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Citation: Dabrowska, Ewa (2008) The later development of an early-emerging system: the curious case of the Polish genitive. *Linguistics*, 46 (3). pp. 629-650. ISSN 0024-3949

Published by: De Gruyter Mouton

URL: <http://dx.doi.org/10.1515/LING.2008.021>  
<<http://dx.doi.org/10.1515/LING.2008.021>>

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# The later development of an early-emerging system: the curious case of the Polish genitive\*

EWA DĄBROWSKA

## *Abstract*

*Eighty Polish children and adolescents aged from 6 to 18 participated in a nonce word inflection experiment testing their productivity with the two genitive masculine endings, -a and -u, and their sensitivity to the distributional and semantic factors determining the choice of ending. All participants were able to use at least one ending productively, although the youngest children did not do so consistently, confirming earlier research which suggests that children are only partially productive with these inflections. In the youngest group, the choice of ending was not influenced by either semantic or distributional cues. Participants began to show sensitivity to distributional cues from about ten years of age; the strength of this sensitivity continued to increase right up to age 18. However, only a few of the oldest participants were also sensitive to the semantic factors determining the choice of ending. Another unexpected finding was a sharp increase in the number of gender errors around age 14, suggesting that the system might be undergoing a reorganization at this late age. The experiment also revealed considerable individual differences in the rate of development as well as the actual generalizations that learners extract. The results challenge the widely-held view that learners' mental grammars reach a steady state in early or middle childhood, and that speakers of the same dialect acquire the same set of rules.*

## **1. Introduction**

By the age of 5 or so, virtually all children are fluent and competent speakers of their native language who are able to produce and understand a variety of complex structures. They may still have problems with some particularly intricate or irregular aspects of grammar and do not always reliably supply the target form in experimental settings, but their

spontaneous speech is by and large adult-like, and it is generally accepted that their mental grammars have reached a “steady state” and cease to change (Chomsky 1962: 529; Crain and Lillo-Martin 1999: 8; O’Grady 1997: 1).

However, adultlike performance doesn’t necessarily imply an adultlike grammar. As noted by Bowerman (1982a, 1982b), Karmiloff-Smith (1992), and others, in the course of language acquisition, periods of relatively accurate performance are sometimes followed by periods marked by high error rates, after which learners return to adultlike forms. It is generally agreed that such apparent regressions are a mark of reanalysis or reorganization, and hence that the younger learner’s grammatical system differs significantly from that of a mature language user.

More recently, Tomasello (2000, 2003) has argued that although young children may produce structures which sound fairly mature, the grammars underlying these structures are very different from adult grammars. Young children’s linguistic creativity, Tomasello argues, is fairly constrained, and relies primarily on low-level lexically specific schemas. As their linguistic systems develop, these initial item-based patterns evolve into more abstract representations which allow children to produce more varied structures.

The developmental changes studied by the researchers named above occur at quite an early stage of development. According to Tomasello, the more abstract representations characteristic of adults develop in the third or fourth year of life (at least for the basic syntactic constructions which he investigated), and the reorganizations studied by Bowerman and Karmiloff-Smith occurred between age 4 and 6.

This article will add to the body of research suggesting that young children’s grammars may be qualitatively different from those of mature speakers even when children consistently produce adultlike forms. It will show that important changes in the linguistic system can occur substantially later than in the cases mentioned above, about age ten, or even in the teens. Finally, it will investigate another corollary of the fact that similar behavior can be produced by different mental mechanisms — namely, the possibility that mature speakers of the same dialect may be using a different set of rules to produce similar or identical output.

The specific linguistic subsystem which will be investigated is the Polish genitive inflection, and in particular, genitive marking on inanimate masculine nouns. This particular inflectional subsystem was chosen because it is complex and highly irregular, and hence poses a considerable challenge to the language learning mechanism. Moreover, because the inflection has several different formal markers, it is possible to investigate the factors

determining the choice of marking, and thus glean some insights into the nature of the generalizations that learners extract from the input.

Nouns occurring in grammatical contexts requiring the genitive case normally take one of three endings, *a*, *-u*, and *-y* (or its variant *-i*).<sup>1</sup> The most important factor determining the choice of ending is gender: feminine nouns nearly always take *-y* or *-i*; neuter nouns usually take *-a*; and most masculine nouns take *-a* or *-u*. For most nouns, gender can be reliably predicted from the phonological form of the nominative: the vast majority of masculine nouns end in a consonant; most feminine nouns end in *-a*; and neuter nouns nearly always end in *-o*, *-e*, or *-ę*. There are, however, exceptions to these rules: some masculine nouns referring to human males end in [a], and some feminine nouns end in a so-called “soft” consonant (see Section 3.2).

The distribution of the two masculine endings, *-a* and *-u*, is determined partly by semantic factors, in that nearly all animate masculines take *-a*. However, there are no reliable rules determining the choice of *-a* or *-u* with inanimate masculines, although there are some broad regularities (see Westfal 1956; Bodnarowska 1962; Kottum 1981). The *-a* ending is strongly associated with some derivational suffixes (e.g., *-acz*, *-ak*, *-ek*, *-arz*, *-nik*, *-ec*) and stems ending in a palatalized consonant; on the other hand, stems ending in [m], [st], [ʃt], [ft] and the suffixes *-ot* and *-izm* ‘prefer’ *-u*. The most useful and reliable criteria are again semantic: nouns designating small, easily manipulable objects, body parts and units of measurement usually take *-a*, while most nouns designating substances, large immovable objects, locations, abstract concepts and collections of objects require *-u*.

How do learners cope when confronted with such an irregular system? Previous research on the acquisition of the genitive inflection has produced somewhat contradictory findings. Studies which used spontaneous speech data suggest that the genitive inflection is acquired very early. Dąbrowska (2001) found that children begin to use correctly inflected nouns in grammatical contexts which require the genitive between the ages of 1;4 and 1;7, and reliably supply the correct inflection from about 1;9–1;11. Although all children occasionally overgeneralize some of the endings, such errors are fairly rare, accounting for 0.5–3.3% of the explicitly marked genitives during the period from the emergence of the genitive until age 5. Smoczyńska (1985) also reports that the genitive singular is acquired early and that overgeneralization errors are infrequent.

These findings are partially supported by an experimental study by Dąbrowska (2005), who elicited the genitive form of both familiar and unfamiliar nouns. In the control (real-word) condition, the proportion of target responses ranged from 87% in two-and-a-half-year-olds to 99% in

the ten-year-olds. Most responses coded as “nontarget” were simply failures to respond at all: when the children did attempt to respond, they nearly always supplied the target form. Thus, in the control condition, the levels of provision of the target form were comparable to those observed in naturalistic studies. Dąbrowska also found that 78% of two-and-a-half-year-olds were productive with *-a*, the more frequent masculine ending, and 22% were also productive with *-u*, where “productivity” was defined as the ability to inflect at least one nonce word out of eight. However, the children did not consistently use the genitive masculine ending with nonce words. The youngest children in the experiment supplied one of the target genitive endings in 42% of the opportunities, and used the citation form (i.e., the nominative) in a grammatical context requiring the genitive 37% of the time. The proportion of nominative responses declined very gradually, still accounting for 21% of the children’s responses at age 6 and 11% at age 10. Dąbrowska argues that the failure to reliably inflect nonce words cannot be attributed to performance factors, and suggests that children may initially extract phonologically specific low-level schemas rather than abstract rules which apply across-the-board.

Dąbrowska (2005) also found that even at age 10 children are not sensitive to one of the most reliable semantic cues to the choice of ending for inanimate masculine nouns, namely, the contrast between nouns designating small objects, which usually take *-a*, and nouns referring to substances, which are strongly associated with *-u*, although they did appear to be able to use another semantic cue, namely animacy. This is surprising, since the spontaneous speech research suggests that Polish children reliably supply the correct genitive ending with familiar nouns from an early age. To be able to do this, they must either store the correct endings of all inanimate masculine nouns (or at least all inanimate masculine nouns which take the less frequent ending), or they must make use of some other cue in order to determine which ending an unfamiliar noun is likely to take. A possibility that comes to mind is the grammatical distinction between count and mass nouns.

Count and mass nouns occur in different constructions. Count nouns can take plural affixes and co-occur with numerals, while mass nouns normally do not; on the other hand, mass nouns can take quantifiers such as *dużo* ‘lots’, *mало* ‘few, little’, and *trochę* ‘some’ when used in the singular, while count nouns normally do not. The distinction is very strongly correlated with referential status: nouns designating substances are almost always mass, while nouns designating objects are usually count. The following experimental study explores the possibility that learners may be picking up on grammatical rather than referential cues. In the experiment, nonce words were presented in three language

conditions: a Count context, with the numeral *jeden* ‘one’ after a negated verb (which requires the genitive case); a Mass context, with the quantifier *trochę* ‘some’, and a Neutral context, as the object of a negated verb. In addition, the nonce words from the Count and Mass conditions were also presented in a neutral context in the presence of a referent (either an object or a substance) in order to determine whether the results of Dąbrowska’s study could be replicated with a different set of words and with older participants. Thus there were five conditions: Count, Mass, Object, Substance, and Neutral.

## 2. Method

### 2.1. *Participants*

The participants were six-, ten-, fourteen- and eighteen-year-olds recruited from two schools in the Gdańsk area (20 in each age group). All were native speakers of Polish and all spoke standard Polish.

### 2.2. *Materials*

Three sets of nonce words were compiled, each comprising 13 items: 6 masculines, 4 feminines and 3 neuters. The feminine and neuter words were used as practice items and controls. All words had the phonotactic structure of real Polish words and gender-typical offsets (*-a* for feminines, *-o* or *-e* for neuters, and a hard consonant for masculines).

The materials used in the referent-bias part of the experiment included 13 unusual objects and 13 unfamiliar substances. The substances differed in color, smell, and consistency and were presented in identical transparent plastic tubes. All materials were pre-tested with three adult informants to ensure that there was no simple label (apart from a superordinate term such as *liquid* or *tool*) that could be used to refer to the object or substance.

A list of all the nonce words and more detailed descriptions of the materials are to be found in the Appendix.

### 2.3. *Procedure*

Each participant was tested in two separate sessions. In the first session, participants completed the Count, Mass, and Neutral conditions. The

second session was administered 2–3 weeks later by the same experimenter and included the remaining two conditions. This order of testing was thought to be less contaminating than the opposite. In session 1, participants were exposed to 39 nonce words with no referents in rapid succession, and hence were unlikely to remember their own responses 2 weeks later; but if they were presented with the referent during the first session, they might have remembered the meanings of some of the words.

2.3.1. *Session 1: Count, Mass, and Neutral conditions.* The younger participants (six- and ten-year-olds) were presented with the test sentences in the context of three “pretend games” involving visitors from Mars. In one game (corresponding to the Count condition), the child was asked to imagine that he/she was a Martian preparing for a voyage to another planet. The ship’s crew would need various supplies during the voyage, and the child’s task was to tell an imaginary mission commander what was required, following the experimenter’s cues:

- (1) Experimenter: Potrzebny                    nam  
   necessary:MASC:NOM 1PL:DAT  
   jest   X  
   be:3SG:PRES   X:NOM  
   ‘We need (an) X.’  
       Child:                   Nie mamy           ani   jednego                                   X:GEN.  
   not have:1PL   not   one:GEN:MASC   X:GEN  
   ‘We haven’t got a single X’

In another game (the Mass condition), the child’s task was to ask another imaginary Martian for various medical supplies for the spaceship, with the experimenter indicating what was needed:

- (2) Experimenter: Na ból                    głowy                    najlepszy  
   for pain:ACC   head:GEN   best:NOM:MASC  
   jest   X.  
   be:3SG:PRES X:NOM  
   ‘If you’ve got a headache, X is best.’  
       Child:                   Daj                   mi                   trochę   X:GEN.  
   give:IMP   1SG:DAT   some   X:GEN  
   ‘Give me some X:GEN.’

In the third game (the Neutral condition), the child was asked to imagine that he/she was a shop assistant and the experimenter a Martian attempting to buy Martian products in a terrestrial shop. The Martian products were uniformly unavailable, leading to a series of exchanges of the following form:

- (3) Experimenter: Jest X?  
 be:3SG:PRES X:NOM  
 'Is there an/any X?'  
 Child: Nie, nie ma X:GEN.  
 No not have:3SG:PRES X:GEN  
 'No, there isn't any X.'

To provide some variety, the experimenter occasionally insisted that a particular item was absolutely necessary (in the first two games) or expressed disappointment or incredulity that the shop did not carry that particular line (in the last game).

If the child did not respond, he/she was prompted with the test sentence with the final word (i.e., the nonce noun) omitted. If the child still did not respond, the experimenter repeated the original prompt containing the nonce word, the beginning of the test sentence, and the first syllable (or, for longer words, the first two syllables) of the nonce noun. Each condition began with two practice items (one feminine and one neuter), which were modeled for the child if necessary.

The older participants (fourteen- and eighteen-year-olds) completed a written test which contained exactly the same sentences as the oral version. The nonce word in the lead-in sentence (corresponding to the experimenter's prompt in the oral version) was printed in boldface; and the test sentence contained a blank in which the participants were asked to write the form of the nonce word required by the grammatical context in which it occurred. The two practice items given to the younger children were presented as models.

There were three versions of the test, with nonce words from each of the three sets assigned to a different condition in each version (e.g., words from the first list appeared in the Count condition in version A, the Mass condition in version B, and the Neutral condition in version C). Within each version, the order of presentation of the three conditions was counterbalanced across participants. Items within each condition were presented in the same order to all participants, with the masculine nouns interspersed with the feminine and neuter fillers.

2.3.2. *Session 2: Object and Substance conditions.* This part of the experiment consisted of two phases. In the training phase, the participant was presented with an object or substance and the corresponding label in a presentative construction:

- (4) Zobacz, to jest X.  
 look this be:3SG:PRES X:NOM  
 'Look, this is (an) X.' (X can be either mass or count).



If the stimulus referred to a substance, the experimenter opened the tube, thus making it clear that the word referred to the contents and not the container. The participant was encouraged to guess what the object or substance was for, and the experimenter provided feedback. This was followed by presentation of the remaining 12 objects and substances.

In the testing phase, the participants were invited to play a “hiding game”. The experimenter produced an object or substance and said

- (5) Jest X!  
 be:3SG:PRES X:NOM  
 ‘Here’s the X!’

The child’s task was to hide the object or substance in a bag and say

- (6) Nie ma X:GEN!  
 not has X:GEN  
 ‘The X is gone!’

If the child did not respond, he/she was prompted with the first two words of the sentence (*Nie ma . . .*), and then with the first two words followed by first syllable of the test item (or the first two syllables for longer words). Thus, the child was given three chances of producing the target form; on the last attempt, he/she merely had to supply the final syllable of the test item. As in the first session, the testing phase began with two practice items (one feminine and one neuter) which were modeled for the child if necessary.

There were three versions of the test corresponding to the three versions used in the first session. Noun which occurred in the *-a*-biasing (i.e., count) context in part 1 were associated with *-a*-biasing referents (i.e., objects) in part 2, while noun which occurred in the *-u*-biasing linguistic context in part 1 were given *-u*-biasing referents in the second part of the experiment. Nouns which occurred in the Neutral context in part 1 were omitted. One third of the participants were tested with each version (the same for each participant, so that participants who were tested with version 1 in the first session were tested with the corresponding version in the second session).

#### 2.4. Coding

The participants’ responses to masculine stimuli were coded as follows:

- Target *-a*
- Target *-u*

- Zero: failure to inflect, i.e., use of the citation form (the nominative) instead of the genitive;
- Feminine: use of the feminine ending (-y/-i) instead of the masculine;
- Other: substitution of a familiar word, use of a plural ending, or failure to respond.

Responses to feminine and neuter stimuli were coded as target (correct) or nontarget.

### 3. Results and discussion

The following discussion is divided into five sections. Section 3.1 compares the children's ability to supply the target endings with masculine, feminine and neuter nouns. The remaining four sections are devoted to a detailed analysis of performance on masculine nouns. Section 3.2 provides data on the distribution of target and nontarget responses in each age group. Sections 3.3 and 3.4 discuss the development of sensitivity to the linguistic context (count vs. mass) and referential properties of the noun (object vs. substance). Finally, Section 3.5 provides data on individual speakers' preference for *-a* or *-u*, and explains what these differences reveal about their mental grammars.

#### 3.1. *Comparison of performance on masculine, feminine, and neuter nouns*

To contextualize the following discussion of the development of knowledge about the genitive masculine inflection, it will be useful to compare the children's ability to supply the target ending with masculine nouns (for which there is no obvious regular ending) with performance on feminine and neuter nouns, both of which have a clear default (-y/-i and *-a* respectively). The relevant data is presented in Table 1. As we can see, while all age groups were productive with endings of all three genders, the number of target responses continued to increase throughout childhood and adolescence, rising from an overall mean of 75% at age 6 to 93% at 18. Moreover, in spite of the irregularity of the masculine inflections, performance on masculine nouns was no worse than on feminines, and considerably better than on neuters. This suggests that regularity as such is not a reliable predictor of productivity. (For further discussion and converging evidence, see Dąbrowska and Szczerbiński 2006).

Table 1. *Proportion of target responses in the experimental condition (masculine nonce words) and the control conditions (feminine and neuter nonce words)*

Age	Masculine (SD)		Feminine (SD)		Neuter (SD)	
6	72	(30)	87	(16)	65	(30)
10	94	(6)	92	(10)	75	(25)
14	88	(14)	88	(15)	73	(25)
18	95	(8)	96	(9)	89	(13)

Table 2. *Responses types (in %) by age group*

Age	<i>-a</i> (SD)	<i>-u</i> (SD)	Total target (SD)	Zero (SD)	Femin. (SD)	Other (SD)
6	37 (30)	35 (29)	72 (30)	26 (30)	1 (3)	1 (2)
10	32 (34)	62 (34)	94 (6)	3 (5)	2 (3)	1 (2)
14	40 (24)	48 (25)	88 (14)	1 (4)	10 (14)	1 (2)
18	37 (25)	59 (25)	96 (8)	0 (1)	4 (8)	0 (1)

### 3.2. *Development of masculine inflections*

All participants were productive with the *-a* ending (i.e., used it at least once in the course of the experiment) and 96% were productive with *-u*. The three children who did not use *-u* at all were all six-year-olds boys. Two of the three were only very weakly productive with *-a*, inflecting only 1 and 4 masculine words (out of a total of 30). This is well below the mean number of gender-appropriate responses for their age group (21.7) and suggests that they were slow developers, and hence it is likely that they have not yet acquired productive use of the other inflection, which is learned later (Dąbrowska 2005). The third boy was the most consistent *-a* user of all participants, supplying this ending with all thirty nonce words. It is impossible to determine whether this was a compensation strategy due to failure to generalize the other ending, or whether he was productive with both endings, but consistently chose *-a* with the test words. In any case, it is clear that, by age 6, the vast majority of learners are productive with both endings.

Table 2 summarizes the number of *-a*, *-u*, zero, feminine, and other responses to all 30 test items across age groups. Since there were large differences in variance for zero and feminine responses, the data were analyzed using nonparametric tests (Kruskal-Wallis and Mann-Whitney). All reported significance levels have been corrected for multiple comparisons.

There were no significant differences between groups in the number of *-a* responses ( $\chi^2 = 2.619$ ,  $df = 3$ ,  $p = 0.454$ ). The other response types, however, did vary between groups.

For *-u*,  $\chi^2 = 9.773$ ,  $df = 3$ ,  $p = 0.021$ ; however, pairwise comparisons showed no significant differences, although the difference between the six- and ten-year-olds approached significance ( $p = 0.060$ ). Given that the Kruskal-Wallis did indicate that age was a significant factor, the latter results are attributable to lack of power rather than the absence of an effect. This is confirmed by the results of a second analysis using parametric tests, whose assumptions were met in this case. A one-way ANOVA showed an effect of age ( $F(3, 76) = 3.477$ ,  $p = 0.020$ ), with post-hoc tests (Games-Howell) indicating a significant difference between six- and eighteen-year-olds ( $p = 0.048$ ); the difference between six- and ten-year-olds approached significance ( $p = 0.057$ ). There is, then, a slight increase in the frequency of *-u* responses after age 6. However, the effect is small and attributable to the fact that some of the six-year-olds were probably not productive with *-u* at all: if the three children who did not use *-u* at all are excluded from the analysis, the differences between groups disappear.

For zero responses, the effect of age was much larger ( $\chi^2 = 31.602$ ,  $df = 3$ ,  $p < 0.001$ ). Post-hoc tests showed that the youngest group differed significantly from the other three ( $p \leq 0.001$ ); there were no other significant differences. The relatively high proportion of zero responses among the six-year-olds (26%) is similar to the results reported by Dąbrowska (2005), confirming that such errors are phased out over a long period of time. However, the corresponding figure for ten-year-olds, 3%, is considerably lower than that obtained in the earlier study (11%). This discrepancy may be attributable to a different perception of the experimental situation, due partly to the identity of the experimenter and partly to the materials used in the study.<sup>2</sup>

Finally, the last analysis revealed age effects in the number of feminine errors ( $\chi^2 = 15.838$ ,  $df = 3$ ,  $p = 0.001$ ); such errors accounted for 10% of the fourteen-year-olds' responses, and were very rare in all other age groups. It is the feminine errors which are responsible for the slight dip in performance observed in the fourteen-year-olds (see Table 1).

A possible explanation for this apparent regression is the emergence of a productive schema for the so-called consonantal feminine nouns. As indicated earlier, the gender of most Polish nouns can be reliably predicted from the phonological form of the nominative: the vast majority of feminine nouns end in [a], while masculine nouns usually end in a consonant. There is, however, a small group of feminine nouns which end in a "soft"

consonant. The correct generalizations about the latter may be particularly difficult to acquire for two reasons. First, because the class is fairly small, learners require a considerable amount of time in order to acquire enough exemplars to generalize over. Secondly, the “soft” consonants do not form a phonologically natural class: they include the “phonetically soft” (i.e., palatal or palatalized) consonants ([ç], [z̥], [t̥ç], [d̥z̥], [ɲ], and [j]), the so-called “functionally soft” consonants which were once soft but have become depalatalized ([ʃ], [ʒ], [f̥s̥], and [t̥ʃ]), as well as [v] and [l]. Because of this, learners may have problems delimiting the precise class of nouns to which the feminine endings apply. The nonce words used in the experiment all ended in a “hard” consonant, and were therefore unambiguously masculine; however, if the participants had formed an incorrect generalization about feminine nouns ending in a consonant, they could overgeneralize the feminine endings to some masculine stems.

Thus, the unexpected appearance of feminine errors in the fourteen-year-olds may signal a late reorganization of the case-marking system. Six- and ten-year-olds do not make this error because they have learned to add masculine suffixes to nouns ending in a consonant and feminine suffixes to nouns ending in *-a* or *-i*. They also know that some nouns ending in a consonant (such as *noc* ‘night’, *miedź* ‘copper’, *stal* ‘steel’) take feminine endings, but these are learned as lexical exceptions. Sometime between age 10 and 14, children begin to use the rule for feminine consonantal nouns productively; at this point, they have not yet determined exactly when the rule can be applied, and as a result, occasionally overgeneralize it to nouns ending in a hard consonant. By 18, most learners have learned both the rule and its domain of application, and hence feminine errors disappear.

### 3.3. *Sensitivity to the linguistic context*

In this and the following sections, I examine the effect of linguistic context (count v. mass) and referential properties of the noun (object v. substance). As explained in the introduction, nouns designating small, easily manipulable objects (which are often used in count-noun constructions, e.g., with numerals) tend to take the *-a* ending, while nouns designating substances (which are often used in mass-noun constructions such as *trochę N* ‘some N’) tend to take *-u*. If speakers are sensitive to these regularities, they should prefer *-a* with nonce nouns which designate objects or occur in typical count contexts and *-u* with nouns which designate substances or occur in typical mass contexts.

Table 3. *-a* responses as a proportion of all target responses in the Count and Mass conditions

Age	Count (SD)	Mass (SD)	<i>t</i>	<i>p</i>
6	62 (36)	54 (44)	0.64	0.532
10	45 (41)	32 (42)	2.49	0.022
14	56 (40)	25 (28)	4.18	0.001
18	68 (31)	23 (33)	6.06	0.000

The effect of linguistic context was analyzed using a split-plot ANOVA with age as the between-subject factor (4 levels) and context as the within-subjects factor (2 levels). The dependent variable was the number of *-a* responses as a percentage of all target responses. This measure is independent of fluctuations in the number of zero and feminine responses, thus allowing meaningful comparisons across age groups.

There was a significant main effect of context ( $F(1, 76) = 33.11$ ,  $p < 0.001$ ) and a context-age interaction ( $F(3, 76) = 4.05$ ,  $p = 0.010$ ). Subsequent analysis showed that the differences between conditions were significant in all age groups except the youngest children (see Table 3 for details), with the older children showing more sensitivity to linguistic context than the younger children.

### 3.4. Sensitivity to the referential properties of the noun

Sensitivity to the referential properties of the noun was analyzed with another split-plot ANOVA with referent (Object v. Substance) as the within-subjects factor. The dependent variable was again the number of *-a* responses as a percentage of all target responses. The analysis revealed no significant effects of referent ( $p = 0.796$ ) or age ( $p = 0.070$ ) and no interaction ( $p = 0.095$ ), which suggests that respondents were not sensitive to the relationship between the meaning of the noun and the choice of genitive masculine ending. Thus, this part of the experiment replicated the results obtained by Dąbrowska (2005) and showed that the same conclusions also obtain for older participants (fourteen- and eighteen-year-olds).

However, comparing the results for individual age groups (cf. Table 4), we observe that the oldest participants did tend to use *-a* somewhat more frequently in the object condition; and in fact, the difference is significant if we just consider the performance of the eighteen-year-olds ( $t = 2.17$ ,  $df = 19$ ,  $p = 0.043$ ). Interestingly, this effect is due largely to the extremely good performance of two of the participants. In fact, one of the

Table 4. *-a* responses as a proportion of all target responses in the Object and Substance conditions

Age	Object (SD)	Substance (SD)	<i>t</i>	<i>p</i>
6	46 (43)	44 (42)	0.21	0.840
10	27 (36)	31 (36)	-1.04	0.313
14	49 (32)	47 (35)	0.24	0.812
18	37 (40)	24 (35)	2.17	0.043

eighteen-year-olds used *-a* with all six nonce words referring to objects and *-u* with all the nonce words referring to substances. The probability of such apparently consistent behavior arising by chance is less than 1 in 4000. In view of these considerations, it would perhaps be more accurate to say that while most participants were unable to use the properties of the referent to predict the choice of genitive ending on the corresponding noun, a small minority (about 10%) of the eighteen-year-olds were sensitive to this contrast.

These exceptional individuals notwithstanding, it is clear that what most learners seem to pick up on is not the semantic characteristics of the referent noun, but properties of the construction in which it occurs. This is an unexpected finding, since the choice of ending depends on the properties of the noun, not on the construction: an *-a* noun will take *-a* whether it is used in a count context, a mass context, or a neutral context. The results thus indicate that learners may be more sensitive to probabilistic distributional cues than to semantic cues.

### 3.5. Choice of ending in the absence of biasing factors

As explained earlier, the experiment also included a Neutral condition, in which the nonce words were presented without a referent in a grammatical context compatible with both mass and count nouns. This condition was included in order to establish each participant's preference for *-a* or *-u* in the absence of any biasing factors. However, since only two participants showed any sensitivity to properties of the referent, the Object and Substance conditions are also, in effect, "neutral". Not surprisingly, the frequencies of the *-a*, *-u*, and zero responses in the three conditions are strongly correlated (Pearson's *r* from 0.52 to 0.88,  $p < 0.001$ ). Therefore, the following analysis of performance in the absence of biasing factors will use data from all three conditions.

The focus will be the learning *outcome* rather than the learning *process*. As explained earlier, no increases in productivity with *-a* or *-u* were

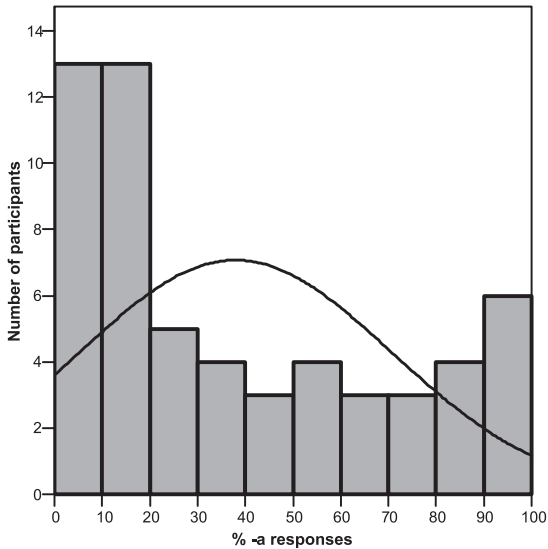


Figure 1. *Individual differences in preference for masculine ending in the absence of biasing factors*

observed after age 6: that is to say, the ten- and fourteen-year-olds supplied both endings as frequently as the most mature participants. Therefore, the analysis will include data from the three older groups (ten-, fourteen-, and eighteen-year-olds); however, the two eighteen-year-olds who appeared to be sensitive to the referential contrast will be excluded.

On average, the participants used *-a* in 38% of their gender-appropriate responses. This figure is very similar to the proportion of inanimate *-a* nouns in the general lexicon (37%), which suggests that they might be matching the ambient language probabilistically. If this were the case, than a histogram showing the frequencies of individual scores should show a normal distribution. As we can see from Figure 1, this is clearly not the case. Rather than being clustered around the sample mean, the individual scores are clustered towards the extreme points in the distribution. Ten of the participants (i.e., 17%) show a strong preference for *-a* (use it in 80% or more of their gender-appropriate responses); 26 (45%) have an equally strong preference for *-u* (i.e., *-a* responses account for no more than 20% of their gender-appropriate responses); and only 22 (38%) use both endings fairly frequently.

Why should there be such dramatic differences in individual preferences for the two endings? One possibility is that they are attributable to



differences in linguistic experience. There is no systematic work comparing the frequency of *-a* and *-u* nouns in different language varieties, but it is clear that such differences do exist. Some nouns allow both endings and it is possible that this is associated with dialectal differences. However, the number of such “amphibious” nouns is relatively small — only about 1.4% of the inanimate masculine nouns listed in one contemporary dictionary (Bańko 2000). This figure is likely to be an underestimate, since the editors may have failed to include uses which occurred in their corpus but which they regarded as incorrect. In a corpus-based study by Westfal (1956), 10% of all inanimate masculine nouns occurred in both forms; however, most of these were nouns which occurred overwhelmingly in one of the two forms, which suggests that the untypical forms may have been errors or idiosyncratic uses; thus Westfal’s figure is probably an overestimate. In any case, whatever the exact number of “amphibious” nouns, it is clear that they constitute only a small minority of masculine nouns.

Another factor to consider are differences stemming from the fact that certain classes of words are more frequent in some genres than in others. As explained in the introductory section, the *-a* ending is strongly associated with nouns designating humans, animals, body parts, tools, and small objects, while *-u* predominates with collective nouns, nouns designating large, immovable objects and abstract concepts. Given these semantic contingencies, the most extreme difference between genres are likely to be found between the speech addressed to young children, which is dominated by nouns belonging to the semantic classes associated with *-a*, and formal written language, which contains a much higher proportion of nouns belonging to the classes associated with *-u*. The differences in the frequency of the two endings between these genres are indeed sizeable: *-u* nouns account for 27% of masculine noun types in input to a two-year-old child<sup>3</sup> and 53% of the nouns in the frequency list compiled by Kurcz et al. (1990), which is based on a variety of journalistic and literary texts. However, it is considerably smaller than the differences observed in the experiment, where the proportion of *-u* responses in the three non-biasing conditions ranged from 0% to 100%. We may also note that the older children and teenagers had been exposed to a variety of genres; moreover, the participants from each age group were classmates who spent a considerable part of their day talking to each other, listening to the same teachers, watching the same television programs, and reading the same books.

In sum, while different learners are obviously exposed to different input, the differences in the frequency of *-a* and *-u* in the input to any one age group are unlikely to be very large and hence they cannot explain the

strong preferences for one or the other of the two endings that were found in the data.

If the observed individual differences are not attributable to differences in the input, it follows that different learners extract different generalizations from comparable input.<sup>4</sup> It should be noted in this connection that there is no one “correct” generalization about the genitive masculine ending. Learners could note that most masculine nouns take *-a* and extend this ending to all new masculines; they could note that most inanimate masculine nouns take *-u* and consistently use this ending; they could observe that there are certain phonological regularities and exploit those; or they could use both endings probabilistically. It is perfectly possible, then, for different learners to extract schemas at different levels of abstraction, and possibly schemas based on different principles (e.g., phonological rather than semantic). Thus, speakers who have different schemas for animate and inanimate masculine noun would use *-a* with the former and *-u* with the latter; speakers who have a single schema for all masculine nouns would consistently use *-a* with all masculine nonce words; and speakers who only had low-level phonological schemas and no overarching generalization would show no clear preference for either ending. This account is clearly somewhat speculative and needs further investigation; but it does seem to offer the most convincing explanation compatible with the data.

#### 4. Conclusion

Earlier research suggests that the Polish genitive inflections are acquired very early. In naturalistic contexts, children supply the correct ending close to 100% of the time from about age 2. Moreover, they are able to use genitive endings productively, as evidenced by their ability to inflect nonce words in experimental settings and overgeneralization errors in spontaneous speech. Nevertheless, this productivity appears to be quite limited: overgeneralizations are quite rare, in spite of the fact that the system is highly irregular and hence affords many opportunities for error; and in nonce-word experiments, children often use the citation form in grammatical contexts which require the genitive. In Dąbrowska’s (2005) study, such errors were almost as frequent as target responses among two-and-a-half-year-olds, accounting for 37% of their responses; the present study shows that by age six, they still account for about a quarter of the children’s responses. This indicates that children require a considerable amount of exposure to language before they acquire mental

representations that are strong and general enough to enable them to reliably inflect novel words.<sup>5</sup>

The only other reasonably frequent type of nontarget response observed in this study were gender errors, i.e., use of a feminine ending with a masculine noun. Such errors have a rather interesting developmental history. Dąbrowska (2005) reports that they are moderately frequent among the two-and-a-half-year-olds, accounting for 11% of their responses to masculine nonce nouns, then virtually disappear. The present study shows that such errors appear again twelve years later at levels similar to those found in two-year-olds. This rather unexpected increase in the frequency of gender errors among the fourteen-year-olds may be attributable to learners developing a productive schema for feminine nouns ending in a consonant, which would then compete with the schema(s) for masculine nouns. If this account is correct, the results indicate that reorganizations of the inflectional system can occur as late as the teens.

Another late-emerging aspect of linguistic competence is sensitivity to the factors governing the choice between the two masculine endings. We have seen that up to age 6, children supplied *-a* and *-u* equally often regardless of whether the nonce noun was used in a count or a mass context, and regardless of whether it referred to an object or a substance. The ten-year-olds participants, however, used *-a* significantly more frequently in the count-noun context than in the mass-noun context, showing that they were able to use information about the grammatical construction in which the noun occurred in order to predict its genitive ending. The difference in the number of *-a* responses between the two conditions was considerably greater in the fourteen-year-old group, and still greater in the eighteen-year-olds, which suggests that sensitivity to the linguistic context continues to develop in the teens.

The fact that sensitivity to the factors influencing the choice of genitive endings develops late has some interesting implications. It was noted in the introductory section that two- to five-year olds are overwhelmingly accurate in selecting the correct ending with familiar words. Since children of this age are not sensitive to the factors predicting the choice of ending for inanimate nouns, it follows that the early correct performance relies largely on stored exemplars. In other words, in spite of having learned the relevant rules at an early age, children rarely use them, preferring instead to rely on memorized forms, and continuing to add to their store of memorized exemplars years after they have learned to use the relevant inflections productively.

Finally, the experimental task revealed considerable individual differences in both the age of acquisition of genitive masculine inflections and the kinds of generalizations that learners extract. While all six-year-olds

were productive with at least one genitive ending, there was a small minority who supplied a target form less than 20% of the time. On the other hand, Dąbrowska's (2005) study has shown that some two-and-a-half-year-olds were already 100% correct with nonce words. Thus, while some children are fully productive with at least one genitive masculine inflection by age 2;6, others do not master it until age 6 or later. The development of sensitivity to the linguistic context as a predictor of the choice of ending shows similar developmental lags. One of the six-year-olds already displays a strong sensitivity to the contrast between the two forms used in the experiment. The proportion of children able to make use of this information gradually increases in the older groups; however, a quarter of the eighteen-year-olds still use both endings equally frequently with nonce words presented in count and mass contexts. Last but not least, a small minority of the eighteen-year-old participants are sensitive to properties of the referent as well as the linguistic context.

The experiment also showed that different speakers favored different endings in the absence of biasing factors: about 17% had a strong preference for *-a* (i.e., used it over 80% of the time); approximately 45% had an equally strong preference for *-u*; and the remaining 38% used both endings with similar likelihood. As argued earlier, these differences are quite stable and are unlikely to arise from exposure to different input; instead, it appears that different learners attend to different features of the input and extract schemas of varying degrees of generality.

As pointed out in the introductory section, the genitive masculine is a particularly irregular part of the Polish case marking system, so conclusions drawn on the basis of research into the acquisition of this inflection may not be generalizable to other aspects of grammatical development. It should be stressed, however, that research on the acquisition of Polish case shows no evidence that children find the genitive masculine inflection particularly difficult, or that this inflection follows a different developmental trajectory from other parts of the case-marking system (see Dąbrowska 2004; Dąbrowska and Szczerbiński 2006). Regardless of how typical or atypical the course of development observed in this study is, the results described above show that at least some parts of the grammatical system continue to develop years after children have learned to apply the relevant rules productively and reliably supply adultlike forms in spontaneous speech, and that speakers of the same dialect do not necessarily acquire the same mental grammars.

*Received 30 July 2004*  
*Revised version received*  
*6 July 2005*

*University of Sheffield*

**Appendix I. Nonce words used in the experiment**

Gender	Set 1	Set 2	Set 3
Masculine	flors	sor	ćwiarg
	kuch	grask	grumb
	narot	gamap	czabis
	mulos	figon	ścigor
	supang	opurk	ekrod
Feminine	syragin	malirach	famagon
	kruma	pradzia	chrunia
	patala	żurania	karada
	garyta	zamrosia	szawosa
Neuter	oronica	szmargona	garbodzia
	żurbko	krucinko	grutko
	oposie	świele	orowie
	grucie	orocino	somie

**Appendix II. Substances and objects used in the experiment**

Objects	Substances
Paper crinkling device	Transparent green liquid
Toy punch	Lightly scented dark brown powder
Implement for shaping clay	Thick greasy semi-transparent yellow paste
Eye mask	Citrus-smelling orange liquid
Scrubbing implement	Aromatic light brown powder
Novelty kitchen sink plug	Lightly scented dark green paste
Wooden massager	Strongly scented colorless liquid
Massager with a roller	Thick aromatic dark brown paste
Wickerwork container	Sharp-smelling yellow powder
Inhaler part	Bright blue liquid disinfectant
Hand rest for applying nail polish	Thick lightly scented white liquid
Novelty coaster	Spicy red powder
Egg puncher	Sweet-smelling thick dark-brown liquid

**Notes**

- \* I would like to thank Grażyna Dąbrowska and Joanna Rudnicka for their help in collecting the data; Barbara Dąbrowska for organizational support throughout the

duration of the project; and Marcin Szczerbiński and Tore Nessel for comments on an earlier draft of the article. A very special and warm thanks goes to the children and young people from Szkoła Podstawowa nr 35 and Szkoła Muzyczna in Gdańsk who participated in the experiment.

This study was supported by British Academy grant RB 100556; much of the research was conducted while visiting the Max Planck Institute for Evolutionary Anthropology in Leipzig.

Part of the material discussed here was presented at the International Association for the Study of Child Language Symposium in Madison, Wisconsin in July 2002. Correspondence address: School of English Literature, Language and Linguistics, Sir William Empon House, Shearwood Road, University of Sheffield, Sheffield S10 2TD, United Kingdom. E-mail: e.dabrowska@shef.ac.uk.

1. A few nouns take the adjectival endings *-ego* or *-ej*; and about 1% do not decline at all (i.e., the citation form is used in all oblique cases, including the genitive).
2. The research assistant who conducted the Dąbrowska (2005) experiment had previously worked with many of the participants while they were in kindergarten; and the materials were chosen to be attractive to young children. Consequently, the children perceived the experiment as a game. The research assistant employed to conduct this study was a Polish teacher in the school the children attended. Although she did not actually teach them, the children were more likely to see the experiment as a language test. This may have affected the performance of the older children (aged 10 and above), who had received explicit instruction about the Polish noun declension system in grammar lessons. The children are extremely unlikely to have memorised an explicit rule stating that inanimate masculine nouns take *-a* or *-u* in the genitive, but they were probably aware that nouns require various endings in oblique contexts, and they may have been consciously avoiding zero-marked forms.
3. This estimate is based on the Marysia corpus, which comprises 30 hours of spontaneous conversation with a two-year-old girl living in the Gdańsk region.
4. Yet another possibility is that the differences are attributable to different strategies adopted by the participants for the duration of the experiment. However, the differences appear to be reasonably stable, which makes this possibility rather unlikely. Recall that participants in this experiment were tested in two separate sessions 2–3 weeks apart, and, as observed earlier, the scores were reasonably highly correlated in spite of the fact that different nonce words were used in each session. Furthermore, in a pilot study with 11 adult participants who were tested a second time about 7–10 days later using the same test items, there was a very high correlation between the proportion of *-a* responses produced on the test and the retest ( $r = 0.96$ ,  $p < 0.001$ ).
5. The average frequency of genitive masculine forms in the input in the Marysia corpus is 14 times per hour. Assuming that this figure is representative and that children are exposed to language for 8 hours every day (a rather conservative estimate), this means that they will have heard over 200,000 tokens of this form between the ages of 1;0 and 6;0.

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