress. On each trial, children heard a pair of sentences that were minimally different in their aspect (i.e., progressive or imperfective vs. perfective) and had to match each sentence to the picture that best fit the sentence. Even two-and-a-half year old English and Polish children succeeded in this task, whereas Finnish children’s performance was not significantly above chance until the age of six. Thus, at least in English and Polish, even very young children can associate the progressive/imperfective with an ongoing event. However, as in the study by Vinnitskaya and Wexler, children’s ability to match imperfectives to ongoing events does not show that they are aware of the lack of completion entailments of the imperfective.

In a study that we build upon in the design of our first two studies, Wagner tested children’s knowledge of tense morphology in a story comprehension task with 2-4 year old English-speaking children (Wagner, 2001). Children watched stories in which a toy cat took a walk along a road with two landmarks and had a chance to perform a certain event at each location. At the first landmark, the cat either performed the event completely or incompletely, with an equal proportion across trials. While the cat was still engaged in performing the event at the second landmark, children were asked a where-question that contained either a present or a past progressive predicate (e.g., Where is/was the kitty V-ing?) and had to name or point to a landmark in response. The two-year olds responded correctly to the queries only if a present ongoing event was contrasted with a past complete event, but not if it was contrasted with a past incomplete event, whereas the three and four year olds gave adultlike responses in all conditions. These findings suggested that the younger children incorrectly mapped English tense morphology onto aspectual semantics, taking the past tense auxiliary to indicate completion and the present tense auxiliary to indicate that an event is in progress. This result is interesting, as it suggests that 2-year olds have an imperfect understanding of tense and aspect morphology, but for our purposes it is important to note that the study was not designed
to specifically test English-speaking children’s knowledge of aspectual distinctions. Since only one past tense category was probed in the study, it is hard to say whether children’s performance with past progressives reflected a problem with progressive morphology or a problem with the semantics of past tense morphology, as had been suggested by a number of earlier studies (e.g., Bronckart & Sinclair, 1973; Antinucci & Miller, 1976; Bloom, Lifter, & Hafitz, 1980; Weist, Wysocka, Witkowska-Stadnik, Buczowska, & Konieczna, 1984; Shirai & Anderson, 1995).

Using a design similar to the one used by Wagner, van der Feest and van Hout investigated comprehension of tense and aspectual distinctions by Dutch-speaking 3-4 year old children (van der Feest & van Hout, 2002). The children watched a story in which a puppet took a walk along a road with three landmarks and had an opportunity to perform a certain event at each of the locations. The puppet always performed the event halfway at the first location and completely at the second location. While the puppet was still engaged in the event at the final location the experimenter asked a question about one of the events using simple present, simple past or present perfect predicates. Of those tense-aspectual categories, the simple past is of most interest to us, as it has traditionally been claimed to lack completion entailsments in Dutch. However, in this experiment the adult controls accepted simple past queries only with past complete events, but not with past incomplete events, suggesting that at least in the scenarios provided in this study the simple past did have a strong completion entailment. (The Dutch facts are discussed further in Section 5.) Although this fact makes the experiment somewhat less relevant to the question of what children know about categories that exhibit the Imperfective Paradox, the study is still very important in another respect, since it showed that children accept the simple present with present ongoing events that develop in front of the child in the here-and-now. This observation, also made by Delidaki and Varlokosta (2003) for Greek-speaking children, will become important in considering the results of our own studies.

Summarizing, previous results indicate that young children have some knowledge about the semantic properties of imperfectives or progressives, but do not provide a clear indication of what they understand about the completion entailments of these categories.

4 Experiments with Russian-speaking children

4.1. Experiment 1: Creation predicates

4.1.1. Experiment 1: Design and methods

The aim of Experiment 1 was to test Russian-speaking children’s knowledge of completion entailments with imperfective and perfective predicates. In particular, we wanted to know whether they are able to associate simple imperfective sentences with past incomplete events.

Twenty-five children aged 3–6 years (mean age 4;10) from Moscow, Russia participated in the experiment. All children were raised in monolingual Russian-speaking households. Written consent was obtained from a parent or guardian for all participants. Each child was tested individually in a quiet room. Following a warm-up story, each
child saw a total of four experimental stories interspersed with filler stories presented in one or two sessions of 15-25 minutes long each. Stories were acted out by one experimenter, who also tape-recorded children’s responses.

Experiment 1 was a modified Truth-Value Judgment task (Crain & McKee, 1985; Gordon, 1996; Crain & Thornton, 1998) in which stories that contained complete and incomplete creation events were acted out in front of the child. Creation predicates were chosen since they made it possible to act out clearly different complete and incomplete versions of the same event. When creation predicates are used the completion of the event is defined by the status of the direct object, which fully comes into existence only as the event reaches its culmination. For example, in a \textit{smurf-building} event a complete smurf is an automatic product of the completed event, whereas a half-built smurf (or any other amount of smurf) indicates that the event took place, but failed to reach completion.

\begin{table}[h]
\centering
\begin{tabular}{|l|l|}
\hline
\textbf{Predicate} & \textbf{English equivalent} \\
\hline
sobiral\textsuperscript{I} / sobral\textsuperscript{P} gnomika & 'was assembling / assembled a smurf' \\
stroil\textsuperscript{I} / postroil\textsuperscript{P} dom & 'was building / built a house' \\
sostavlyal\textsuperscript{I}/sostavil\textsuperscript{P} kartinku & 'was making / made a puzzle' \\
lepil\textsuperscript{I} / slepil\textsuperscript{P} medvedya & 'was molding / molded a bear' \\
\hline
\end{tabular}
\caption{List of creation predicates tested in Experiment 1}
\end{table}

Each of the four stories followed the same pattern, which was adapted from the design previously used to test children’s understanding of tense morphology (Wagner, 2001). See Table 1 for a full list of predicates used. In the story, a toy animal went down a road with three landmarks: a flowerbed, a castle and a tree. A given action, that could be performed to completion at each location, was performed completely at one location only, incompletely at one other location, and not at all at a third location. For example, in the \textit{smurf-building} story the main character is a monkey who encounters pieces of a smurf at each of the three locations (Figure 1a). He builds a smurf completely at the flowerbed; at the castle he starts building a smurf, but is interrupted and therefore leaves the smurf half-finished; finally, at the tree he notices the smurf pieces but ultimately does not do anything with them. In what follows, we will refer to the location where the main event was completed as the \textit{complete} location, the location where the main event did not reach completion as the \textit{incomplete} location, and the remaining location where the event could have taken place, but did not, as the \textit{null} location. At the incomplete location, the reason for the main event not to reach completion was always an interruption: the agent was distracted from the main event and could not complete it because of an intervening event, e.g., a bug stinging the monkey. Interruptions were chosen over scenarios in which the agent simply failed to complete the event, as this reduced the number of possible ways of describing the event and thus made the use of imperfectives more natural for adult Russian speakers.\footnote{We thank Sergey Avrutin for useful commentary on this issue. In a pilot study, agents simply failed to complete the main action, e.g., because it was too difficult to put the smurf together, and children often preferred to describe the scenario by explaining that the agent tried to complete the event but was unable to do so.} The order of main event types (complete, incomplete, null) was randomized across and within trials. The interrupting event took place twice per story, always at the incomplete location, and at either the complete or the null location, with an
equal distribution across the stories. The fact that the interrupting event happened in two of the three locations provided a control for the children’s ability to hold multiple occurrences of the same event in memory. The scene at the end of the story provided the child with visual cues to what had happened in the story. For example, the child could determine where the smurf building event had happened completely by looking at the final scene and finding the location where there was a complete smurf (Figure 1b). The verb that was tested in the question at the end of the story was never used by the experimenter in telling the story.

**Figure 1:** The first (A) and the final (B) scenes from the *smurf-building* story. (A) The monkey starts a journey down a road with three landmarks – a flowerbed, a castle and a tree, with pieces of a smurf at each landmark. (B) The monkey built a smurf incompletely at the flowerbed, completely at the castle and did not do anything at the tree.

After each story the experimenter asked the child a series of questions. This always included both perfective (6) and imperfective (7) *where*-questions about the main event, and a control question about the interrupting event (8) between them. The order of the perfective and imperfective questions was randomized.

(6) Gde obezjyanka sobrala\(^p\) gnomika?

> where monkey assemble.Past.Perf smurf

*Where did the monkey build a smurf?*

(7) Gde obezjyanka sobirala\(^l\) gnomika?

> where monkey assemble.Past.Imp smurf

*Where was the monkey building a smurf?*

(8) Gde obezjyanku ukusil\(^p\) zhuk?


*Where was the monkey stung by a bug?*

In order to provide an adultlike answer to the questions in (7) and (8) a child needed to list multiple locations: the complete location and the incomplete location for (7) and the locations of the two interruptions for (8). Therefore, in order to maximize the chance that children would list multiple locations in their answers, all *where*-questions were accompanied by a follow-up question that asked whether the event happened anywhere
else. These questions always preserved the verb morphology used in the where-question, e.g., following (7), *A gde-nibud’ esh’e obezjyanka sobirala gnomika?* ‘Was the monkey building a smurf anywhere else?’ We considered the child’s representation of the perfective to be adultlike only if he named the complete location in response to (6) and responded negatively to the following anywhere-else question. To be considered adultlike on either imperfective questions or controls, the child had to name exactly two appropriate locations cumulatively in response to the where-questions and the corresponding anywhere-else question. Children received no feedback on their replies.

At the end of each trial the child also gave truth-value judgments on some statements made by a puppet who had watched the story with the child. The child was told that the puppet was trying hard to remember what had happened in the story, and was asked to judge whether the puppet’s understanding of the story was correct. The puppet produced statements about the events and locations in the story using perfective and imperfective verbs. We used the child’s truth-value judgments to clarify and reinforce the results from the where-questions, and the explanations that the child gave when correcting the puppet were helpful in better understanding the child’s rationale for his judgment.

4.1.2. Experiment 1: Results

In light of the fact that multiple questions were asked about each story, we performed two types of analysis: a conventional analysis that was based exclusively on responses to the first query in each trial and an additional analysis that combined the answers to different subparts of the trial. There was no effect of the order of questions, nor were there any reliable differences between the results derived from the first query only and the results derived from answers to all questions. In what follows, we therefore report results that are based on answers to all questions asked on each trial.

A control group of 10 Russian-speaking adults who were tested on the same stories as the children showed the predicted results. They chose only the complete location in response to perfective queries, and chose both the complete and incomplete locations in response to imperfective queries.

Since a fair assessment of children’s understanding of the imperfective required the ability to name two locations as an answer, we only included in the analyses those trials in which the child successfully answered the control question by mentioning both locations where the interrupting event occurred. In this experiment children showed 100% success on the controls, so no trials were excluded. The overall results based on all queries about a given story showed a clear contrast between success on the perfective questions (89/94 trials correct, 95%) and much lower performance on the imperfective trials (37/94 trials, 39% correct). Importantly, all incorrect responses to imperfective queries were due to the same error: many children were unwilling to associate the imperfective with an incomplete event. This was seen in a refusal to name the incomplete location in response to the experimenter’s initial imperfective question and the following anywhere-else question, and in rejection of the puppet’s imperfective statement about the incomplete location. In a small number of imperfective trials (2/94) children answered by saying that the event in question happened ‘halfway’. Although this answer is somewhat felicitous when presented in the English simple past tense or the Russian perfective, it strikes adult Russian speakers as distinctly odd when presented in the imperfective, since
it suggests a completion requirement that the imperfective lacks (for further discussion see Kazanina & Phillips, 2003).

Children’s responses across the questions within each trial were highly consistent, and also their responses to where-questions and to corresponding truth-value judgment questions were highly consistent with one another. Therefore, it was possible to classify responses to the entire set of questions in each trial into a small number of categories, as shown in Table 2. In 32% of trials children gave completely adultlike responses on all parts of the trial. In another 61% of trials children failed to associate the imperfective with an incomplete event, but were adultlike in all other respects, i.e., they correctly accepted both aspects with the complete event and rejected the perfective with the incomplete event. Only 7% (7/94) of trials did not fit either of these patterns. In 5 of those trials the child incorrectly accepted the perfective with an incomplete event; in 2 trials the child’s replies to the where-questions were inconsistent with his truth-value judgments on the same trial.

Table 2. Results of Experiment 1 (n = 23). Children’s responses are classified based on patterns of answers to all of the queries posed following each experimental story.

<table>
<thead>
<tr>
<th>Description</th>
<th>% of trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult-like imperfective responses;</td>
<td>32% (30/94)</td>
</tr>
<tr>
<td>adult-like perfective responses</td>
<td></td>
</tr>
<tr>
<td>Rejected imperfective with incomplete events;</td>
<td>61% (57/94)</td>
</tr>
<tr>
<td>adult-like perfective responses</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>7% (7/94)</td>
</tr>
</tbody>
</table>

There were roughly twice as many trials on which the imperfective was incorrectly rejected with incomplete events than trials with correct responses. However, this pattern was not due to inconsistent performance by individual children. Rather, there were 8 children who gave adult-like answers to all queries in all or all but one of their four trials. This group of children accounted for 80% (24/30) of the total number of target-like trials. Meanwhile, there were 15 children who consistently rejected the imperfective with an incomplete event in all or all but one of their trials. This group of children accounted for 88% (50/57) of the rejections of the imperfective. Only 2 of the 25 children could not be classified in either group: one child gave mutually incompatible responses to the where-questions and the truth-value judgment statements in 3 of his 4 trials; the other was the only child in the sample of 25 children who gave equal numbers of adultlike and non-adultlike responses to imperfective queries. The bimodal distribution of responses to imperfective questions across children was confirmed by the significance of a Shapiro-Wilk test (W = .706, p < .001) suggesting deviance from a normal distribution. The average age of the Non-adultlike group was numerically lower than that of the Adultlike group (4:8 vs. 5:2), although this difference was statistically non-significant (Mann-Whitney test, 1-tailed, U=40.5, p = .104), due to the presence of a single age-outlier in each of the two groups. When the oldest and youngest child was excluded from each group, the age difference between the groups became marginally significant (Mann-Whitney test, 1-tailed, U=40.5, p < .06).
4.1.3. Experiment 1: Discussion

In Experiment 1 Russian-speaking children demonstrated adultlike comprehension of perfective predicates by accepting them only with completed events. However, many children had problems with imperfectives, as witnessed by their unwillingness to associate the imperfective with incomplete events. Children’s rejection of the imperfective with incomplete events cannot be attributed to a failure to hold multiple locations in memory, given their excellent performance on control questions that required naming both locations where the interrupting event took place.

One possible reason for children’s rejection of imperfective statements about incomplete events in Experiment 1 may have been the use of creation verbs. Creation events are special in the respect that the object of a creation predicate does not come into existence until the event is completed. This property of creation verbs is valuable for designing scenarios that clearly contrast complete and incomplete events, but it may also have incurred a cost. Children’s unwillingness to accept the imperfective with incomplete events in Experiment 1 could be due to the lack of the object in the scene: under this approach, a child might hear ‘He was building a smurf’ and reject it if there is no (complete) smurf in the scene. This approach to children’s failure is particularly plausible from the perspective of the extensional theory of the imperfective (Parsons, 1990), in which creation verbs call for a special notion of Extended Object that makes it possible to include incomplete objects in the set of denotations for a nominal. In our sample story, for example, this approach might predict that children were unable to accept The monkey was building a smurf at the incomplete location, because they failed to extend the set of the possible denotates of the NP a smurf to unfinished instances of smurfs, such as their bodies.

The notion that the children’s difficulties are specifically related to creation verbs can be straightforwardly tested in a modification of Experiment 1 that uses a different verb class. Experiment 2 pursues this idea.

4.2. Experiment 2: Change-of-state predicates

4.2.1. Experiment 2: Design and methods

The aim of Experiment 2 was to test Russian children’s ability to associate imperfective predicates with incomplete events using change-of-state verbs, in settings that were closely matched to those used in Experiment 1. If the sole reason for the rejection of the imperfective with incomplete events in Experiment 1 was the absence of the direct object of the creation event, we expect children to show improved performance with change-of-state predicates, such as color in a flower, whose direct object exists regardless of the event completion.

41 Russian-speaking children aged 3-6 years (mean age 4;8) participated in this experiment, none of whom had previously participated in Experiment 1. A full list of the change-of-state predicates used in this study is given in Table 3. All other details of the experimental design and analysis were identical to Experiment 1.
Table 3. List of change-of-state predicates tested in Experiment 2.

<table>
<thead>
<tr>
<th>Predicate</th>
<th>English equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>napolnyal₁ / napolnilᵲ stakanchik (molokom)</td>
<td>‘was filling/filled a glass (with milk)’</td>
</tr>
<tr>
<td>zakrashival₁ / zakrasilᵲ cvetochek</td>
<td>‘was coloring / colored in a flower’</td>
</tr>
<tr>
<td>perevorachival₁ / perevernilᵲ kartinku</td>
<td>‘was turning / turned over a picture’</td>
</tr>
<tr>
<td>razvorachival₁ / razvernulᵲ podarok</td>
<td>‘was unwrapping / unwrapped a gift’</td>
</tr>
</tbody>
</table>

4.2.2. Experiment 2: Results

The control question about the location of interrupting events was answered correctly in 96% (153/160) trials. The remaining 4% of trials were excluded from subsequent analyses. Children’s responses to the critical queries about the change-of-state predicates were very similar to the results of Experiment 1. Children showed clearly adult-like performance on queries about perfective predicates, achieving 93% correct answers (143/153), and showed worse performance on queries about imperfective predicates, scoring only 54% correct (82/153). The contrast in accuracy on the two conditions was highly reliable (Fisher Exact test, two-tailed, p < .0001). As in Experiment 1, the incorrect answers to imperfective queries were all due to the refusal of some children to associate imperfective predicates with incomplete events. As in Experiment 1, we found no effect of the order in which queries were presented after each trial, and therefore we present here the results based on answers to all queries following each story.

Children’s responses across the questions within each trial were again highly consistent, and thus it was possible to classify responses to the entire set of questions in each trial into a small number of categories, as shown in Table 4. In 40% of trials children gave completely adultlike responses to queries about both perfective and imperfective aspects. In 48% of trials children failed to associate the imperfective with an incomplete event, but were adultlike in all other respects. Only 12% (18/153) of trials did not fit either of these patterns. In 10 of those trials the child incorrectly accepted the perfective with an incomplete event; in the remaining 8 trials the child’s replies to the where-questions were inconsistent with his truth-value judgments on the same trial.

Table 4. Results of Experiment 2 (n = 41). Children’s responses are classified based on patterns of answers to all of the queries posed following each experimental story.

<table>
<thead>
<tr>
<th>Description</th>
<th>% of trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult-like imperfective responses; adult-like perfective responses</td>
<td>40% (61/153)</td>
</tr>
<tr>
<td>Rejected imperfective with incomplete events; adult-like perfective responses</td>
<td>48% (74/153)</td>
</tr>
<tr>
<td>Other</td>
<td>12% (18/153)</td>
</tr>
</tbody>
</table>

As in Experiment 1, the two most frequent response patterns across trials showed a bimodal distribution across subjects, as supported by the results of a Shapiro-Wilk test of normality ($W = .801, p < .001$). There were 16 children who gave adult-like answers to
all queries in all or all but one of their four trials. This group accounted for 89% (50/56) of the total number of adult-like trials. There were 20 children who consistently rejected the imperfective with an incomplete event in all or all but one of their trials. This group accounted for 89% (63/71) of the rejections of the imperfective. Only 5 of the 41 children could not be classified in either group: two children were at chance in their judgments of imperfectives; another two children accepted the perfective with an incomplete event in 2 of their 4 trials; the fifth child gave conflicting responses to where-questions and truth-value judgments in 2 of 4 trials. The mean age of the children in the non-adultlike group was 13 months younger than the adultlike group, a difference that was significant in a one-tailed Mann-Whitney test (mean age 4;2 vs. 5;3; U=65.0, p < .01).

4.2.3. Experiment 2: Discussion

Experiment 2 yielded very similar results to Experiment 1. Children showed a high level of accuracy in associating both perfective and imperfective predicates with complete events, and were also adultlike in their rejection of perfective predicates with incomplete events. However, a substantial proportion of children, mostly younger children, were non-adultlike in their unwillingness to associate imperfectives with incomplete events. Since the same results were obtained with creation predicates (Experiment 1) and change-of-state predicates (Experiment 2), this excludes the possibility that children’s failure is due to an idiosyncratic property of creation verbs, namely the lack of the direct object in the scene when the event is not completed. The direct object of a change-of-state verb, such as the flower in the predicate ‘color in the flower’ is present throughout the event, regardless of its degree of completion.

Taken together, the results of Experiments 1 and 2 indicate that younger Russian children are not fully adultlike in their understanding of the imperfective. This confirms our suggestion that Vinnitskaya and Wexler’s picture-matching task may not have provided a strong enough test of Russian children’s mastery of the completion entailments in the imperfective. The refusal of many children to associate imperfectives with past incomplete events could not have been detected in previous studies that tested whether children could associate imperfectives with ongoing events, which might still reach completion.

The finding that children reject the imperfective with past incomplete events appears to present a challenge for the extensional theory of the progressive/imperfective (Parsons, 1990). If we accept the conclusion from previous literature that children have no difficulty accepting the imperfective with present ongoing events, then there is a contrast between children’s judgments of present ongoing events and past incomplete events. In both instances the child has witnessed the same subpart of the event, but his judgment is affected by the incompleteness of the event only in past tense situations. However, in the extensional theory of the imperfective the denotations of past and present imperfectives are exactly the same, and involve only that part of the event that took place in the real world. Thus the child’s success with present but not with past imperfectives remains unexplained under the extensional approach.

On the other hand, both the perspective-based approach and the intensional version of the event-based approach to the imperfective have the tools needed to capture the contrast between children’s judgments of present ongoing events and past incomplete events. In
the perspective-based approach the contrast may reflect the relative difficulty of adopting
the perspective needed to evaluate the imperfective statement. For present ongoing events
the child’s own ‘here-and-now’ perspective on the event is sufficient to provide the
insider perspective of the imperfective. For past incomplete events, on the other hand, a
shift in perspective is required in order to obtain a suitable insider perspective on the
event. It is possible that this perspective shift is the source of children’s difficulty with
past tense imperfectives. Meanwhile, under the intensional approach past incomplete
events are counterfactual, and hence require the child to find a complete version of the
incomplete event by considering an outcome that contradicts what happened in the actual
world. Present ongoing events also require the child to project beyond what already
happened in the actual world, but do not require the child to entertain continuations that
are counterfactual. It is possible that children may experience greater difficulty in making
counterfactual projections of partial events. In the two subsequent experiments we test
the predictions of these two approaches, to determine whether children’s difficulties are
due to problems with counterfactuality or to problems with perspective shifting.

Before proceeding, we will also address some additional potential sources of
children’s difficulty in associating imperfectives with incomplete events. First, it is
possible that the non-adultlike children simply failed to draw any semantic distinction
between perfective and imperfective verb forms, and took both aspectual forms to have
the semantics of perfective aspect. Although there is nothing in the results of Experiments
1 or 2 that can exclude this possibility, this issue is directly addressed in Experiment 3.

Second, we considered the possibility that the children who failed to associate past
incomplete events with imperfectives might have failed because they were unable to
understand or remember the agent’s unfulfilled intention when it contradicted what
happened in the actual world. This possibility is particularly relevant in light of the fact
that many of the children in our sample are at an age where they may still experience
difficulties in tasks that require reasoning about beliefs that are different from their own
(Piaget, 1930; Wimmer & Perner, 1983; Birch & Bloom, 2004). An understanding of the
agent’s intentions may be particularly important under intensional approaches to the
licensing of the imperfective. However, some evidence suggests that the children’s non-
adultlike judgments were not due to misunderstanding of the agent’s intentions. One type
of evidence comes from the non-adultlike responses to truth-value judgment queries in
Experiments 1 and 2. Children’s answers to the questions indicated no difficulty in
recalling the plot of the story, and some children used the agent’s unfulfilled intentions to
justify their non-adultlike answers to imperfective queries (e.g., ‘Tiger wanted to turn it
(the picture) over, but it started raining.’). This suggests that they remembered perfectly
the original intention of the agent. Another type of evidence comes from a pilot study that
was designed in cooperation with Laura Wagner, in which we specifically highlighted the
agent’s intention by providing an explicit motivation for the intention. In this study we
used two creation predicates, and two motion predicates, i.e., walk home and bike to the
farm, and the agent gave a clear rationale for his goals. For example, a dog wanted to
make a clay bear because he was lonely and desperately wanted to have a bear-friend.
This study elicited the same errors found in Experiments 1 and 2 in associating
imperfectives with incomplete events. All children showed that they fully understood the
agent’s goals, but a substantial proportion of them still failed to match imperfectives to
partially realized goals. In the trials with motion predicates we were able to confirm this
error using a new type of query. In Experiments 1 and 2 the experimenter always supplied the predicate and asked where it happened (using perfective or imperfective aspect). In trials with motion events, the experimenter was able to supply a verb with perfective or imperfective aspect while leaving the child to complete the predicate, by asking the child where the agent was going. Children often described incomplete events using inappropriate predicates. For example, in a story where a boy wanted to bike to the farm to get some milk but was side tracked at a playground along the way, a number of children responded to the imperfective query by saying that the boy was going to the playground. For an adult who knows the agents’ intentions, this is an inappropriate answer to the question ‘Where was he going?’.

Thus, we contend that the children’s errors in Experiments 1 and 2 are unlikely to be the result of a general failure to understand others as intentional agents. However, children who understand the beliefs and desires of others may nevertheless be subject to what has been called the ‘curse of knowledge’, a tendency to be biased by one’s own knowledge of the outcome such that an ‘outcome-naïve’ viewpoint can no longer be taken (Birch & Bloom, 2003, 2004). Although we have shown evidence that children had a general awareness of the agent’s counterfactual intention, we have not yet provided any evidence confirming that they were able to use the agent’s counterfactual intention for the specific task of licensing the imperfective with incomplete events. It remains a possibility that the non-adultlike children may have been aware of the agent’s intentions, yet unable to evaluate a past imperfective statement from the perspective of some time in the past when the event was still in progress, paralleling the well-known difficulties that children experience in tasks that require them to view a situation using a spatial perspective different from their own (Piaget & Inhelder, 1956; Krauss & Glucksberg, 1969).

In light of the persistence of the children’s error with different types of predicates, designs and experimental tasks, the most likely source of the error is a non-adultlike representation of the semantics of the imperfective by young Russian-speaking children, although we cannot rule out the possibility of an adultlike representation accompanied by a processing difficulty of some kind. Experiments 3 and 4 were designed to provide a more precise assessment of the nature of children’s semantics for the imperfective, focusing in particular on the role of counterfactuality and perspective shifting.

4.3. Experiment 3: Non-counterfactual event with explicit temporal modifier

4.3.1. Experiment 3: Design and methods

In Experiments 1 and 2 children failed to associate the imperfective with incomplete events that happened in the past and were permanently incomplete. In Experiment 3 we tested whether children are able to associate the imperfective with a subpart of an event, i.e., a portion of a larger past event that reached completion in the actual world. Experiment 3 differed from its predecessors in two respects, involving the counterfactuality of the event and the presence of an overt temporal modifier phrase that explicitly signaled an insider perspective on the event.

Experiment 3 was a truth-value judgment task in which children judged imperfective sentences like (9) and its perfective counterpart in (10). These sentences contain a while-
clause that provides an explicit reference frame for evaluation of the main clause predicate. These sentences were tested against the situation diagrammed in Figure 2.

(9)  Poka malchik polival\textsuperscript{l} cvety, devochk\textsuperscript{a} vytirala\textsuperscript{l} stol.  
while boy water.PAST.IMP flowers girl clean.PAST.IMP table  
*While the boy was watering the flowers, the girl was cleaning the table.*

(10) Poka malchik polival\textsuperscript{l} cvety, devochk\textsuperscript{a} vytirala\textsuperscript{p} stol.  
while boy water.PAST.IMP flowers girl clean.PAST.PERF table  
*While the boy was watering the flowers, the girl cleaned (all of) the table.*

**Figure 2.** Schematic view of the scenario tested in Experiment 3. The main event reaches completion outside the interval specified by the temporal reference frame. A full rectangular bar denotes a complete event; an arrow denotes an event in progress.

The schematic representation of the story in Figure 2 depicts a situation in which a boy starts watering some flowers and soon after that a girl starts to clean a table. After a while, the boy finishes watering the flowers and starts to ride his bike. While he is riding his bike the girl successfully finishes cleaning the table. In order to evaluate the truth of (9) or (10) in this situation, a speaker must determine whether the proposition expressed by the main clause holds at the interval delimited by the reference frame (i.e. the *while*-interval, marked by the vertical lines in the diagram). For an adult speaker of Russian (9) is true because the truth conditions of the imperfective main clause are satisfied during the reference frame: informally, there was a table-cleaning event that was ongoing during the interval delimited by the watering of the flowers. On the other hand, (10) is false, since the truth conditions of the perfective main clause *devochka vyterla\textsuperscript{p} stol* ‘the girl cleaned the table’ were not satisfied during the interval specified by the reference frame: the table was not cleaned completely while the boy was watering the flowers. Importantly, it is precisely because speakers evaluate the perfective predicate in the main clause at the reference interval that (10) is false. The proposition expressed by the main clause is true, but only at a larger interval that includes the entire table-cleaning event.

Experiment 3 provides two main modifications to the scenarios tested in Experiments 1 and 2. First, the imperfective describes a subpart of a past event that is non-counterfactual, since it develops further into a complete event. The boundaries of the subpart of the event are defined by the *while*-clause. According to intensional approaches to the imperfective, the non-counterfactuality of the event may help the child in licensing the imperfective, since it simplifies the task of finding a full version of the event in the actual world, and does not require the child to consider counterfactual outcomes for the event. In this respect, the imperfective in (9) may be regarded as a past tense parallel to present imperfective predicates used with a present ongoing events, since both cases involve incomplete yet non-counterfactual events. Second, the addition of a *while*-clause
explicitly highlights the interval that provides an ‘insider’ perspective on the event. If the children’s problems in Experiments 1 and 2 were due to difficulty in adopting an appropriate perspective on the event, then this modification may lead children to give more adultlike judgments. We introduced both of these changes into Experiment 3 in order to find out whether there was any way to elicit adultlike judgments about imperfectives from younger Russian children. It was understood that if these changes proved to be successful, it would be necessary to conduct additional studies to determine the specific source of children’s difficulty.

Participants in this study were 34 children aged 3-6 years (mean age 4;7) from Moscow and the surrounding area. Since we were interested in comparing performance on this study with performance on Experiments 1 and 2, all of the children in this study had previously participated in either Experiment 1 or Experiment 2, on a different day but at most one week earlier. Experiment 3 used a truth value judgment task. The study was conducted in a quiet room in one or two sessions of 15-25 minutes each, for a total of four experimental stories per child. Each session started with a warm-up story, and a filler story followed every two experimental stories. In the company of a puppet the child watched a series of stories acted out with small props that followed the sequence of events shown schematically in Figure 2. A sample story is given in the Appendix and a full list of experimental materials in Table 5. After the story the puppet described what he thought happened in the story using sentences like (9) or (10), and the child’s task was to judge whether the puppet had given an appropriate description of what had happened.

Table 5. List of sentences tested in Experiment 3.

<table>
<thead>
<tr>
<th>Predicate</th>
<th>Full sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>'clean the table'</td>
<td>Poka mal’chik polival cvety, devochka vytilală/vyterla p stol.</td>
</tr>
<tr>
<td></td>
<td><em>While the boy was watering flowers, the girl was cleaning/cleaned the table.</em></td>
</tr>
<tr>
<td>‘roll the rope’</td>
<td>Poka Zaychik kachalsya na kachelyah, Begemotik zamatyvală/zamotală p verevku.</td>
</tr>
<tr>
<td></td>
<td><em>While Rabbit was swinging, Hippo was rolling/rolled up the rope.</em></td>
</tr>
<tr>
<td>‘read the book’</td>
<td>Poka Kotenok igral v konstruktor, Sh’enok chitală/prochitală p knigu.</td>
</tr>
<tr>
<td></td>
<td><em>While Kitty was playing Lego, Doggy was reading/read the book.</em></td>
</tr>
<tr>
<td>‘undress the baby’</td>
<td>Poka mama myla posudu, papa razdevală/razdelă p rebenka.</td>
</tr>
<tr>
<td></td>
<td><em>While Mommy was doing dishes, Daddy was undressing/undressed the baby.</em></td>
</tr>
</tbody>
</table>

Note that although some of the predicates used could potentially be understood either as activities or as accomplishments according to Vendler’s aspectual classification of predicates (Vendler, 1967), they were disambiguated towards the accomplishment reading by overtly declaring the agent’s goal to attain the event completion. Using the predicate clean the table as an example, the girl’s aim was ‘to make the table shine, so that there is not a single dirty spot left!’ As argued by Wagner & Carey (2003), children can use the goal of the event for purposes of event individuation by 3 years of age. In addition, as already mentioned above, Russian-speaking children did not have a problem in understanding the agent’s intention.
4.3.2. Experiment 3: Results

After each story, the child judged three statements by the puppet. Two statements like (9) and (10) probed the child’s understanding of perfective and imperfective aspect, and were separated by a control statement about the story. The control statement was not directly related to the experimental hypothesis, and was included in order to test whether the child had paid attention to the story. If the child judged the control statement incorrectly, his responses to the remaining experimental trials for that story were excluded from the analysis. If the child judged the control statement incorrectly for more than one of the four stories, all of his responses were excluded. Four children were excluded in accordance with these criteria. The results of Experiment 3 were rather straightforward, as summarized in Table 6, and stand in clear contrast to the results of Experiments 1 and 2. Children correctly accepted imperfective statements like (9) in 91% of trials, and correctly rejected perfective statements like (10) in 89% of trials, a contrast that clearly shows that the children did not treat perfective and imperfective forms as equivalent and successfully distinguished the two aspects in this study. The difference in the proportion of “no” responses across conditions was highly reliable (Fisher Exact test, two-tailed, p < .001). Table 6 shows only the responses to the first statement.

Table 6. Results of Experiment 3 (n = 30). Analysis based on judgments of the first experimental statement following each story.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Adult Response</th>
<th>% Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperfective</td>
<td>Yes</td>
<td>91% (53/58)</td>
</tr>
<tr>
<td>Perfective</td>
<td>No</td>
<td>89% (50/56)</td>
</tr>
</tbody>
</table>

The conclusion from Table 6 is reinforced by the fact that in all cases where children rejected the perfective sentence they adequately explained their rejection. Furthermore, in 80% (91/114) of trials the child correctly switched his response from ‘yes’ to the imperfective statement to ‘no’ to the perfective statement (or vice versa) within the same trial. Therefore, an analysis based on responses to all statements in each trial yields the same pattern of results shown in Table 6.

Since all participants in Experiment 3 also took part in either Experiment 1 or Experiment 2, it was possible to conduct a within-subjects analysis, comparing responses to the simple imperfective statements tested in Experiments 1 and 2 with responses to the two-clause statements tested in Experiment 3. In Table 7 the participants in Experiment 3 are grouped according to their performance in Experiments 1 and 2. Most importantly, the group of 12 children who were classified as non-adultlike based on their responses in Experiments 1 and 2, where they showed only 11% accuracy (5/46 trials) in matching imperfectives to incomplete events, improved to 78% accuracy (36/46 trials) in judging the imperfectives in Experiment 3. The difference in performance was significant on a Wilcoxon signed ranks test (Z = -3.1, p < .01). Also, the subgroups of children who were classified as adultlike or as non-adultlike in Experiments 1 and 2 showed no difference in their accuracy in Experiment 3 (Fisher Exact test, 2-tailed, p = .43).
Table 7. Within-subjects comparison of children’s accuracy in imperfective trials, comparing Experiments 1 and 2 with Experiment 3. Percentage correct.

<table>
<thead>
<tr>
<th>Group from Experiments 1 &amp; 2</th>
<th># children</th>
<th>Experiment 1 &amp; 2</th>
<th>Experiment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adultlike</td>
<td>13</td>
<td>73% (36/49)</td>
<td>86% (42/49)</td>
</tr>
<tr>
<td>Non-adultlike</td>
<td>12</td>
<td>11% (5/46)</td>
<td>78% (36/46)</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>25% (5/20)</td>
<td>68% (13/19)</td>
</tr>
</tbody>
</table>

4.3.3. Experiment 3: Discussion

Experiment 3 tested children on their judgments of imperfective statements that referred to a subpart of a past event that reached completion. All children, including those who fell into the non-adultlike group in Experiments 1 and 2, correctly accepted the imperfective and rejected the perfective sentence in this study.

The results of Experiment 3 are important in several respects. First, the overwhelming rejection of perfective sentences like (10) in the situation schematized in (14) shows that the children used the correct temporal interval for evaluation of the main clause, i.e. they used the interval defined by the while-clause reference frame. If the children had not evaluated the main clause using this interval, they would have incorrectly accepted (10) as true, since at a longer interval the event reaches completion and thus can be described by a perfective predicate. Children’s acceptance of imperfective sentences like (9) therefore indicates that they are able to associate imperfectives with incomplete events, since in the scenario in (14) the main event was not completed during the interval described by the while-clause.

Second, the results of Experiments 1 and 2 were consistent with the possibility that children in the non-adultlike group simply mistook the semantics of the imperfective for that of the perfective. The results of Experiment 3 make this account seem rather unlikely. Since children gave almost opposite judgments to trials that involved the very same story and sentences that differed only in aspectual verb morphology, it is clear that the children in our study drew a semantic distinction between perfective and imperfective predicates.

Summarizing, even those children who refused to associate the imperfective with a counterfactual past incomplete event in Experiments 1 and 2 were willing to associate the imperfective with a non-counterfactual past incomplete event in Experiment 3. Children’s acceptance of past imperfectives in this study, together with their acceptance of present imperfectives in descriptions of present-tense ongoing situations indicates that they are aware that the imperfective, unlike the perfective, can describe parts of full events. The children’s success in Experiment 3 may reflect either of the two modifications that were introduced in this experiment. It may have been due to the addition of an explicit temporal modifier that directed the child’s attention to an appropriate insider perspective.

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3 The results of Vinnitskaya & Wexler (2001) also suggest that Russian-speaking children semantically distinguish perfectives and imperfectives, since children in their study consistently matched imperfectives to pictures depicting ‘ongoing’ scenes and matched perfectives to pictures depicting completed scenes. However, as noted above, this contrast does not reflect the full range of interpretations available for adults, and it is not clear that the ‘ongoing’ pictures were interpreted as depicting past events, leading to a possible tense confound.
on the event. Alternatively, it may have been due to the non-counterfactuality of the incomplete event. Experiment 4 was designed with the aim of teasing apart these two alternatives by modifying Experiment 3 in such a way that the explicit temporal modifier was still provided, but the critical event was counterfactual.

4.4. Experiment 4: Counterfactual event with explicit temporal modifier

4.4.1. Experiment 4: Design and methods

Experiment 4 tested the same types of sentences used in Experiment 3 (e.g., (9) and (10)), but made one important modification to the situation that these sentences were judged against. As in Experiment 3, the table-cleaning event carried out by the girl overlapped with the boy’s watering of the flowers, and later on, with his biking. The only difference is that eventually the girl failed to clean the table completely (for example, because she ran out of cleaning solution). This change in the outcome of the table-cleaning event does not affect the truth-value of sentences like (9) and (10) for Russian-speaking adults: the imperfective statement (9) is true and the perfective statement (10) is false in both of the situations in Figures 2 and 3. This should not be surprising, since the truth-value of the sentence is obtained by evaluating the main clause at the interval delimited by the reference frame, and the two situations are identical during that interval. Nevertheless, in Experiment 3 the main clause of the imperfective sentence in (9) described a non-counterfactual event (a subpart of a completed past event), whereas in Experiment 4 it picked out a counterfactual event (a subpart of an incomplete past event).

Figure 3. Schematic view of the scenario tested in Experiment 4. The main event fails to reach completion, but its failure point lies outside the interval specified by the temporal reference frame. A full rectangular bar denotes a complete event; a broken bar denotes an incomplete event; an arrow denotes an event in progress.

The goal of Experiment 4 was to establish whether the reason for the children’s success in Experiment 3 was due to the explicit insider perspective provided by the temporal modifier, or whether it was due to the fact that the event that the imperfective referred to was non-counterfactual. If the perspective provided by the temporal modifier is the crucial factor, then children should also succeed in Experiment 4. On the other hand, if the counterfactuality of the event is the crucial factor, then children should fail in Experiment 4.

Twenty-one children from Moscow and the surrounding region aged 3-6 years (mean age 4;10) participated in Experiment 4. As in Experiment 3, all of them had previously participated in Experiment 1 or Experiment 2, at most one week earlier. A full list of sentences tested in Experiment 4 is given in Table 8.
Table 8. List of sentences tested in Experiment 4.

<table>
<thead>
<tr>
<th>Predicate</th>
<th>Full sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘saw the branch’</td>
<td>Poka dochka sobirala cvety, papa otplival₁/otpilil⁰ vetku.</td>
</tr>
<tr>
<td></td>
<td><em>While the daughter was picking up flowers, the father was sawing</em></td>
</tr>
<tr>
<td></td>
<td><em>off/sawed off the branch.</em></td>
</tr>
<tr>
<td>‘zip the bag’</td>
<td>Poka brat katalsya na rolikah, sestra zastegivala₁/zastegnula⁰ sumku.</td>
</tr>
<tr>
<td></td>
<td><em>While the brother was rollerblading, the sister was zipping up/zipped</em></td>
</tr>
<tr>
<td></td>
<td><em>up the bag.</em></td>
</tr>
<tr>
<td>‘erase the star’</td>
<td>Poka Telepuzik gulyal s oslikom, mal’chik stiral₁/stirₐ⁰ zvezdu.</td>
</tr>
<tr>
<td></td>
<td><em>While Teletubby was walking the donkey, the boy was erasing/erased</em></td>
</tr>
<tr>
<td></td>
<td><em>the star.</em></td>
</tr>
<tr>
<td>‘straighten the wire’</td>
<td>Poka Zaychik sobiral solnyshko, Vinni-Puh vyprymlyal₁/vypryamilɡ provolochku.</td>
</tr>
<tr>
<td></td>
<td><em>While Rabbit was playing Lego, Winnie-the-Pooh was straightening/straightened the wire.</em></td>
</tr>
</tbody>
</table>

4.4.2. Experiment 4: Results

Following the same analysis procedures and exclusion criteria used in Experiment 3, one child was excluded for failure to answer control questions accurately. The results for the remaining twenty children are summarized in Table 9. Results were very similar to those found in Experiment 3: children correctly accepted imperfective sentences like (9) and correctly rejected perfective sentences like (10). The same conclusion is reached whether we consider only the child’s judgment of the first experimental sentence in each trial, as shown in Table 9, or if we consider the child’s response to both the perfective and the imperfective queries within the same trial. In 79% of cases (62/78 trials) the child correctly rejected the perfective sentence and accepted the imperfective sentence within the same trial.

Table 9. Results of Experiment 4 (n = 20). Analysis based on judgments of the first experimental statement following each story.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Adult Response</th>
<th>% Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperfective</td>
<td>Yes</td>
<td>84% (31/37)</td>
</tr>
<tr>
<td>Perfective</td>
<td>No</td>
<td>90% (37/41)</td>
</tr>
</tbody>
</table>

Following the same procedure used in Experiment 3, we divided the results in Experiment 4 according to how each child had performed in Experiment 1 or Experiment 2, as shown in Table 10. The group of 8 children who were classified as non-adultlike based on their responses in Experiments 1 and 2, where they showed only 13% accuracy (4/31 trials) in matching imperfectives to incomplete events, improved to 81% accuracy (25/31 trials) in judging the imperfectives in Experiment 4. The difference in performance was significant on a Wilcoxon signed ranks test ($Z = -2.4, p < .05$). Also, the subgroups of children who were classified as adultlike or as non-adultlike in Experiments
1 and 2 showed no difference in their accuracy in Experiment 4 (Fisher Exact test, 2-tailed, p = .29).

Table 10. Within-subjects comparison of children’s accuracy in judging imperfective statements in Experiments 1 and 2 with their accuracy in Experiment 4.

<table>
<thead>
<tr>
<th>Group from Experiments 1 &amp; 2</th>
<th># children</th>
<th>Experiment 1 &amp; 2</th>
<th>Experiment 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adultlike</td>
<td>9</td>
<td>83% (29/35)</td>
<td>91% (32/35)</td>
</tr>
<tr>
<td>Non-adultlike</td>
<td>8</td>
<td>13% (4/31)</td>
<td>81% (25/31)</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>25% (3/12)</td>
<td>42% (5/12)</td>
</tr>
</tbody>
</table>

4.4.3. Experiment 4: Discussion

In Experiment 4 children correctly accepted imperfective sentences with past incomplete counterfactual events when the reference frame provided a narrow perspective on the event. Thus, they repeated and extended their success in Experiment 3, in which they accepted the imperfective with past incomplete non-counterfactual events. Thus, summarizing the results of all four experiments, Russian-speaking children inappropriately rejected the imperfective with past incomplete events in Experiments 1 and 2, but correctly accepted it in Experiments 3 and 4 (see Table 11 for a summary). The contrast in performance between the two pairs of experiments cannot be due to differences among children, since in Experiments 3 and 4 we showed that the same children who had failed in Experiments 1 and 2 showed dramatic improvement in their ability to associate imperfective with past incomplete events once an explicit temporal frame of reference was provided.

We considered two possible alternatives for the children’s errors with imperfectives in Experiments 1 and 2. First, the error could have been due to the counterfactual status of the critical event in those experiments. We can now discard this alternative in light of the results of Experiment 4, in which children accepted the imperfective with past incomplete counterfactual events. In other words, Russian children as young as 3 years of age are equal to the challenges posed by the Imperfective Paradox. Specifically, they understand that imperfectives lack completion entailments, and also appear to be able to solve the event-type problem for incomplete events. This implies that a non-adultlike understanding of completion entailments is unlikely as the cause of the children’s errors in Experiments 1 and 2. This leaves us with just one account that can capture the dramatic improvement in children’s performance between the first and the second pair of experiments. We conclude that children’s failures in Experiments 1 and 2 were due to the lack of an explicit temporal reference frame that provided the insider perspective required for evaluation of the imperfective predicate.

5 Parallels between Child Russian and Adult Dutch

Although many of the Russian children in our studies gave judgments for imperfectives that differed from adult Russian judgments, it would be incorrect to assume that their judgments reflect an impossible or incoherent adult system. Interestingly, the pattern found in Russian speaking children with respect to the imperfective parallels the judgments that adult speakers of Dutch give for simple past sentences in similar contexts,
as illustrated by the examples in (11)-(12). We tested Dutch adults in an informal Truth-Value Judgment task using sentences like (11)–(12) and diagrams of the situations that we had used with Russian-speaking children in Experiments 1–4. In what follows we translate Dutch simple past forms as English simple past in contexts where the form has a completion entailment and as past progressive where it does not.

(11) a. Maria maakte de tafel schoon.  
Maria make.simple-past the table clean  
Maria cleaned the table.  

b. De vader zaagde de tak af.  
the father saw.simple-past the branch off  
The father sawed off the branch.

(12) a. Terwijl Hans de bloemen aan het water geven was, maakte Maria de tafel schoon.  
while Hans the flowers on the water giving was, do.simple-past Maria the table clean.  
While Hans was watering the flowers, Maria was cleaning the table.  

b. Terwijl de dochter de bloemen oppakte, zaagde de vader de tak af.  
while the daughter the flowers was picking saw.simple-past the father the branch off  
While the daughter was picking up flowers, the father was sawing off the branch.

Dutch adults strongly preferred to associate simple sentences like (11) with a complete event, and were reluctant to associate them with past incomplete events. Although the Dutch simple past is traditionally considered to be aspectually neutral, and thus compatible with past incomplete events, our findings replicated an earlier report by van der Feest & van Hout (2002), who found that the adult controls in their study of Dutch children rejected imperfectives with past incomplete situations in 90% of trials (Section 3.2). On the other hand, Dutch adults were much more willing to accept the simple past in sentences like (12) with both past incomplete and past complete events of the kinds tested in Experiments 3 and 4.

This property of adult Dutch is important because it shows that the judgments obtained from young Russian children in our studies need not be due to a specifically developmental limitation on the part of the children. It is possible that the Russian children pass through a Dutch-like stage on their way to developing the mature adult Russian semantics for the imperfective.

For ease of reference, Table 11 shows a summary of the judgments obtained for imperfective and simple past sentences from Russian and Dutch adults speakers in our studies.
Table 11. Summary of Russian and Dutch speakers’ judgments of the Russian imperfective and Dutch simple past

<table>
<thead>
<tr>
<th>Sentence &amp; Situation</th>
<th>Russian</th>
<th>Dutch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Children</td>
<td>Adults</td>
</tr>
<tr>
<td>(a) Russian: Maria stroila domik.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dutch: Maria bouwde een huis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maria build.(Rus-IMP/Dutch-simple.past) a house.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past incomplete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past complete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Russian: Poka mal’chik polival cvety, devochka vytilala stol.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dutch: Terwijl Hans de bloemen aan het water geven was, maakte Maria de tafel schoon.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>While Hans was watering the flowers, Maria clean (Rus-IMP/Dutch-simple.past) the table.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 General Discussion: Semantics of the imperfective

As explained in Section 2, the Imperfective Paradox may be understood as a cover term for two related problems in the relationship between predicates of language and events in the world. First, an account of the Imperfective Paradox must explain why imperfective predicates lack completion entailments. Second, an account of the Imperfective Paradox must also address the event-type problem, the problem of how an incomplete event can be successfully identified as being a part of a specific larger type of event?

The results of our experiments with Russian-speaking children showed that the children’s semantics for the imperfective does solve both of the problems that make up the Imperfective Paradox. At least in Experiments 3 and 4, the children were able to associate imperfective predicates with partial or incomplete events, even when they knew that the event never reached completion (Experiment 4). Furthermore, the children’s success in Experiment 4 indicates that they had no difficulty in recognizing which larger events the incomplete events were a part of. Thus, Russian children know a good deal about the semantics of the imperfective, and this presents a fuller picture of children’s
understanding of imperfectives than is available from previous studies on Russian and other languages. Nevertheless, Experiments 1 and 2 showed that many of the Russian children also showed a strikingly non-adultlike refusal to associate incomplete events with simple imperfective statements. For these children, therefore, the completion entailments of the imperfective appear to differ according to the presence or absence of an explicit temporal modifier. A similar pattern was also found in adult Dutch speakers. In what follows we consider the implications of these findings for an account of the semantics of the imperfective.

The two general approaches to the imperfective described in Section 2 differ in their treatment of the two components of the Imperfective Paradox. The perspective-based approaches focus on the notion that the imperfective provides an ‘insider’ perspective on an event. This perspective has the consequence that the endpoints of the event are irrelevant to the truth of the statement, and hence the lack of completion entailments is derived. An additional advantage of the perspective-based approach is that it successfully captures the widespread intuition that the imperfective conveys a special perspective on an event. Unfortunately, this approach leaves unanswered the second component of the Imperfective Paradox, namely the event-type problem. On the other hand, event-based approaches make the interesting claim that a solution to the event-type problem can automatically explain the lack of completion entailments. This implies that the tools of the perspective-based approach may not be needed at all in order to account for the semantics of the imperfective. We do not dispute the need for a solution to the event-type problem of the kind that event-based theories provide, but in light of our developmental evidence, we argue that the lack of completion entailments cannot be seen as an automatic consequence of the standard intensional solution to the event-type problem. In order to explain the judgments of the Russian children and Dutch adults, and how the Russian children might turn into Russian adults, we suggest that it is necessary to combine the insights of the perspective-based and event-based approaches to the imperfective.

As described in Section 2, we draw a distinction between the notion of frame of reference, which refers to a temporal interval that is specified outside the sentence of interest, through an explicit temporal modifier or through discourse context, and the notion of perspective, which refers to the time interval that the predicate applies to. These two intervals are, of course, closely related, but they are not necessarily identical to one another.

The children’s judgments of the completion entailments of imperfectives changed dramatically according to the presence or absence of a temporal modifier phrase that provided an explicit insider perspective: the same children who rejected the imperfective with incomplete events in monoclausal sentences in Experiments 1 and 2, accepted it in biclausal sentences with a temporal embedded clause in Experiments 3 and 4. This suggests that frames of reference play an important role in suspending the completion entailments of imperfectives, as claimed by perspective-based theories. These theories claim that the imperfective must be evaluated using an insider perspective, even if such a perspective is not salient. Thus, it is possible that when such a perspective is explicitly provided in the discourse by an overt temporal modifier, as in Experiments 3 and 4, it is easier for younger children to arrive at an appropriate representation. On the other hand, the children’s improvement following the introduction of an explicit temporal modifier is
unexpected under event-based theories, which do not rely upon the need to adopt a specific perspective in order to license the imperfective. Event-based approaches incorrectly predict similar performance in Experiments 1, 2, and 4, in which the critical event always remained incomplete, and hence should have been licensed in the same way in all cases. In addition, the extensional version of the event-based approach is unable to capture the contrast in children’s performance between present ongoing and past incomplete events (Section 4.2.3).

The findings from Russian children provide support for perspective-based approaches to the imperfective, but of course with the proviso that these accounts leave the event-type problem unresolved. We therefore propose that there is something fundamentally correct about both approaches to the imperfective. We adopt the basic insight of intensional approaches to the event-type problem, which is that imperfectives are always associated with representations of a complete event, but that these full events need only partially coincide with what transpires in the actual world. However, we also enrich this solution to the event-type problem with the notion of a perspective, which provides a constraint on how much of an event must coincide with the actual world. We next outline one way in which this hybrid approach might be implemented, although it is not the only way to combine the insights of the two approaches.

Following standard intensional approaches (e.g., Dowty, 1979; Landman, 1992) we assume that an event may be described with an imperfective predicate only if a complete version of the event may be found either in the actual world or in an intended or expected continuation of what happened in the actual world (i.e., Dowty’s inertia world or Landman’s continuation branch). In these approaches the non-actual continuation may diverge from the actual world at any point prior to the failure of the event in the actual world, provided that the event in the real world develops sufficiently that it may be identified as plausibly on the way to completion, were the world to continue in a normal fashion. We depart from standard intensional approaches by imposing the additional requirement that these non-actual continuations may only be used at times that lie beyond the perspective on the event that is used to evaluate the imperfective. This extra constraint has the consequence that the event-type problem can only be solved if the imperfective is evaluated using a perspective on the event that excludes the event failure. If this requirement is not satisfied, a complete version of the event cannot be found in a qualifying continuation of the actual world. This effectively has the same impact as the claim in perspective-based approaches that the imperfective takes an insider perspective on an event, and thus enables us to capture our findings from Russian children, without sacrificing an account that captures both components of the Imperfective Paradox.

In what follows, we suggest an account of how Russian children differ from Russian adults in their understanding of imperfectives, how the Russian imperfective differs from the Dutch simple past, and how Russian children might progress to the adult state. We propose that Russian children’s knowledge of the semantics of the imperfective is adultlike, in the respect that they know that the imperfective may describe an incomplete event, provided that the event failure lies outside the time interval that defines the perspective taken on the event. The reason for the children’s refusal to associate imperfectives with incomplete events in Experiments 1 and 2 reflects a difference in how Russian children and Russian adults select a perspective on a past event. We suggest that a similar difference captures the contrast between Russian and Dutch adults.
Specifically, we suggest that Russian children evaluate the imperfective using the exact interval defined by the reference frame. In Experiments 3 and 4 the reference frame provided by the while-clause does not include the failure point, either because the event never fails (Experiment 3), or because the event failure takes place after that interval (Experiment 4). Thus, Russian children were able to successfully solve the event-type problem and license the imperfective with a partial event in both experiments. On the other hand, in Experiments 1 and 2 no explicit temporal reference frame is provided by the discourse. Thus, we suggest that Russian children have to evaluate past tense imperfectives using a perspective that coincides with a ‘default’ reference frame, which spans a large period of past time and covers the whole past incomplete event including its failure. Therefore, the event-type problem remains unsolved, and consequently Russian children refused to associate imperfectives with incomplete events in Experiments 1 and 2. Our proposal also explains why the present imperfective can be licensed by a present in-progress event. In this case, the children’s perspective on the event includes all of the event up to the present moment and does not contain a failure point, making it possible to license the imperfective. We suggest that a similar explanation applies to the case of simple past in Dutch. This proposal agrees well with the proposal that the Dutch simple past is anaphoric to discourse, even in situations that do not involve incomplete events (Boogart, 1999). Russian adults, on the other hand, are able to associate imperfectives with past incomplete events because to evaluate the imperfective they may use an interval that is narrower than the discourse-specified reference frame. In Experiments 1 and 2 this more liberal choice of perspective enables the adults to choose an interval that is narrower than the default past reference frame and therefore excludes the event failure, allowing licensing of the imperfective. The Russian adults’ acceptance of the imperfective in Experiments 3 and 4 is unsurprising, given that even the Russian children and Dutch adults were able to associate imperfectives with incomplete events in these situations. Here the Russian adults are able to use an explicit temporal reference frame to license the imperfective in just the same way as the children.

Thus, we propose that the difference between Russian children and Russian adults does not reflect a difference in the general representation of the imperfective or in the basic mechanism used to solve the event-type problem, but rather lies in how children and adults select the temporal perspective upon an event. Obviously, this begs the question of why Russian children differ from Russian adults in their choice of perspective on past events, and how they progress to the adult state. Here we lay out a couple of possibilities, each of which is compatible with our current results.

One possibility is that the difference between Russian children and adults has a source in cognitive development. Russian children may be unable to license simple imperfective statements with past incomplete events because a cognitive limitation prevents them from evaluating the statement using an appropriate past perspective, unless this perspective is explicitly provided in the discourse. There is substantial evidence that young children have difficulty in shifting perspectives, and in particular that they have particular difficulty in simultaneously maintaining mutually incompatible perspectives (e.g., Perner, Stummer, Sprung, & Doherty, 2002). Although studies in this area have primarily focused on perspective shifts involving different spatial viewpoints or the beliefs of different agents, it is plausible that children’s difficulty may extend to shifts in temporal perspectives. Under this approach, the trigger that would lead Russian children
to begin to give adultlike judgments in Experiments 1 and 2 would come not from language but from an independently motivated cognitive change. This change might be expected to coincide with changes in performance on false belief tasks (Wimmer & Perner, 1983; Wellman, Cross, & Watson, 2001) or “synonyms” tasks (Doherty & Perner, 1998). Note that this suggestion is compatible with our report in Section 4.2.2 that Russian children who gave non-adultlike judgments on imperfectives were nevertheless able to clearly explain what it was that the agent of the event had been trying to do. There are related findings in the literature on false belief tasks that suggest that children may be able to provide explanations of agents’ inappropriate actions before they are able to use false beliefs to provide correct predictions of agents’ inappropriate actions (Bartsch & Wellman, 1989; Robinson & Mitchell, 1995; but cf. Perner, Lang, & Kloo, 2002). However, it is also important to recognize that the non-adultlike Russian children cannot be subject to a general restriction on perspective shifting, since they have no problems in adopting a past perspective in situations where an explicit temporal frame of reference is provided, as in Experiments 3 and 4.

Alternatively, the Russian children’s errors on the imperfective may be due to the fact that their initial hypothesis about their grammar is different from the target grammar. In particular, they may wrongly assume that the interval used in solving the event-type problem with the Russian imperfective must be anaphoric to a reference frame established by the discourse, as in adult Dutch. In the absence of a discourse-salient reference frame, a default past interval is chosen. This may be seen as a consequence of a more general conservative learning strategy. Such learning strategies are represented in both formal accounts of language learning (‘Subset Principle’: Baker, 1979; Pinker, 1984; Berwick, 1985; Wexler & Manzini, 1987) and in functionalist approaches (e.g., Tomasello, 2003), and propose that the child gradually progresses from more restrictive to less restrictive grammatical hypotheses on the basis of positive input. In the case of imperfectives and temporal perspectives, the child Russian system is more restrictive than the adult Russian system, since it allows the imperfective to be used in a narrower range of situations. In addition to the Subset Principle, our finding of similarity between the Russian children’s system and the system of Dutch adults’ is compatible with a stronger hypothesis on language acquisition, the Continuity Hypothesis, according to which child and adult languages can differ only in ways that adult languages can differ from each other (Pinker 1984; Crain 1991). Importantly, regardless of whether the similarity between Russian children and the Dutch adults’ is principled or coincidental, our account predicts that Russian children will be able to progress to the Russian adult grammar on the basis of positive input, by hearing adults use simple imperfective statements as descriptions of past incomplete events and consequently loosening their requirements on perspective used to evaluate the imperfective.

7 Conclusion

In this article we investigated the Imperfective Paradox in light of developmental evidence from Russian-speaking children. We argued that previous event based accounts of the Imperfective Paradox were not tenable in light of the sensitivity of Russian children and Dutch adults to the presence of temporal reference frames. In order to capture these findings, we proposed an account of the Imperfective Paradox that draws
together insights from both event-based and perspective-based approaches. We agree with the intensional approaches to the imperfective that a partial event in the actual world must be related to some representation of a complete version of the same event in order for the imperfective to be licensed. However, we add to this the condition that all imperfectives make an assertion with respect to a specific temporal perspective, and require that the failure point of an incomplete event must lay outside the limits of this temporal perspective. This effectively recreates the key insight of perspective-based approaches to the imperfective, namely that the imperfective provides an ‘insider’ perspective on an event.

In our experiments younger Russian-speaking children were able to associate the imperfective with an incomplete event, but only if a suitable insider reference frame was explicitly provided by the discourse. The children’s judgments thus differed from the judgments of Russian adults, who always accepted the imperfective with incomplete events, regardless of whether an explicit reference frame was provided by the discourse. We argued that the difference between the adult Russian imperfective on the one hand, and the child Russian imperfective and the Dutch simple past on the other hand is due to a difference in how adults and children select the temporal perspective that is used to evaluate imperfective statements. If this is the case, then the Russian children’s superficially more complex system in fact reflects a simper underlying representation. Regardless of whether the children’s non-adultlike selection of temporal perspectives reflects representational or computational difficulties, our account ensures the possibility of a smooth transition from the childlike representation of the Russian imperfective to the adultlike representation.

More generally, our results reinforce the point that developmental dissociations may provide a valuable tool for investigations of long-standing questions about adult language.
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Appendix. Sample story for Experiments 3 and 4

This story is designed to test the predicate ‘clean the table’, as illustrated in Figures 2 and 3. The other predicates used in Experiments 3 and 4 are shown in Tables 5 and 8, respectively.

A girl and a boy return home from a summer vacation. They have a few things to do about the house, including watering the flowers in the garden, arranging their toys and cleaning a table.

Boy: Let me start with the flowers. It has not been raining for a long time so I’ll have to water them really thoroughly, otherwise they will die. He goes to the garden, finds a watering-can and starts to water the flowers.

Girl: OK, I think I will surprise my brother. I will take care of everything in this room – that is the toys and the table. What should I do first? I guess I’ll start with the toys. Oops, but we left the toy box in the park. Too bad, so I can’t do anything with them. OK, so let me wipe the table instead. Look it’s dirty all over the place! I am going to make the table shine, so that there is not a single dirty spot left! Let me start from this corner. The girl starts to wipe the table with a cloth. I am doing really well. When my brother comes back from the garden he will be surprised to see how shiny the table is.

A dog runs into the room and starts barking.

Dog: Woof-woof, please, give me some water. I am very thirsty.

Girl: Doggy, I don’t have time. Can’t you see that I am busy with this table.

Dog: Please, give me some water! I usually drink from a pool in the garden, but it has not rained in such a long time, all of the pools have dried up!

Girl: Doggy, you always need something at the wrong time. OK, I’ll get some water for you.

The girl leaves the room and returns with a jar full of water.

Girl: Here you are, Doggy. And now I’ll have to get back to work.

The girl resumes cleaning the table. After a while, the boy finishes watering the flowers in the garden and returns to the house.

Boy: Look at this table: half of it is still dirty but the other half is so shiny!

Girl: I am sorry, I thought I would have time to make it all clean before you come back, but the dog interrupted me

Boy: Don’t worry! I am going off to ride my bike now.

The boy starts to ride his bike, and the girl resumes cleaning the table. Some time later ....
Experiment 3 ending (successful completion):
The girl finishes cleaning the table.
Girl: Look how shiny the table is!
Boy (as he rides his bike past her): Yes, indeed!

OR

Experiment 4 ending (unsuccessful completion):
The girl runs out of cleaning solution; part of the table is left dirty.
Girl: Oh, well, what can I do now? Still it’s better than it was before. I will have to leave it as is and call my grandma to let her know that we came home safely.

Puppet: That was a story about a girl and a boy, and about how they did some things about the house. I know one thing that happened:

Imperfective statement: While the boy was watering flowers, the girl was cleaning the table.

OR

Perfective statement: While the boy was watering flowers, the girl cleaned the table.

References

Bennett, M., & Partee, B. (1972). Towards the logic of tense and aspect in English. Bloomington, IN: IULC.

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4 This ending is presented here for illustrative purposes only, in order to show how the scheme of the stories used in Experiment 4 was the same as for those in Experiment 3, except for the outcome. The predicate ‘clean the table’ illustrated in this example was used in Experiment 3. A different set of predicates was used in Experiment 4. See Tables 5 and 8 for a full list of predicates, and see http://www.ling.umd.edu/ninaka for full details of the experimental stories.


