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Syntactic–semantic interface in the acquisition of verb morphology*

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ABSTRACT

The purpose of this research was to show how the syntactic and semantic components of the tense–aspect system interact during the acquisition process. Our methodology involved: (1) identifying predicates, (2) finding the initial occurrence of their tense–aspect morphology, and (3) observing the emergence of contrasts. Six children learning Polish and six children learning English, found in the CHILDES archives, were investigated. The average starting age of the children learning English was 1;11, and 1;8 for the children learning Polish. In the first analysis, we traced the same 12 verbs in both languages, and in the second analysis, we contrasted the acquisition patterns for a set of telic versus atelic predicates. We tracked the verbs/predicates from the starting age to 4;11 or the child's final transcript. In English, progressive aspect is the marked form, and in Polish, perfective aspect is the marked form. This typological distinction has a significant effect of the acquisition patterns in the two languages. We argue that children acquire a multi-dimensional system having deictic relations as one of the basic dimensions. This process can be best understood within a functional theoretical framework having a well-defined syntactic–semantic interface.

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INTRODUCTION

The purpose of this research was to discover the role that the semantic structure of the predicate plays in the acquisition of syntactic structure. Based on the assumption that components of the child's knowledge of syntactic are reflected in his/her verb morphology, we investigated the emergence of the tense–aspect system in children learning Polish and English. There has been considerable previous research on this problem, and recent reviews can be found in Li & Shirai (2000) and Weist (2002). When the acquisition of tense, grammatical aspect, and lexical aspect has been evaluated with the frequency of occurrence as the dependent measure, crosslinguistic research has consistently revealed two relatively high frequency categories: (1) past tense, external/bounded aspectual perspective (e.g. perfective in Polish), and the lexical feature telic, and (2) non-past tense, internal/unbounded perspective (e.g. progressive in English), and the feature atelic. This frequency pattern has been observed in a variety of languages, e.g. Italian (Antinucci & Miller, 1976), Japanese (Shirai, 1998), Polish (Weist, Wysocka, Witkowska-Stadnik, Buczowska & Konieczna, 1984) and Turkish (Aksu-Koç, 1988), and in child-directed speech as well as child-initiated speech (e.g. Shirai & Andersen, 1995). The explanations for the acquisition of verb morphology in general and tense–aspect morphology in particular have varied widely from 'usage-based' (Tomasello, 2000*a*, *b*, 2003) to Universal-Grammar (UG) based (Wexler, 1994, 1998). First, we will review two relatively recent explanations that represent a minimal versus maximal claim about the child's knowledge of syntax, i.e. Prototype theory and Principles and Parameters (P&P) theory. Prototype theory proposes a connectionist model and an associative learning process, and the P&P theory is based on Chomsky's minimalist framework with a strong or weak continuity assumption. Secondly, we will outline an alternative theory based on the principle that children construct their understanding of syntactic structure from an integrated view of semantic and syntactic variables. We will utilize fundamental concepts from Role and Reference Grammar (RRG) to capture the form of the semantic and syntactic representations that children construct. We will argue that the first two alternatives are inadequate for different reasons. The former does not contain an account of how the child integrates their knowledge of tense and aspect with their knowledge of clause structure, and the latter does not contain an adequate syntactic or semantic explanation of aspect.

According to Li & Shirai (2000: 66), 'children create a semantic representation of tense–aspect morphology which is restricted to the prototype of the morphological category'. In their second stage of acquisition, children learning English associate *-ing* with the semantic features [dynamic & atelic], and they link simple past morphology (*-ed*/irregular forms) to the features [dynamic, telic, punctual & result]. They view these prototypes as having a value of grammatical aspect that is associated with a configuration

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of lexical aspectual features. We will refer to these prototypes as follows: (1) the bounded achievement, and (2) the unbounded activity. Tense and grammatical aspect do not have an independent status in Prototype theory. In other words, no claim is made regarding the child's knowledge of syntactic structure, and the theory of semantic knowledge consists of lexical feature sets such as those defining the prototypes above. Li & Shirai explain language acquisition as an associative learning process. We will argue that the child's knowledge of tense and aspect within their tense–aspect–modality (TAM) system can be viewed as knowledge of operators on a clause structure rather than contributions to two amalgamative constructs.

According to the Principles and Parameters (P&P) theory, children have the innate knowledge of principles (i.e. the properties of grammatical operations or structure) and parameters (i.e. highly constrained options). One of the structural principles is X-bar structure, and this structure contains functional categories such as complementizer (COMP), inflection phrase (IP), subject agreement (AGRS), tense (TNS), and aspect (ASP). Child language investigators working in the minimalist framework of the P&P theory have proposed a number of variations on the nativist theme. There are at least two related approaches to the problem of acquisition that Vainikka (1993/4) and others described as the strong and the weak continuity hypotheses. On the weak view, functional categories emerge under maturational control, and on the strong view, children start the acquisition process with a full set of functional categories. Specifically, 'the weak continuity approach – assumes gradual development of phrase structure, from the VP to the IP to the CP' (Vainikka, 1993/4: 260 and also Radford, 1990). According to Meisel (1994: 94), 'the emergence of these categories and rules is an autonomous process', ... [it] 'does not rely crucially on the grammaticization of semantic–pragmatic principles', and furthermore, 'functional categories ... emerge consecutively' (p. 124). Meisel was primarily concerned with agreement and tense, and he argued that 'agreement is discovered very early ...', and 'tense comes in significantly later' (p. 124). Sano & Hyams (1994) used the P&P framework to explain the relationship between aspect and tense. They hypothesize a functional category for aspect (i.e. ASP) within an X-bar structure of the form $[_{I'}\ [_{I}\ \emptyset]\ [_{ASPP}\ [_{ASP'}\ [_{ASP}\ \text{walked}_i]\ [_{VP}\ [_{V'}\ [_{V}\ t_i]]]]]]$. From their perspective, '... children prefer an analysis of *-ed* as a perfective aspect marker rather than a past tense marker ...' (p. 551), and this preference follows the principle of economy. In other words, aspect precedes tense in child language because of the application of the principles of Universal Grammar.[1] According to the

[1] This argument is reminiscent of an argument that we characterized as the 'Defective Tense Hypothesis', i.e. in child language, tense morphology codes aspect, and it does not have the deictic function that it has for the fluent speaker (Weist *et al.*, 1984).

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argument, this pattern of acquisition should proceed independently of the semantic structure of predicates.

Taking the strong continuity position, Wexler proposed that children have a full set of functional categories. However, this does not imply that the child will exhibit the full potential of these functional categories during the initial phase of language acquisition because of a hypothetical 'under-specification of a feature and/or projection' (Wexler, 1998: 58). Schütze & Wexler (1996) and Wexler (1998) proposed the AGR/TNS Omission Model (ATOM) to explain the fact that either agreement or tense (or both) may be missing during an early phase of acquisition referred to as the 'optional infinitive (IO)' stage (see Wexler, 1994). The ATOM model was revised by Wexler (1998) since the initial version could not account for the fact that some languages, e.g. Italian and Polish, don't exhibit the symptoms of the IO stage. The unique checking constraint (UCC) is at the core of the revision. Wexler assumes that 'both AGRS and TNS have a D [Determiner] feature which must be eliminated by checking against the D-features of a DP which raises up for checking' (Wexler, 1998: 51). The UCC stipulates that 'the D-feature of DP can only check against one functional category' (p. 59). Within the minimalist framework, null-subject languages like Italian or Polish don't require D-feature checking for AGR (see Wexler, 1998: 70 for the explanation). Hence, the revised ATOM does not predict the symptoms of the IO stage in INFL-licensed null subject languages. However, if Sano & Hyams (1994) are correct, the full complement of functional categories will include an aspect projection that would have to be immune to the unique checking constraint. While ATOM might be extended to embrace grammatical aspect, the general theoretical framework explicitly excludes the potential role of lexical aspect in the acquisition process.

According to Tomasello's (2003) usage-based theory, children acquire constructions, i.e. 'a unit of language that comprises multiple linguistic elements used together for a relatively coherent communicative function' (p. 100). Children utilize 'intention-reading' and 'pattern-finding' skills to acquire such constructions. Constructions vary in abstraction. A relatively concrete construction would involve the concepts of noun and verb, e.g. the past tense construction [X VERB-ed], the ongoing action construction [X's VERB-ing], or the future intention construction [I'm gonna VERB] (where the X slot is filled with a noun/pronoun). Beyond knowing the concept of verb as opposed to noun, children acquire different 'schemas' contrasting intransitive with transitive verbs, i.e. they know something about argument structure (pp. 149–152). Within the transitive constructions, children know 'the syntactic roles that the participants are playing', e.g. 'I'm VERBing X means that I am doing something to X' (p. 299). At a more abstract level, children know constructions such as 'I wanna VERB PHRASE' and

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'I think CLAUSE'. Hence, children come to know syntactic relations and higher-order constituent structures. Tomasello does not present an explicit hypotheses regarding what exactly the child knows when they know argument structure, syntactic relations, and clause structure.

Van Valin (1991) and Van Valin & LaPolla (1997: Epilog) proposed that children know the opposition between predicating elements and non-predicating elements (*cf.* Tomasello, 2003: 19, and Braine, 1992), and the opposition between noun phrases and adpositional phrases that are arguments of the predicate and those that are not (*cf.* Tomasello, 2003: 107). Assuming these two oppositions, Van Valin proposed how children might acquire the layered clause structure of RRG in conjunction with a cognitive system of the form introduced by Braine (1992).

There are a number of reasons for preferring Van Valin's (1991) approach to language acquisition. Regarding acquisition in general, RRG contains an explicit hypothesis regarding the kind of clause structure that a child might construct from the linguistic data, and RRG integrates this syntactic structure with semantic, and information structure. Everyone would agree that the child's knowledge of verb–argument structure extends beyond a 'slot' in a 'construction' or a projection in an X-bar structure. However, none of the theorists cited above have presented an adequate hypothesis regarding the nature of the semantic representations of predicates that children acquire. RRG contains such a hypothesis. Tense is not acquired in a vacuum. Tense interacts with aspect and modality, and it is acquired in the context of structured clauses. An understanding of the aspect component requires an understanding of lexical as well as grammatical aspect, and a hypothesis of the semantic representations of predicates is essential to understand lexical aspect.

While it is not possible to review the RRG theory in this paper, we will present a minimal framework in order to reveal how tense, aspect, and lexical aspect are integrated within the theory. The clause structure is viewed as a layered structure. With minimal genetic programming, Van Valin (1991) proposed a constructivist account of the acquisition of clause structure as contrasted with the 'adaptationist' account of the P&P model. Within the proposed layered structure of the clause, the nucleus is defined by the predicate. The next more inclusive layer is the core, and it includes the predicate and the arguments of the predicate. The clause incorporates the core and the periphery subsuming non-arguments as well as the predicate and its arguments. Tense and aspect are considered to be operators that modify syntactic structure at different layers. Van Valin (1991) proposed that children learn the scope of the operators as they acquire the layered structure of the clause. Aspect has the nucleus within its scope, and tense has the clause within its scope. We propose that these scope relations are acquired simultaneously.

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TABLE 1. *The representation of the semantic structure of the predicate*

VanValin-type	Structural representation	Sentence example
1. State	**predicate'** (x) or (x,y)	*The toy is broken*
2. Activity	**do'** (x, [**pred'** (x) or (x,y)])	*Eva played in school*
3. Accomplishment	BECOME **pred'** (x) or (x.y)	*The toy broke*
4. Achievement	INGR **pred'** (x) or (x,y)	*Eva found the toy*
Active-accomplishment	do' (x,[pred' (x)]) & BECOME pred' (x)	*Eva walked to school*
Causative	**do'** (x,Ø) & CAUSE & [logical structure of 1–4]	*Eva broke the toy*

In contrast to a list of features such as dynamic and telic, RRG contains a theory of the logical structure of predicates and an interface to syntax. The semantic structure of four basic predicate types and two derived types is summarized in Table 1. The four basic predicate types are state (e.g. *know*, *love*), activity (e.g. *cry*, *play*), accomplishment (e.g. *make*, *melt*), and achievement (e.g. *fall*, *find*). Smith (1991) and Van Valin (in press) also included a basic category of punctual activities (e.g. *cough*, *bounce*). Within RRG, the elements **do'** and **predicate'**/**(pred')** are entries in the semantic meta-language, where **do'** is the generalized activity predicate. In Table 1, the predicate in the activity example would be realized as **play'**, and the predicate in the accomplishment example as **broken'** in the meta-language. The elements BECOME and INGR (ingressive) are predicate modifiers. Structures with these modifiers are telic. In our investigation, the analysis will focus on the distinction between activity predicate structure and structures that include one of these two modifiers, i.e. accomplishments, achievements, active-accomplishments, and some causatives (see Table 1). The structure of the predicate is an essential part of the link to syntax. The linking system involves two semantic macroroles, i.e. actor and undergoer, and these macroroles represent generalizations over more specific thematic relations such as agent or effector versus patient of theme, where agent is the unmarked choice for actor and patient for undergoer. Van Valin & LaPolla (1997) proposed a selection hierarchy that maps arguments of the predicates onto macroroles, and then depending on the typology of the language, onto the privileged syntactic argument (PSA), i.e. a concept of subject. Polish and English are nominative–accusative languages, and the PSA is nominative in case.

This is a crosslinguistic investigation of the acquisition of the tense–aspect systems of Polish and English. There are fundamental differences between these two systems. For these languages, absolute tense, grammatical aspect, and lexical aspect (or Aktionsart) are the key components of the systems. Absolute tenses have speech time as their deictic center (*cf.* relative tenses). Past tense locates the primary situation prior to speech

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time, 'without saying anything about whether that situation continues to the present or into the future' (Comrie, 1985: 41). Polish and English have past and non-past tense morphology. In Polish, a non-past form in the perfective aspect has future meaning, and there is a paraphrastic imperfective future formed with the future tense form of *być* 'to be' and either the past participle or the infinitive (see examples in Tables 5 and 10). In English, future meaning is obtained with *will* or *going to/gonna* modal constructions among other possibilities (see examples in Tables 3 and 6). Whereas absolute tense relates event time to speech time, aspect is an inflectional category that codes the temporal contour of a situation. Polish has perfective and imperfective aspect. Perfective aspect is semantically marked and imperfective is unmarked or neutral. The concepts completion and bounded are at the core of the meaning of perfective. According to Stoll (2001: 38), 'the perfective aspect highlights or signals one or more boundaries of a verb … without taking into account whatever phase precedes or follows the boundary in the Aktionsart'. English has progressive and non-progressive aspect. Progressive aspect is the semantically marked form, and it codes the notion of ongoing action (see Comrie, 1976, section 1.2.2), and non-progressive is the unmarked or neutral form. In English, the marked form (i.e. progressive) is related to the distinction between dynamic and stative predicates, and in Polish, the marked form (i.e. perfective) is related to distinction between telic and atelic predicates. Regarding this typological distinction, Chung & Timberlake (1985: 239) classified English as a 'dynamicity' language and Polish as a 'closure' language.[2]

The interactions of tense, aspect, and lexical aspect are different in Polish and English. In Polish, stative verbs are imperfective as the perfective form of a stative verb has ingressive meaning, i.e. it specifies an initial boundary. In English, stative verbs are non-progressive since the progressive aspect requires the feature dynamic and this feature is lacking in stative verbs. In Polish, the non-past form of a perfective verb has future meaning, and therefore, there is no present perfective tense. English has non-progressive (or simple) as well as progressive present tense forms. However, the aspectual meaning of the simple present form depends on the lexical category. Dynamic verbs have a habitual or frequentative meaning in the simple present, e.g. *She plays the flute*.

[2] We disagree with Chung & Timberlake's (1985: 239) claim that perfective forms 'must' be telic (*cf.* Smith, 1991: 307). It would be more accurate to say that perfective forms are likely to be telic (see Table 8a). A predicate with the logical structure of an activity, e.g. *bawić się/po-bawić się* 'to play' has a perfective as well as an imperfective form. When realized as perfective, the activity is bounded. It still does not have an inherent terminal point, and it does not qualify as a telic predicate. It obtains a delimited meaning in the perfective form (see Table 10). Furthermore, the perfective *po-bawić się* can occur with adverbials like *godzinę* 'for an hour', whereas telic perfective verbs cannot occur with such adverbials.

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The perfective past in Polish is quite different from the simple past in English, i.e. as already noted, the former is the marked past form and the later is the unmarked past form. As Comrie (1985: 42) has pointed out, '… the perfective past will necessarily indicate that the situation in question was completed, since use of perfective aspect and past tense locates the whole situation in past time'. Furthermore, the precise outcome will depend on the lexical aspect of the verb. In English, the sentence, *She knew him*, identifies a state of being acquainted that was in existence prior to speech time and that may still pertain at speech time. In Polish, the past perfective of the verb *poznać* '*to know*' means that the individual in question became acquainted, i.e. an initial boundary is signalled, and this change of states was completed in the past. In English, the sentence, *She played with her friend*, only reveals that such an activity occurred prior to speech time without specifying the termination of the event. In Polish, the past perfective of the verb *pobawić się* '*to play*' signals an initial and a final boundary indicating that the activity took place during some interval that was completed prior to speech time. In general, telic verbs have the concept of an inherent terminal point as part of their meaning. In English, in the sentence *She made dinner*, past tense places event time prior to speech time, and since the predicate, *to make*, contains an inherent terminal point at the core of its Aktionsart, the conversational implication is that the terminal point was reached prior to speech time. In contrast, in Polish, the past perfective form of the verb *zrobić* '*to make*' activates the inherent terminal point prior to speech time. If the semantic structure of the predicate influences the acquisition of tense–aspect morphology, the acquisition pattern for telic and atelic predicates should be different in a dynamicity language like English versus a closure language like Polish. Thus, we agree with Bowerman's (1985: 1285) hypothesis that, 'children begin with grammars that are slanted toward the semantic structure of the input language …'.

In fact, we have confirmed Bowerman's hypothesis in recent research (Weist, Atanassova, Wysocka & Pawlak, 1999). In one experiment, three-, four-, and six-year-old children learning Polish and English were asked to match one of two sentence alternative with a picture. The comprehension test was presented to every child in a still picture and a video format. This comprehension test contained past versus future tense contrasts and marked versus unmarked aspect contrasts. In one of the still picture tense problems, for example, one picture illustrated a boy with his fishing line in the water and a fish approaching his bobber, and the alternative picture showed the same boy holding up a fish on the end of his line. The two sentence alternatives were as follows: (1) *The boy* (*will catch*/*caught*) *the fish*, '*Chłopiec* (*złapie*/*złapał*) *rybkę*'. In one of the still picture aspect problems, for example, one picture portrayed a girl holding a partially filled glass of juice to her lips, and in the contrasting picture, the same girl was holding an

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empty glass. The sentence alternatives associated with these pictures were as follows: (1) *The girl* (*was drinking/drank*) *the juice*, '*Dziewczynka* (*piła/wypiła*) *soczek*'. For English, the marked form was past progressive versus the unmarked form of simple past, and for Polish, the marked form of the verb was past perfective and the unmarked form was past imperfective. For both still and video presentations, the procedure involved reading two sentence alternatives, and then asking the children to match one of the sentences with one of two illustrations or video screens. The test alternatives were counterbalanced. The key finding for the purpose of this paper was that the children did better on aspect problems when they were tested with the marked alternative (see also Weist, 2002: 48, Fig. 2). Hence, there is evidence that the basic difference in aspectual organization described above has an impact on the acquisition processes.

With these theoretical and typological considerations in mind, we intend to show that the acquisition of the parameters of tense and aspect is influenced significantly by the semantic structure of predicates, and furthermore, the acquisition pattern will vary crosslinguistically. The central role of semantic principles in the acquisition process is contrary to the claim for a syntactically autonomous acquisition process. Furthermore, we predict that the evidence will show that tense morphology codes deictic relations and not the aspectual contrast between bounded/unbounded. If it can be shown that tense and aspect have an independent status in the child's temporal system, such a system does not meet the constraints of Prototype theory. With these goals in mind, we analysed the emergence of the tense–aspect morphology of six children acquiring English and six children acquiring Polish. The methodology that was employed in this study is called 'predicate tracking'. Briefly, predicate tracking entails, (1) identifying a predicate and determining its semantic structure, (2) finding the initial occurrence of each tense–aspect morpheme, and (3) observing contrasts in tense and aspect (*cf.* Mueller Gathercole, Sebastian & Soto, 1999).

METHOD

Children

The children were found in the CHILDES archives (MacWhinney & Snow, 1985). Five of the children learning Polish were taken from the Kraków project (Smoczyńska, 1985) and two from the Poznań project (Weist *et al.*, 1984). As for the children learning English, they were as follows: Adam, Eve, and Sarah (Brown, 1973), Naomi (Sachs, 1983), Abe (Kuczaj, 1976), and Nina (Suppes, 1974). Table 2 contains the children and the age span that was investigated. We discontinued our analysis at 4;11. It is important to note that on the average, the starting age for the children learning English (i.e. 1;11) was later than it was for the children learning Polish (i.e. 1;8).

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TABLE 2. *The children and their age span*

Polish	Age span	English	Age span
Inka	1;0–4;11	Adam	2;3–4;10
Basia	1;5–4;11	Eve	1;6–2;3
Kasia	1;3–3;1	Sarah	2;3–4;11
Jaś	1;6–4;11	Naomi	1;2–4;9
Wawrzon	2;2–3;2	Abe	2;4–4;11
a. Kubuś	2;1–2;6	Nina	1;11–3;3
b. Michał	2;0–4;11		

Kubuś was included in the first analysis only, and Michał in the second only.

This fact is relevant to the interpretation of any potential main effect of language.

Procedure

For each child, we searched for a set of verbs/predicates, and then we traced the acquisition of tense–aspect morphology for that verb/predicate. In the first analysis, the set of verbs was held constant across all children and the semantic category of the predicates underlying these verbs was allowed to vary. In this analysis, we identified 12 verbs, and we analysed the acquisition pattern for these verbs in English and in Polish. In the second analysis, the telicity of the predicates was controlled, and the specific set of verbs for each child was allowed to vary. In the second analysis, we identified a set of telic and atelic predicates for each child. In order to accomplish this classification, we used a set of tests for lexical aspect. The precise tests that were utilized have been summarized in Appendix A (*cf.* Shirai & Andersen, 1995 for English and Weist *et al.*, 1984 for Polish). In our classification, we distinguished dynamic predicates (e.g. *cry*, *bounce*, *build*, and *fall*) from stative predicates, (e.g. *want*, *have* and *know*). Among the dynamic set, we distinguished atelic predicates (e.g. *cry* and *bounce*) from telic predicates (e.g. *build* and *fall*). We did not discriminate durative predicates (e.g. *cry* and *build*) versus punctual predicates (e.g. *bounce* and *fall*). In summary, the critical distinction among dynamic predicates concerned the property of telicity, i.e. the concept of an inherent terminal point.

Tense–aspect systems

As mentioned above, only absolute tense forms were considered, and both languages have past, present, and future tense forms.[3] In Polish, the basic

[3] English has perfect tenses. While we observed these forms, we did not include them in the analysis. In fact, they are quite rare. If the basic aspectual distinction was between present perfect and present progressive as Radford (1990) has claimed, contrasts in aspect would be extremely late in child English (in particular American English).

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aspectual distinction is between perfective and imperfective aspect, and in English, it is between non-progressive and progressive aspect. Perfective is the marked form in Polish, and progressive is the marked form in English.

Tense and aspect interact. In English, there is a simple present verb form, but in Polish, the non-past stem of a perfective verb form has future meaning. In English, the simple present form of dynamic predicates conveys the aspectual meaning of habitual/frequentative, e.g. Nina (2;11) *Usually milk comes from a cow*, and Nina (3;0) *Cause he cries every day when you push him down*. The English simple present verb forms were excluded from our analysis since we were unable to make a crosslinguistic comparison, i.e. the form does not exist in Polish. As a result, we analysed five tense–aspect forms in each language (see Tables 3 and 5). Within the scope of our investigation, the children learning English never produced a future progressive form, and for some of the analyses, the statistical design had only two levels of tense, i.e. past versus non-past. There were three basic dependent measures: (1) the first occurrence of a tense–aspect form, (2) the likelihood of occurrence, and (3) contrast. There were three types of contrast. In English, they were: (1) tense (T), e.g. non-progressive (or simple) past versus non-progressive future, (2) aspect (A), non-progressive versus progressive past, and (3) tense–aspect (T/A), e.g. simple past versus present progressive. In Polish, they were: (1) tense (T), e.g. perfective past versus perfective future, (2) aspect (A), e.g. perfective past versus imperfective past, and (3) tense–aspect (T/A), e.g. perfective past versus imperfective present. Unless otherwise specified, our statistical analysis was based on complete tense–aspect forms, e.g. present progressive includes *is/am/are* + verb + *-ing* (i.e. the auxiliary as well as the main verb for all periphrastic forms). However, for comparison, our search included 'present' progressive forms with the auxiliary omitted within a minimal clause (e.g. I Ø draw-ing). In Polish, we encountered future imperfective forms where the auxiliary was omitted, and these forms were omitted from the analysis.

In order to provide a clear understanding of the methodology, Sentences 1–4 and Table 3 demonstrate how contrast data was obtained starting with the individual child such as Naomi and the verb *to draw*. The first step involved a search from the youngest files to the oldest files or to 4;11. The initial occurrence of Naomi's tense–aspect forms is shown in Sentences 1–4.

(1) (2;0) **I'm** draw-**ing** donkey's eyes.
[compare: (1;10) I Ø draw-**ing**.]
(2) (2;0) I draw-**ed** it.
(3) (2;0) I'm going Ø draw apples.
(4) (2;11) When you **were** draw-**ing**.
[context: 'When I was a little girl, honey.']

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TABLE 3. *The age of the initial occurrence of tense–aspect forms and contrasts for Naomi and the verb* to draw

Tense/aspect	Non-progressive	Progressive
Past	2;0 I drawed it.	2;11 When you were drawing.
Present	*Excluded*	2;0 I'm drawing donkey's eyes.
Future	2;0 I'm going Ø draw apples.	*Not observed*

Type of contrast	Tense/aspect	Tense	Aspect
Emergence age	2;0	2;0	2;11

The ages of the initial occurrence of the verb morphology was entered into a tense–aspect table as shown in Table 3. The initial occurrence data was then used to determine the age of the initial morphological contrasts involving tense and aspect. For Naomi and the verb *to draw*, two kinds of contrasts emerged at 2;0. There was a tense contrast between non-progressive past versus future, and a tense–aspect contrast with either of the two non-progressive forms against the present progressive. An aspectual contrast between non-progressive and progressive past emerged eleven months later at 2;11. The contrast data is also summarized in Table 3.

Deictic relations

Anderson & Keenan (1985: 259) defined deictic expressions as, 'those linguistic elements whose interpretation in simple sentences makes essential reference to properties of the extralinguistic context of the utterance in which they occur'. There are person (e.g. *I/you*), spatial (e.g. *here/there*), and temporal (e.g. *yesterday/tomorrow*) deictic expressions. In this research, we are concerned with the temporal deictic relations that are established with absolute tense. By evaluating contrasts in the verb morphology, we intend to show that tense expresses deictic relations in child language. In order to confirm that the past tense forms coded event time prior to speech time and the future tense forms coded event time subsequent to speech time, we evaluated the context in which the utterance occurred, and this interpretation was consistent with the context. In fact, future tense always has at least a minimal modal value. We will argue that the primary function of future is deictic. Children have specific alternative modal constructions to express their present time desires and obligations, e.g. *want to/have to* plus the infinitive.

RESULTS

Verbs held constant – verb tracking analysis

In the first analysis, the tense, aspect, and tense–aspect contrasts were found for twelve verbs for six children learning English and the six learning

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TABLE 4. *The average age of the emergence of tense–aspect, tense, and aspect contrasts*

Language	Tense–aspect	Tense	Aspect
English	2;11	2;11	3;6
Polish	2;5	2;3	2;4

The 12 verbs: (*ze-*)*psuć się*, '*to break*', (*na-*)*rysować*, '*to draw*', (*wy-*)*pić*, '*to drink*', (*z-*)*jeść*, '*to eat*', *spaść/spadać*, '*to fall*', (*s-*)*chować się*, '*to hide*', (*u-*)*śmiać się*, '*to laugh*', (*z-*)*robić*, '*to do/make*', (*po-*)*bawić się*, '*to play*', (*po-*)*siedzić*, '*to sit*', *powiedzieć/mówić*, '*to talk*', (*na-*)*pisać* '*to write*'.

Polish. The basic data for each child was the average age of the emergence of the three types of contrasts summed over the twelve verbs. Table 4 contains the average age of the emergence of the three types of contrasts.

The analysis of variance revealed a significant effect of the type of contrast. Overall, tense contrasts emerged first followed by tense–aspect contrasts, and finally aspect contrasts, $F(2, 20) = 4{\cdot}44$, $p < 0{\cdot}025$. The most important finding was the interaction of language by type of contrast, $F(2, 20) = 4{\cdot}30$, $p < 0{\cdot}028$. In Polish, tense and aspect contrasts emerge at about the same age, but in English, tense contrasts are found at a much earlier age than aspect contrasts. Naomi's acquisition pattern for the verb *to draw*, which was demonstrated in Table 3, was typical for the children learning English. As shown in Table 3, future progressive was absent, and past progressive forms were late. Hence, the only possible contrast in aspect that is not confounded by tense (i.e. simple past versus past progressive) emerged relatively late. This pattern will be explained in more detail in the second analysis. Continuing with the first analysis, the contrasts emerged at an earlier age in these Polish children. However, this difference might be explained by the earlier starting age of the Polish children, i.e. on the average 1;8 versus 1;11.

Telic/atelic predicate tracking analysis

Categorizing predicates. The second analysis began by categorizing predicates into atelic and telic categories as shown in Appendix A. In fact, we utilized a more extensive categorization that is summarized in Table 1 including states, activities, accomplishments and achievements. In order to make these discriminations, it is not possible to limit the search to the verb itself, since the same verb represents different categories of lexical aspect. The best-known examples of this fact are found in creation, consumption, and motion verbs. Regarding creation, the verb *to draw* in Sentence 3 above represents an activity predicate. In contrast, the same verb includes an accomplishment structure in the semantic representation underlying

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Sentences 1 and 2, i.e. it is an active-accomplishment (see Table 1). Sentence 4 is ambiguous. If Sentence 4 is interpreted as, '*you were drawing a picture*', then it would also be classified as an active-accomplishment. In Sentence 5, the verb *to eat* is an activity predicate, and in Sentence 6, it is an active-accomplishment predicate. In Sentence 7, the verb *jechać/pojechać* 'to go by vehicle' has an active-accomplishment predicate, and in Sentence 8, the predicate has an activity structure.[4] In Sentence 9, the verb might be translated as *to start* having an achievement structure, and in Sentence 10, the verb is once again an active-accomplishment involving motion to goal, and therefore, it is telic.

(5) Abe (2;5) He's eating peanuts.
(6) Abe (2;7) I'm eating a peanut butter sandwich.
(7) Wawrzon (2;2) **Jad-ę** rower-em na budow-ę
(**go/ride:IPFV-1:S** bike-INSTR to construction site-ACC)
('**I am going** to the construction-site by bike.')
(8) Wawrzon (2;7) Babci-a **jecha-ł-a** Wielkim Balanin-em?
(grandma-NOM **go/travel:IPFV-PT-F-3:S** train name-INSTR)
('Grandma **went** on Great Balanin?') {Wielkopolanin}
(9) Wawrzon (2;5) **Po-jecha-ł**. Nie **po-jecha-ł**
(**PFV-go-PT-M:3:S.** Not **PFV-go-PT-M:3:S**)
('**It went**. **It didn't go**.') {playing with a toy train}
(10) Wawrzon (2;7) Cioci-u **po-jedzie-sz** z nami do Łodz-i?
(Auntie-VOC, **PFV-go-2:S** with us to Łódź-GEN)
('Auntie, **will you go** with us to Łódź?')

Sentences 7 through 10 contain the initial occurrence of four of the five tense–aspect forms that were observed for this verb. Following the model exhibited in Table 3, these forms have been entered into a tense–aspect display in Table 5, and the contrasts that were derived from this data are also summarized in Table 5. Table 5 contains one verb but a mixture of three predicates types some of which were telic and one of which was atelic, i.e. *jecha-ł-a*. Tense contrasts and aspect contrasts both emerged at 2;7, and they all contain a mixture of predicate types, e.g. a past perfective achievement versus a past imperfective activity. Telicity was controlled in the predicate tracking analysis that follows.

[4] The following abbreviations were used in the Polish glosses: 1, 2 & 3 person, ACC accusative, AUX auxiliary, DAT dative, IPFV imperfective, INF infinitive, INSTR instrumental, FUT future tense, F feminine, GEN genitive, M masculine, NOM nominative, P plural, PFV perfective, PP past participle, PT past tense, REFL reflexive, S singular, VOC vocative & VIR virile. The colon [:] symbol codes fusion, and the dash [-] symbol codes agglutination. The verbs that were at the focus of tracking are in bold characters.

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TABLE 5. *The age of the initial occurrence of tense–aspect forms and contrasts for Wawrzon and the verb* po-/jecha-ć '*to ride*'

Tense/aspect	Perfective	Imperfective
Past	2;5 po-jecha-ł	2;7 jecha-ł-a
Present	*Doesn't exist*	2;2 jad-ę
Future	2;7 po-jedzie-sz	*Not observed*

Type of contrast	Tense/aspect	Tense	Aspect
Emergence age	2;5	2;7	2;7

For the six children learning English, we classified 10 atelic and 10 telic predicates, and for the six children learning Polish, we classified 12 atelic and 12 telic predicates, owing to the robust nature of the Polish data. In this analysis, telicity was under control, and the exact set of atelic and telic predicates varied from child to child. For English, the ten most frequent in the atelic set were: *play*, *sit*, *eat*, *hold*, *talk*, *pull*, *cry*, *fly*, *walk*, and *call*, and in the telic set: *make*, *come*, *fall*, *put*, *take*, *break*, *draw*, *get*, *catch* and *buy* (see Table 6 for sentence examples). In Polish, the ten most frequent in the atelic set were: *siedzie-ć/po-siedzie-ć* 'sit', *bawi-ć się/po-bawi-ć się* 'play', *płaka-ć/po-, roz-płaka-ć* (*się*) 'cry', *trzyma-ć/po-, przy-trzyma-ć* 'hold', *patrze-ć/po-patrze-ć* 'look, watch', *spa-ć/po-, prze-spa-ć* (*się*) 'sleep', *chodzi-ć/po-chodzi-ć* 'walk, go', *leże-ć/po-leże-ć* 'lie', *śmia-ć się/po-, u-śmia-ć* (*się*) 'laugh', *piszcze-ć/po-, za-piszcze-ć* 'squeal', and in the telic set they were: *przychodzi-ć/przyjś-ć* 'come, arrive', *naprawi-a-ć/naprawi-ć* 'fix, repair', *wychodzi-ć/wyjś-ć* 'go out, leave', *zamyk-a-ć/zamk-nąć* 'close', *spad-a-ć/spaś-ć* 'fall', *psu-ć/po-, ze-psu-ć* 'break', *kup-owa-ć/kupi-ć* 'buy', *przynosi-ć/przynieś-ć* 'bring', *odda-wa-ć/odda-ć* 'give back', *łama-ć/z-łama-ć* 'break' (see Tables 9 and 10, and related text for examples).

The focus of this analysis (and indeed this project) was on the potential difference in the atelic and telic acquisition pattern. Three dependent variables were evaluated: (1) the age of the emergence of tense–aspect forms, (2) the likelihood of the emergence of tense–aspect forms, and (3) the age of the acquisition of tense–aspect contrasts. When determining the average age of the initial occurrence of a form or contrast, it was possible to find a child who never used a form, e.g. atelic, past-perfective, and/or who never made a contrast, e.g. telic predicate and aspect contrast. Failure to produce a form or contrast is a symptom of the early/non-precocious phase of acquisition, i.e. the child has not yet reached a milestone. Since a zero would represent an impossibly precocious acquisition, we replaced such a zero with the age of their oldest observed data point. This kind of replacement was made in the data of two children as follows: (1) Wawrzon, atelic

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TABLE 6. *Age of initial occurrence and sentences for tense–aspect types and contrasts for Nina*

Atelic predicate = *to cry*

Tense/aspect	Non-progressive	Progressive
Past	2;3 Justin cried for the doctor too.	2;11 I wasn't crying when you did it.
Present	*Excluded*	2;4 That lady's crying.
Future	2;9 Then she will cry.	*Not observed*

Type of contrasts	Tense/aspect	Tense	Aspect
Emergence age	2;4	2;9	2;11

Telic predicate = *to fall*

Tense/aspect	Non-progressive	Progressive
Past	2;3 He falled down.	2;5 I was falling in it.
Present	*Excluded*	2;1 See # that's falling down.
Future	2;3 He will fall off # Mommy.	*Not observed*

Type of contrast	Tense/aspect	Tense	Aspect
Emergence age	2;3	2;3	2;5

past perfective and telic past imperfective, and (2) Inka, telic, imperfective future.

Age of emergence. Table 7a contains the average age of the initial occurrence of the tense–aspect forms for the atelic and the telic predicates. In Polish, there is a striking difference in the pattern created by the difference in predicate structure. Atelic predicates emerge at a relatively early age in the imperfective aspect, and telic predicates emerge relatively early in the perfective aspect. In English, the difference in the patterns motivated by the semantic structure of the predicates is much smaller. The interaction of grammatical aspect and lexical aspect is brought into focus in Table 7b where the analysis is collapsed over tense. When evaluated within the analysis of variance, this interaction of language by telicity by aspect was significant, $F(1, 10) = 21{\cdot}1$, $p < 0{\cdot}001$, and among other effects the interaction of telicity by aspect was also significant, $F(1, 10) = 60{\cdot}3$, $p < 0{\cdot}001$. Across languages, the combinations of atelic Aktionsart and internal perspective and telic Aktionsart and external perspective were acquired more rapidly. In order to obtain a balanced $(2) \times (2) \times (2)$ mixed design, the future imperfective data from Polish was omitted, and tense was viewed as past versus non-past. While it was omitted from the analysis, the influence of telicity on the future imperfective was just as obvious as in other tense–aspect forms (see Table 7a). The interaction of aspect by tense was significant,

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TABLE 7a. *The average age of the emergence of tense–aspect forms for (atelic/**telic**) predicates*

Polish	Aspect	
Tense	Perfective	Imperfective
Past	3;4/**2;2**	2;7/**3;1**
Non-past (Present)	Non-existent	2;1/**2;8**
Non-past (Future)	2;9/**2;3**	*{*2;5/**3;0***}

*{} The future imperfective data was scored but omitted from the statistical comparison.

English	Aspect	
Tense	Non-progressive	Progressive
Past	2;11/**2;7**	3;2/**3;5**
Non-past (Present)	Excluded	2;10/**2;10** *{*2;4/**2;7***}
Non-past (Future)	2;11/**2;8**	Absent

*{} 'Present' progressive forms were scored without the auxiliary, but these forms were omitted from the statistical comparisons.

TABLE 7b. *The interaction of language by telicity by aspect for the average age of emergence*

Language	Polish		English	
Telicity/aspect	Perfective	Imperfective	Non-progressive	Progressive
Atelic	3;0	2;4	2;11	3;0
Telic	2;2	2;11	2;7	3;1

$F(1, 10) = 8{\cdot}74$, $p < 0{\cdot}014$. It is important to keep in mind that this interaction collapses over telicity as well as language. Given the perfective/non-progressive aspectual forms, the average age of the emergence of past forms (2;9) versus non-past forms (2;8) (i.e. future tense) was very similar. Given the imperfective/progressive aspectual forms, the difference between past (3;1) forms and non-past (2;7) forms (i.e. present tense) is greater. This interaction is largely due to the relatively slow acquisition of past-progressive forms in English. Some forms are more likely than others, and the more likely the form, the more reliable the estimate of the age of emergence (compare Tables 7a and 8a). The next analysis concerns the likelihood data.

Likelihood of emergence. When we consider the likelihood (i.e. the proportion of occurrences) that the children produce each of the tense–aspect forms, the pattern of acquisition is influenced by telicity along with tense

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TABLE 8a. *The average likelihood of tense–aspect forms for (atelic/**telic**) predicates*

Polish	Aspect	
Tense	Perfective	Imperfective
Past	10/**100**	89/**25**
Non-past (Present)	*Doesn't exist*	96/**72**
Non-past (Future)	30/**99**	*{93/**21**}

*{ } The future imperfective data was scored but omitted from the statistical comparison.

English	Aspect	
Tense	Non-progressive	Progressive
Past	77/**87**	47/**35**
Non-past (Present)	*Excluded*	93/**83**
Non-past (Future)	92/**97**	*Not observed*

TABLE 8b. *The interaction of language by telicity by aspect in the likelihood findings*

Language	Polish		English	
Telicity/aspect	Perfective	Imperfective	Non-progressive	Progressive
Atelic	20	92	84	70
Telic	99	49	92	59

and aspect (see Table 8a). The difference in the likelihood of occurrence is quite salient in different ways in the two languages. Most of the variance can be accounted for by two facts. Children learning Polish are likely to produce a telic predicate in the perfective aspect and an atelic predicate in the imperfective. Secondly, when children learning English talk about events that occurred prior to speech time, they are unlikely to specifically code the concept of on-going action, i.e. use the past progressive. These two facts create numerous main effects and interactions, and we will report the most relevant findings. As shown in Table 8a, the interaction of language by telicity by aspect and by tense was significant with $F(1, 10) = 14{\cdot}4$, $p < 0{\cdot}004$.

The crosslinguistic differences come into sharp focus in the interaction of language by telicity by aspect as can be seen in Table 8b, where $F(1, 10) = 143{\cdot}8$, $p < 0{\cdot}001$. In Polish, the distinction between atelic and telic predicates has considerable impact on grammatical aspect. In Polish, the combinations of atelic with perfective and telic with imperfective are relatively unlikely. In English, the relationship between lexical and grammatical

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TABLE 9. *The average age of the emergence of tense–aspect, tense, and aspect contrasts*

Language	Tense–aspect	Tense	Aspect
Polish	2;10	2;4	2;11
English	3;0	3;0	3;5

aspect is much less prominent. Since the non-progressive past form in English is the unmarked form (i.e. has the most extensive semantic range), children learning English can and do use that form for both telic and atelic predicates. In fact, the crosslinguistic differences are greater than this statistical design reveals. Children learning Polish use the imperfective aspect with all tenses, i.e. they use the form with the broadest semantic range for future as well as past.

Type of contrast. The third dependent measure is contrast, and the findings are summarized in Table 9. Table 9 shows the average age of the initial contrasts in tense–aspect, tense, and aspect for both atelic and telic predicates. The main effect of the type of contrast ($F(2, 20) = 14{\cdot}9$, $p < 0{\cdot}001$) and the interaction of language by type of contrast was significant ($F(2, 20) = 4{\cdot}61$, $p < 0{\cdot}023$). These data can be compared with the findings that were presented in Table 4. Children learning both languages consistently make minimal tense contrasts before they make minimal aspect contrasts (see Table 7a). Polish children make minimal tense contrasts before any other kind of contrast. With telic verbs the contrast is likely to be past versus future perfective (see Table 11 examples), and with atelic verbs, the contrast is likely to be present imperfective versus either past or future imperfective (see Table 10 examples). In English, the past versus future non-progressive contrast is early for telic verbs (see Table 6 examples), but due to the fact that past progressive is late and future progressive is absent, the early contrasts for atelic verbs are likely to involve a shift in both tense and aspect, e.g. simple past versus present progressive (see Table 6 examples).

The closure language pattern. The best way to explain the Polish acquisition pattern is by example. Sentences 11–15 demonstrate the acquisition pattern for the atelic predicate (*po-*)*bawić się*, 'to play' found in Inka's data (see Table 10).

(11) Inka (1;9) Inka **bawi-Ø** (się) klock-ami.
(Inka **play:IPFV-3:S** (REFL) block-P:INSTR)
('Inka **is playing** with blocks.')

(12) Inka (1;11) Halinka (się) (z) Inusi-ą **bawi-ł-a-Ø**.
(Halinka (REFL) (with) Inusia-INSTR **play:IPFV-PT-F-3:S**)
('Halinka **was playing/played** (with) Inka.')

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TABLE 10. *The age of the initial occurrence of tense–aspect forms and contrasts for Inka and the atelic predicate* (po-)bawi-ć się '*to play*'

Tense/aspect	Perfective	Imperfective
Past	5;1 się po-bawi-ł-a-m	1;11 bawi-ł-a (się)
Present	*Doesn't exist*	1;9 bawi-Ø (się)
Future	4;3 się po-bawi-ę	2;0 będzie-sz bawi-ć (się)

Type of contrast	Tense/aspect	Tense	Aspect
Emergence age	4;3	**1;11**	4;3

(13) Inka (2;0) **Będzie-sz** (się) **bawi-ć** (z) Inusi-ą?
(**AUX:be:FUT-2:S** (REFL) **play:IPFV-INF** (with) Inusia-INSTR ?)
('**Will you play** (with) Inka?')

(14) Inka (4;3) Ja przyjd-ę do ciebie, tylko **się po-bawi-ę** trochę.
(I come:PFV-1:S to you:GEN, only **REFL PFV-play-1:S** a little.)
('I will come to you, when **I have played** a little.')

(15) Inka (5;1) Nic **się po-bawi-ł-a-m**,
jutro na angielski-Ø id-ę, to znowu się nie po-bawi-ę.
(Nothing **REFL PFV-play-PT-F-1:S**,
tomorrow to English+lesson-ACC go:IPFV-1:S, then REFL not PFV-play-1:S).
('**I haven't played** at all,
tomorrow, I'm going to my English lesson and again I won't play.')

All of Inka's early sentences with '*to play*' were formed with the imperfective aspect. Having no early perfective forms, a perfective/imperfective (i.e. minimal aspectual) contrast of any kind was impossible. The past imperfective simply specifies that the activity occurred prior to speech time, i.e. 'she played'. Further contextual information would be needed to know if she was coding ongoing action in the past. The perfective form of the verb has a delimited meaning. In Sentences 14 and 15, Inka specifically limits the time frame of the activity with *trochę* 'a little' and *nic* 'none at all'. However, these examples of delimited meaning come along much later in acquisition, with the past perfective form being beyond the formal range of this study. The delimited meaning may be viewed as more advanced. The delimited meaning has also been found to be a late acquisition in experimental research on Russian (Stoll, 1998).

Inka's acquisition of the telic predicate *spaść/spadać*, 'to fall' was quite different as Sentences 16–18 and Table 11 indicate. Typically, for the telic pattern, the past and future perfective forms emerged at an early age, and

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TABLE 11. *The age of the initial occurrence of tense–aspect forms and contrasts for Inka and the telic predicate* spaść/spadać, '*to fall*'

Tense/aspect	Perfective	Imperfective
Past	1;4 spad-ł-a	*Not observed*
Present	*Doesn't exist*	3;1 spada-Ø
Future	1;5 spadnie-Ø	*Not observed*

Type of contrast	Tense/aspect	Tense	Aspect
Emergence age	3;1	**1;5**	*Absent*

the present imperfective was found later. Sentence 18 conveys a habitual (or timeless) meaning.

(16) Inka (1;4) **Spad-ł-a-Ø**.
(Fall:PFV-PT-F-3:S.')
('**She fell.**')

(17) Inka (1;5) **Spadnie-Ø**, spadnie-Ø!
('**Fall:PFV-3:S.**')
('**She's gonna fall.**')

(18) Inka (3;1) Nie lubi-ę, jak **spad-a-Ø**.
(Not like_IPFV-1_S, when **fall:IPFV-3:S**)
('I don't like it when **it falls**.')

Deictic temporal reference[5]

How does one know that past and future tense morphology specify deictic relations? In order to explore this question further, we have chosen to elaborate on a few of the first-occurrence examples from the telic predicate set for two children. In Sentence 19, Nina comments on an event that just happened, and her mother expands on the comment confirming her past reference. Even though the situation surrounding Sentence 20 involves pretend food and hypothetical guests, Nina uses the word, *until*, to frame the potential forthcoming visit. Furthermore, the subject of the sentence is someone other than the child herself. For Sentence 21, Nina does not have

[5] Considering the 6 children learning English their individual sets of 20 predicates, Audra Montgomery conducted a predicate tracking analysis restricted to *want to/wanna* (i.e. desire), *have to/hafta* (i.e. obligation), and *going to/gonna/will* (i.e. future) constructions. She found the age of emergence to be as follows: (1) *want to* 2;7, (2) *going to/will* 2;9, and (3) *have to* 3;0. The discourse context for future constructions often contained an anticipated event, and furthermore, anticipated events were sometimes part of desiderative discourse context as well.

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to retrieve a memory of the reindeer's change of locations as the object is in a prone position in the situation. Yet, she follows the obligatory context of her mother's past tense question rather than describing the current status of the object in focus. In Sentence 22, Nina predicts a pending event, and her mother expands utilizing the same future tense.

(19) Situation. Nina took a valentine with a rabbit out of an envelope.
Nina (2;2). That rabbit came out. Mother. What did he come out of?

(20) Situation. Nina starts putting plastic food back in the lunch box.
Nina (2;10) Until some people come and eat with us.
Nina (2;10). Some people are gonna come and eat some food with us # Mommy.

(21) Situation. A reindeer is lying on its side on the floor.
Mother. What happened to him? Nina (2;3). He falled down.

(22) Situation. Nina and her mother are building a tower.
Nina (2;3). They going to fall down. Mother. Think it's going to fall down.

In the situation surrounding Sentence 23, Basia observes that something is amiss in the forest, and she asks if the problem will be fixed in the future. Since she is asking a question about the potential action of a third party, she is not expressing her speech time intentions. Sentence 24 involves a negative question. In the light of speech time evidence, this question concerns something that didn't happen prior to speech time. At this phase of development, Basia was quite capable of describing the speech time condition of the toy as 'broken' or stating that she didn't have a toy with which to play. Instead, she used a past tense form. In Sentence 25, Basia states what she expects her grandmother to do, and in Sentence 26, she wonders if her aunt has already done something similar. It is our contention that these sentences express contrasts in deictic relations. In consort with these relations, the sentences with past tense forms are bounded (explicitly in Polish) and the sentences with future tense forms contain at least a degree of possibility, i.e. these forms have aspectual and modal values as well as deictic values.

(23) Situation: Basia sees a place in a forest where the trees have fallen down.
Basia (2;7). Co to tatusi-u, będ-ą naprawi-a-l-i las-Ø?
(what it dad-VOC, AUX:be:FUT-3:P fix-IPFV-PP-VIR forest-ACC ?)
('What's that dad, are they going to fix the forest?')
Basia. Zepsuł się tu las?
('Has the forest got broken here ?')

(24) Basia (2;8). I czemu mi nie naprawi-ł-a-ś?
(and why me:DAT not fix:PFV-PT-F-2:S)

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('Why haven't you fixed (it) for me?')
Basia. Jak będę jeździ-ć psem?
('How am I going to play with my dog?')

(25) Basia (1;10). Baba posia.
('Grandma has left.')
Basia. Cucuś kupi-Ø baba.
(sweets buy:PFV-3:S grandma:NOM)
('Grandma will buy sweets.')
Mother. Tak, baba poszła kupić Basi cucuś.
('Yes, grandma has gone out to buy Basia sweets.')

(26) Basia (1;10). Situation: Aunt H. has been shopping, Basia runs to her and asks:
Kupi-ł-a-Ø Anta cucuś ?
(buy:PFV-PT-F-3:S Anta sweets)
('Has Anta bought sweets?')
Basia. Oj, Anta zapomniała dziecku kupić cucu.
('Anta forgot to buy sweets for the child.')

DISCUSSION

Criteria for acquisition

Arguably, the best-known data pertaining to the acquisition of verb morphology is Roger Brown's (1973: 271) data on the order of the acquisition of 14 grammatical morphemes of English. The criterion used to obtain this data was the percent correct in obligatory context (see Brown, 1973: 225). Obligatory context means the linguistic/non-linguistic context in which the fluent speaker would use the form. A morpheme was viewed as acquired if the percentage reached 90% correct. While we didn't use this criterion, our findings on English, reported in Table 6a, support the general picture seen in Brown's Figure 14 as 'present' progressive without the auxiliary was the earliest to emerge and simple past was found later.

Some concept of frequency has also been widely adopted as a criterion for acquisition, e.g. Shirai (1998: 287) defined 'productive' as 'more than 5 different verb types during a particular month'. In English (Shirai, 1991) and in Japanese (Shirai, 1998), Shirai found that the early 'productive' forms were past tense (i.e. *-ed*/*-ta*) achievements and progressive (i.e. *-ing*)/durative (i.e. *-te i-*) activities. The data in Tables 6a and 7a confirm this finding, and the pattern is especially obvious for Polish. In Polish, the earliest and most frequent forms to emerge are telic predicates (e.g. achievements and accomplishments) in the past perfective and atelic predicates (i.e. activities) in the present imperfective. It is conceivable that these children have acquired the Li-Shirai prototypes. However, Tables 7a

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and 8a also show that at almost the same age and with very similar frequency, the Polish children also produce perfective future forms of telic predicates. The imperfective future form of atelic predicates is also observed quite frequently, but it emerges a few months later than the present tense form owing to its paraphrastic properties. Instead of isolated concepts such as the 'perfective achievement' and the 'imperfective activity' the data reveal the early phase of a tense–aspect system. The child's system is multi-dimensional, and the dimension of tense specifies deictic relations.

In order to understand the acquisition of tense and grammatical aspect, we argue that one needs to carry their investigation beyond the individual tense–aspect forms, and take contrast into consideration. When contrast is considered, contrary to conventional wisdom, the most consistent finding in this research is that tense contrasts are acquired before aspect contrasts. However, this result should not be interpreted as evidence for an acquisition sequence because lexical and grammatical aspect clearly influence the way in which contrasts emerge. The child is processing the aspectual dimensions simultaneously with deictic relations.

Contrast patterns

As we pointed out in the results section, the structure of the tense–aspect system of a language shapes the pattern in the acquisition of morpho-syntactic contrasts. When the semantic structure of the predicates is controlled, in Polish, tense contrasts are quite early as compared to aspect or tense–aspect contrasts (see Table 9). The information in Tables 7a and 8a is needed to understand this facet of the pattern. Tense contrasts are relatively early because of the interaction of telicity and grammatical aspect in a closure language. Given an atelic predicate, the present imperfective form is early and probable, and the earliest contrast is likely to remain within the imperfective aspect, i.e. imperfective past or future. In the example in Table 10, the initial contrast was between present versus past. Given a telic predicate, the past perfective form is early and probable, and the next form to emerge is likely to be the future perfective as seen in the example in Table 11.

The acquisition pattern is much different for children learning English. The impact of aspect on the acquisition pattern within a dynamicity language is different than a closure language. Tables 7a and 8a show that three tense–aspect forms emerged at a similar age with similar likelihood, i.e. present progressive, non-progressive (or simple) past and non-progressive future. The pattern was relatively similar for the telic and the atelic predicates. In English, the non-progressive past and future have the broadest semantic range. In contrast to Polish past perfective, the non-progressive past can be used to refer to events that are contiguous in time, e.g. *Elizabeth*

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toddled along, pointed at the flowers, and babbled something, and it can be used to refer to prior states without an inchoative meaning, e.g. *Elizabeth knew one word*. For the child learning English, the non-progressive past represents the most neutral access to locating the focal event prior to speech time. In contrast, past progressive imposes additional constraints on past reference. Not only does the progressive require internal perspective, it also specifies on-going action. As a consequence of having unconstrained access with the non-progressive past and constrained access with the past progressive, children use the non-progressive past in the early phase of the acquisition of tense. While specifying the continuous contour of prior events is late and improbable, specifying the continuous contour of subsequent events is absent entirely in early child English. Therefore, in English as contrasted with Polish, there is only one way to express a minimal aspectual contrast and that is non-progressive versus progressive past. As a result of the overall organization of the tense–aspect system of English, aspect contrasts emerge at a relatively late age.

There is another variable that contributes to the acquisition of past tense in these two languages, and it concerns a morphological difference. In Polish, there is only one way to form past tense, and that is with the suffix –ł[w] with only a minor variation. The form to function mapping is almost one to one. While children learning American English are unlikely to produce present or past perfect tenses during the investigated phase of acquisition, these forms are still part of the input language. The past progressive is a periphrastic form and tense must be fused with the auxiliary verb along with person and number, i.e. *She/he was* VERB-*ing* versus *You/they were* VERB-*ing*. At the morphological level, past progressive is more complex than non-progressive (or simple) past. In contrast, in Polish, perfective and imperfective past tenses are formed in the same transparent manner. Of course, this fact is independent of interactions between lexical and grammatical aspect.

Comprehension and contrast

It has often been assumed that parent–child interaction data is more sensitive to acquisition than the comprehension data obtained from experimental intervention. However, it depends on the criterion for acquisition. When we consider contrast as a measure of acquisition, we find tense and aspect emerging between 2;3 and 3;6 (see Tables 4 and 9). This is approximately the age range of the youngest group of children in numerous crosslinguistic studies of comprehension, e.g. Weist, Wysocka & Lyytinen (1991). In the typical study conducted by Weist and his Polish and Finnish colleagues, children were required to comprehend minimal tense and aspect contrasts, e.g. simple past versus past progressive, and in general, the youngest

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groups of children could do so. The experiment has the advantage that the investigator controls the predicate that will enter into a contrast, and it is possible to observe that the child's capacity to understand a contrast depends on the semantic structure of the predicate (see also Stoll, 1998).

Theoretical alternatives

At the most fundamental level of consideration, an adequate theory morpho-syntactic acquisition must include the concept of aspect. Wexler's (1998) theory does not do so, and this omission is not uncommon among P&P acquisitionists (e.g. Weissenborn, 1994). This research shows that the acquisition of the syntactic concepts of tense and aspect required a semantic–syntactic interface. Contrary to Meisel's (1994) proposal, semantic principles are required. Furthermore, contrary to Sano & Hyams's (1994) contention, children learning English do not analyse past tense as perfective aspect, and there is a considerable difference between the acquisition patterns between English which does not have perfective aspect and Polish which does. The results of predicate tracking support the idea that children construct a multi-dimensional system of temporal reference. Weist (1986) described this early temporal system as an event time system. On the one hand the system is less complex than reference time systems that characterize latter development and the adult system, yet, on the other hand, the knowledge underlying the event time system does not reduce to a pair of prototypes as Li & Shirai (2000) have alleged. From our perspective, tense and aspect represent ways of modifying elements of clause structure, and RRG provides a hypothesis regarding the form of such a structure. When the child uses a past form in contrast to a future form, they are locating an entire clause relative to speech time. Furthermore, the child's capacity to change the form of the verb goes beyond tense and/or aspect. At a similar phase of acquisition, there is evidence that the concept of agreement is being acquired (e.g. Weist, 1990; Meisel, 1994; Wexler, 1998). Agreement also involves elements of clause structure. We would argue that the acquisition of agreement involves different processes than the acquisition of tense or aspect, i.e. it does not implicate a more or less economical functional category in an X-bar projection. Furthermore, regarding connectionist models, these processes cannot be understood as just another morpheme-to-morpheme connection.

CONCLUSION

Children acquire a tense–aspect system in which tense codes deictic relations and aspect codes the temporal contour of the situation in focus. While children are discovering the relationship between the verb morphology and

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these concepts, they are also constructing representations of predicate structure. These representations contain information pertaining to lexical aspect. Telicity is one of those properties. The aspectual properties of predicate-argument structure influence the way in which the predicates enter the tense–aspect system. Rather than an end in themselves, the frequency patterns, which have been the topic of many investigations, are symptomatic of this acquisition process. The semantic–syntactic interface is an integral component of the acquisition process. Some combinations of lexical aspect and grammatical aspect are more natural than other combinations, e.g. telic predicates and bounded temporal contour and atelic predicates and unbounded contour. These combinations emerge at an early phase, but not at the expense of tense. Children make tense contrasts within the context of these natural combinations, e.g. past perfective (or non-progressive past) versus future perfective (or non-progressive future). The implication for conceptual development is that two-year-old children, who can think about events that are remote in time and space, can construct a linguistic system that enables them to talk about such temporal relations. The implications for linguistic development are: (1) a slot-filling grammar (*cf.* Tomasello, 2000*a*, *b*) does not account for the linguistic competence of the typical three-year old child who is contrasting tense and aspect, (2) the child who's tense–aspect acquisition patterns are shaped by lexical aspect is not functioning with an autonomous syntax, and (3) children learning English (or Polish) don't mistakenly analyse tense morphology as grammatical aspect to satisfy the principle of economy.

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APPENDIX A

PAWLAK – WEIST LEXICAL ASPECT ASSIGNMENT RULES

States (STA)
STA #1: The imperfective (ipfv) form cannot occur as a complement of *namówić* 'persuade'.
STA #2: The perfective (pfv) form has ingressive meaning.
STA #3: States do not occur with a set of adverbs including *ostrożnie* 'carefully'.

Activities (ACT)
ACT #1: The ipfv present entails the perfective past.
ACT #2: Sentences with *prawie* 'almost' mean that the action did not start.
ACT #3: Pfv activities do not take *w godzinę* 'in an hour' like complements.

Achievement (ACH)
ACH #1: As complements of *przestać* 'stop', *skończyć* 'finish' and *zacząć* 'begin', ipfv achievements have iterative meaning.
ACH #2: Pfv achievements cannot be used with the adverb *stopniowo* 'gradually'.
ACH # 3: Present ipfv achievements have a habitual interpretation.

Accomplishment (ACC)
ACC #1: As the complement of *przestał* 'stopped', the ipfv infinitive does not entail the pfv past.
ACC #2: When the pfv form is used with the preposition w 'in', it has the meaning that the process took place through the interval.
ACC #3: Pfv accomplishments take *w godzinę* 'in an hour' like complements.

SHIRAI & ANDERSEN'S THREE STEP CATEGORIZATION RULES

Step 1: State or nonstate.
Does it have a habitual interpretation in simple present tense?
If no, State (e.g. *I love you*). If yes, Nonstate (e.g. *I eat bread*) → Go to Step 2.

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Step 2: Activity or nonactivity.
Does 'X is Ving' entail 'X has Ved' without an iterative/habitual meaning?
In other words, if you stop in the middle of Ving, have you done the act of V?
If yes, Activity (e.g. *run*). If no, Nonactivity (e.g. *run a mile*) → Go to Step 3.

Step 3: Accomplishment or achievement.
[If test (a) does not work, apply test (b), and possibly (c).]
a). If 'X Ved in Y time (e.g. 10 minutes)', then 'X was Ving during that time.
If yes, Accomplishment (e.g. *He painted a picture*.)
If no, Achievement (e.g. *He noticed a picture*).
b). Is there ambiguity with *almost*?
If yes, Accomplishment (e.g. *He almost painted a picture* has two readings: he almost started to pain a picture/he almost finished painting a picture.)
If no, Achievement (e.g. *He almost noticed a picture* has only one reading.)
c). 'X will VP in Y time (e.g. 10 minutes)' = 'X will VP after Y time.'
If no, Accomplishment (e.g. *He will paint a picture in an hour* is different from *He will paint a picture after an hour*, because the former can mean that he will spend an hour painting a picture, but the latter does not.)
If yes, Achievement (e.g. *He will start singing in two minutes* can have only one reading, which is the same as in *he will start singing after two minutes*, with no other reading possible.)

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