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Acquisition and loss of nouns and verbs: parallel or divergent patterns?

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Abstract

This paper investigates a possible correspondence between the acquisition and breakdown of the ability to name nouns, verbs and their subcategories. The postulation of a universal developmental sequence, according to which children are predisposed to acquire nouns before verbs, has been challenged by cross-linguistic studies. In the case of acquired language loss in adults, the traditional assumption of a double dissociation between nouns and verbs has also been contested in recent work. Furthermore, subcategories of verbs (e.g. transitives versus intransitives) have been shown to be differentially acquired and affected.

In our study, we elicited data on noun and verb processing in language production (picture naming task) from children acquiring German and from German aphasic adults. We will report the results from 240 German children (between 2; 6 and 8 years old) as well as the pattern of loss in 11 German aphasic adults. The results show similar category-specific effects in both populations, with a clear-cut noun advantage and a tendency to prefer intransitive verbs, thus supporting the assumption of a specific parallelism in the patterns of acquisition and loss.

Keywords: Nouns; Verbs; Subcategories; Naming; Acquisition; Aphasia

1. Introduction

Nouns and verbs have been a topic of linguistic research from the very beginning and form part of all classification systems of word categories that have been proposed. Modern linguistic research on parts of speech tends to fluctuate between the attribution of a universal status to word classes and the opposite view that each specific language has a specific word class system. The language-specific view has often been propagated by descriptive grammarians who noted the absence of adjectives and even noun–verb

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distinctions in particular languages such as Polynesian. The universal approach is adopted in a strong sense by generative grammarians (Haegeman, 1994), for example in X-bar theory, where word classes are considered theoretical primitives (defined by ±V, ±N, such that nouns, for example, are −V/+N, verbs are +V/−N and adjectives +V/+N). A compromise between the two extreme views has been proposed by some language typologists. In his radical construction grammar, Croft (2000), for example, considers parts of speech as derived, language particular rather than primitive categories. They are defined by language-specific constructions which have semantic–pragmatic functions. These refer to a universal 'conceptual space' containing combinations of semantic class (e.g. objects, properties and actions) and pragmatic functions (e.g. reference, modification and predication).

Without consideration of the theoretical controversy on the universal status of parts of speech, psycho- and neurolinguists have taken categories such as nouns and verbs for granted in their attempt to investigate the processing of different word categories. One current issue concerns the locus at which this category information becomes available in processing models. Some authors treat this information in terms of specifying features to the modality-neutral semantic–syntactic representation of words, the so-called lemma level (Levelt, 1989). In Levelt's model of language production, a concept is first selected at the conceptual level. The subsequent lemma level adds the associated grammatical information such as part of speech, subcategory, gender, etc. For word production, this information is forwarded to the lexeme level, where the phonological form of the word is generated. It is assumed that the production of graphemic words uses the same amodal conceptual and lemma levels but is modality-specific at the lexeme level.

Whereas Levelt defines the lemma level explicitly with respect to word categories, other authors assume that it is the lexeme levels themselves, the output lexica, which are subdivided according to grammatical class. This is postulated in order to explain modality- and category-specific patterns of preservation and deficit (Caramazza & Hillis, 1991).

Another issue which has currently been readdressed is the relation between patterns of language acquisition and patterns of loss after brain damage. The question is whether the regression hypothesis is valid in the sense that earlier acquired linguistic material should be more robust to language loss. A further question concerns the specificity of the correspondence between these patterns. In his review of the regression hypothesis with respect to grammatical categories, Caramazza (1994) starts from the assumption that there is a noun bias in language acquisition. However, this position has become controversial in developmental psycholinguistics.

In studies on the age of acquisition of nouns and verbs, it was standardly assumed that children are predisposed to acquire nouns or object names before verbs or other word classes and that nouns form the majority of children's early vocabulary (the so-called 'noun-bias') (Bates et al., 1994; Gentner, 1981, 1982). This assumption was confirmed by the studies of maternal reports in several languages (Caselli et al., 1995, for Italian; Dromi, 1987, for Hebrew). Differential activation of nouns and verbs in neuroimaging studies might therefore reflect differences in age of acquisition rather than grammatical class per se.

However, there has been conflicting evidence about the sequence of nouns and verbs in undisturbed language development. Recent cross-linguistic results by Brown (1998), Choi (1998), Tardif (1996) and Tardif, Shatz, and Naigles (1997), for example, support the view

that the order of appearance of nouns and verbs depends on linguistic characteristics of the language acquired. Children acquiring verb-final Asian languages like Mandarin, Korean or Tzeltal, a Mayan language, produce a substantial proportion of verbs at very early phases of their lexical development. An equal proportion of verbs and nouns have been reported for Korean (Choi, 1998) and even a higher use of verbs than nouns has been demonstrated for Mandarin (Tardif, 1996), at least in the children's spontaneous production. The class of nouns appears neither earlier nor as a quantitatively dominant class in these children's early lexicon, and the verbs used early are morphologically marked. To explain these divergent results, it was suggested that the early use of verbs in these languages is linked to features of the speech input to children such as frequency or positional saliency.

Even in Indo-European languages like English, French and German, nouns are not generally the first word category in spontaneous speech (Gopnik, 1998), although they appear earlier than verbs (Bassano, 2000 for French; Kauschke, 2000 for German). At the early stages, nouns constitute at their peak only between one-fourth (Kauschke, 2000) and one-third of the spontaneous vocabulary production (Bloom, Margulis, & Tinker, 1993).

The exact proportion of nouns in early vocabulary also depends on methodological factors. For example, checklist data reveal higher proportions of nouns than observational data (Pine, Lieven, & Rowland, 1996). The use of picture naming tasks eliciting nouns and verbs of different subcategories has also differentiated the previous findings. In a picture naming study by Davidoff and Masterson (1995), pictures denoting transitive verbs were named as early as object pictures for nouns and both were produced before intransitive verbs in English children between 3 and 5 years.

In the case of acquired language loss in adults, the traditional assumption was that there is a double dissociation between the relative loss of nouns with sparing of verbs in patients with fluent spontaneous speech and the reverse pattern in non-fluent speakers (Bates, Chen, Tzeng, Li, & Opie, 1991; Daniele, Giustolisi, Silveri, Colosimo, & Gainotti, 1994; Miceli, Silveri, Nocentini, & Caramazza, 1998; Miceli, Silveri, Villa, & Caramazza, 1984; Zingeser & Berndt, 1990, 1998).

This has also been contested in recent work (Berndt, Mitchum, Haendiges, & Sandson, 1997; Luzzatti et al., 2000), in which noun superiority has been reported for fluent speakers as well. Furthermore, some authors suggest that category-specific effects are only apparent, as they are related to general lexical factors such as picturability and frequency (Bird, Howard, & Franklin, 2000) or to a syntactic impairment of verb movement to functional categories (Friedmann, Wenkert-Olenik, & Mali, 2002).

As in language acquisition (Davidoff & Masterson, 1995), the investigation of different subcategories of verbs in a naming test also led to more differentiated results for aphasia. Jonkers (1999) and Jonkers and Bastiaanse (1998) examined Dutch non-fluent agrammatic aphasic patients and one fluent anomic aphasic. All patients showed a specific deficit of intransitive verbs compared to transitive ones. The tentative conclusion given by the authors was that there was no general difference between nouns and verbs. The relevant parameter was within the class of verbs, with a superiority of transitives over intransitives. The authors suggest that the presence of more verbal arguments in transitive verbs or, alternatively, more associated objects in the pictures, supported their early acquisition and better preservation in the case of aphasic language loss.

Some remarks must be made on the characteristics of the languages studied. One major difference is that nouns and verbs are much easier to distinguish in German and Dutch than in English. In English, nouns and verbs are frequently homophonous due to the very productive derivational process of conversion, which rarely applies in German and Dutch.

Verb position constitutes another major difference between English on one hand and German and Dutch on the other. Whereas English is a systematic verb-second language, Dutch and German are verb-final languages. The verb appears in this basic order in subordinate clauses (e.g. literally: '…because I an apple ate'). In main clauses, the surface form is verb second, similar to the basic word order in English (e.g. literally: 'I ate an apple'), yet they often have a sentence-final verbal participle in the case of complex tenses (e.g. literally: 'I have an apple eaten').

If it is reasonable to assume, as suggested in the literature, that verb position in the speech input plays a determining role in lexical acquisition, and that factors affecting age of acquisition are reflected in differential patterns of lexical loss, language-specific effects should have been expected for Dutch and English. Given the absence of such language-specific effects, the structural linguistic explanation for the picture naming data in English children (Davidoff & Masterson, 1995) and Dutch aphasics (Jonkers, 1999) in terms of number of verbal arguments seems to be plausible, providing evidence for the regression hypothesis.

However, other studies on the role of subcategories of verbs have shown a reverse pattern for English aphasic patients, with a superiority of intransitive verbs over transitives (Kim & Thompson, 2000). The authors argue for an influence of argument structure, with less arguments favoring easier lexical access. This diverges from the pattern found for English children (Davidoff & Masterson, 1995), so that the combined results seem to contradict a regression hypothesis for verbal subcategories.

2. The present study

Considering the conflicting empirical findings and different explanations concerning acquisition and loss of word categories, we decided to study the processing of nouns and verbs in different populations within one and the same language. In our German study, we used a picture naming task in which the variables biological/manufactured were controlled for nouns as well as transitivity and intransitivity for verbs. This would allow us to examine Caramazza's statement (1994) about the acquisition and loss of nouns and verbs that "there are important similarities and some mutual constraints between the two areas of investigation. The constraints are provided by the relation that each system—the developing one and the damaged one—has to the normally functioning adult system. When the language system breaks down as a result of brain damage, it reflects the structure of the mature system. However, the mature system has the structure it does largely because of the way it is acquired" (p. 126). Caramazza (1994) rejects a more specific parallelism between the processes of lexical acquisition and loss of subcategories of words than the one for categories referred to earlier.

The design of our study allowed us to investigate whether there is a specific correspondence between the acquisition and breakdown of the ability to name nouns, verbs and their subcategories.

2.1. Subjects

Data on noun and verb production were elicited in a picture naming task with four populations. There were 35 young normal German adult controls (mean age 22.5 years) and 240 monolingual German children with normal language development and without reported cognitive or perceptual impairments. These were distributed over five semi-annual age groups, 30 children each, between 2; 6 and 4; 11 years old (age groups I–V, see Fig. 1), and three annual age groups with 30 children each between 5; 0 and 8; 0 years old (age groups VI–VIII, see Fig. 1). The children were tested in kindergarten or in school. Furthermore, 11 adult German aphasic patients were examined (mean age 62.2, ranging from 48 to 72 years old). These included two global aphasics, four fluent patients (two anomics, one conduction and one unclassifiable patient) and five non-fluent Broca's with agrammatism. They were compared to 11 older normal German adult controls matched for education and age (mean age 59.7, ranging from 46 to 71 years).

2.2. Materials and methods

The material for eliciting nouns consisted of 36 black-and-white drawings of objects, half of which were biological, the other half man-made. The artifact/biological distinction for objects was systematically varied in order to consider the current interest in their potential discrete conceptual and neural organisation. Caramazza and Shelton (1998) propose that these are the result of evolutionary mechanisms. For eliciting verbs, there were 36 drawings of actions, half requiring a label with a transitive verb, the other half with an intransitive verb. Systematic control of the variable transitive was necessitated by current reports on an advantage of transitive over intransitive verbs in children acquiring language (Davidoff & Masterson, 1995) as well as in aphasics with organic language loss (Jonkers & Bastiaanse, 1996, 1998).

Test items were selected from an initial pilot set of 326 objects and 141 actions on the basis of a set of construction criteria including number of syllables (1–2), number of morphemes (1), concreteness for nouns, agentive and non-reflexive for verbs. In ratings obtained from 30 young subjects, targets had to be rated highly picturable, and they had to be unambiguously classifiable as artifacts or biological items for nouns, as transitive or intransitive in the case of verbs. Name agreement based on the results of 65 young adults had to be 80% or more.

In addition, reports of 20 caretakers were obtained concerning the age at which the test items were observed to be spontaneously produced by their children and 36 nouns were matched to 36 verbs on the basis of identical rated age of acquisition. As a result, there were 18 quartets of items with matching rated age-of-acquisition which qualified as test items, each quartet consisting of two nouns, one biological and one man-made, and two verbs, one transitive and the other intransitive. The German test items and their approximate translations are listed in Appendix A.

The method consisted of simple off-line oral naming of black-and-white pictures in Din A5-format. Only the young adult controls performed the task in the written modality. Nouns and verbs were administered in separate sets but items belonging to different N- and V-subcategories were randomized within each set. Responses were tape-recorded, transcribed and stored in a data bank allowing quantitative statistical analysis of correct

and incorrect responses. Self-corrections were scored as correct, and in case of multiple responses to an item, the first response was considered for further analysis. In the case of verbs, finite as well as infinite forms were accepted. A system for error classification was constructed which allowed an analysis of responses to nouns and verbs in approximately comparable categories. Given that verbs and nouns are hardly ever homophonous in German, it was easy to classify the responses of the young children as nouns and verbs. In cases where responses involved a change of part of speech due to derivation, they were coded into a special error category. The quality of errors will not be analyzed here.

3. Results

3.1. Written naming of nouns and verbs by 35 young adult controls

There was no significant difference between nouns and verbs. The mean number of correct responses in each category was 35 ($n = 36$ items). Results on the verbal subcategories of transitive and intransitive verbs did not differ significantly but the small numerical difference between the nominal subcategories reached significance in favor of manufactured items ($p = 0.00$).

3.2. Acquisition of naming nouns and verbs in German

Fig. 1 shows the results for naming nouns and verbs of 240 German children split over eight age bands.

The mean number of correct responses generally increases with age (ANOVA $p = 0.00$). The changes are most outspoken between age groups I and II (2; 6–3; 5 years) and performance is stable between age groups V and VI (4; 6–5; 11 years).

There is an effect of word category such that the difference between nouns and verbs is highly significant in all age groups (*T*-test and Wilcoxon test: $p = 0.00$) in favor of the nouns.

Within the verb class, there is a tendency to better performance for intransitive verbs in each age group. This difference is significant for the first age group (Wilcoxon test: $p = 0.05$; *T*-Test: 0.05) and the second age group (Wilcoxon, *T*-Test: $p = 0.00$). The difference becomes highly significant again in the sixth, seventh, and eighth age groups (Wilcoxon, *T*-Test: $p = 0.00$).

Within the noun category, man-made nouns are significantly better than biological ones in the older groups starting with the fourth group (Wilcoxon: $p = 0.02$; *T*-test: $p = 0.04$) and continuing through the fifth group (Wilcoxon: $p = 0.05$; *T*-test: $p = 0.04$), the sixth group (Wilcoxon, *T*-Test: $p = 0.02$), the seventh group (Wilcoxon, *T*-Test: $p = 0.00$) and the eighth group (Wilcoxon, *T*-test: $p = 0.00$).

The results for verbal subcategories are shown in Fig. 2, for nominal subcategories in Fig. 3.

In summary, there was a clear and consistent noun advantage in picture naming and a preference for intransitive verbs over transitives, especially in the early and late stages. These findings contradict the results of Davidoff and Masterson (1995), who found that English children named transitive verbs on a par with nouns and before intransitives.

On a single case basis, nouns were named better than verbs in age bands II–VII. There

was only one reversal at ages I and VIII each. Intransitive verbs were better than transitives for the majority of children in each age band, but there were also a few reversals and ties.

3.3. Noun and verb naming by older German controls

In contrast to the younger controls, the group of 11 older controls named nouns significantly better than verbs (Wilcoxon: $p = 0.01$). On a single case basis, nouns were better than verbs for each subject. This was significant for two of them. Like the younger controls, performance on manufactured items was better than on biological ones (Wilcoxon: $p = 0.01$), but unlike the younger controls, there was also a difference between the verbal subcategories, and intransitive verbs were named significantly better than

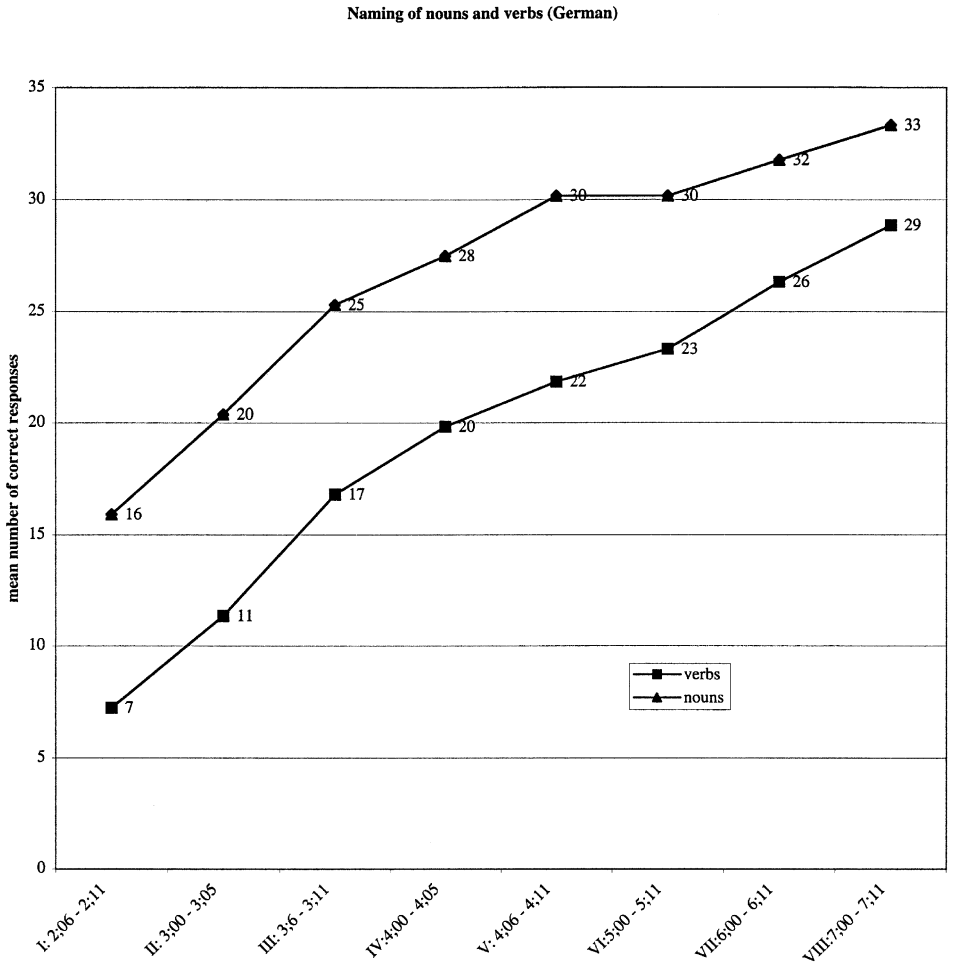

Fig. 1. Results of 240 children (ages 2; 06–8; 00) split over eight age bands ($n = 30$ each) for naming nouns and verbs.

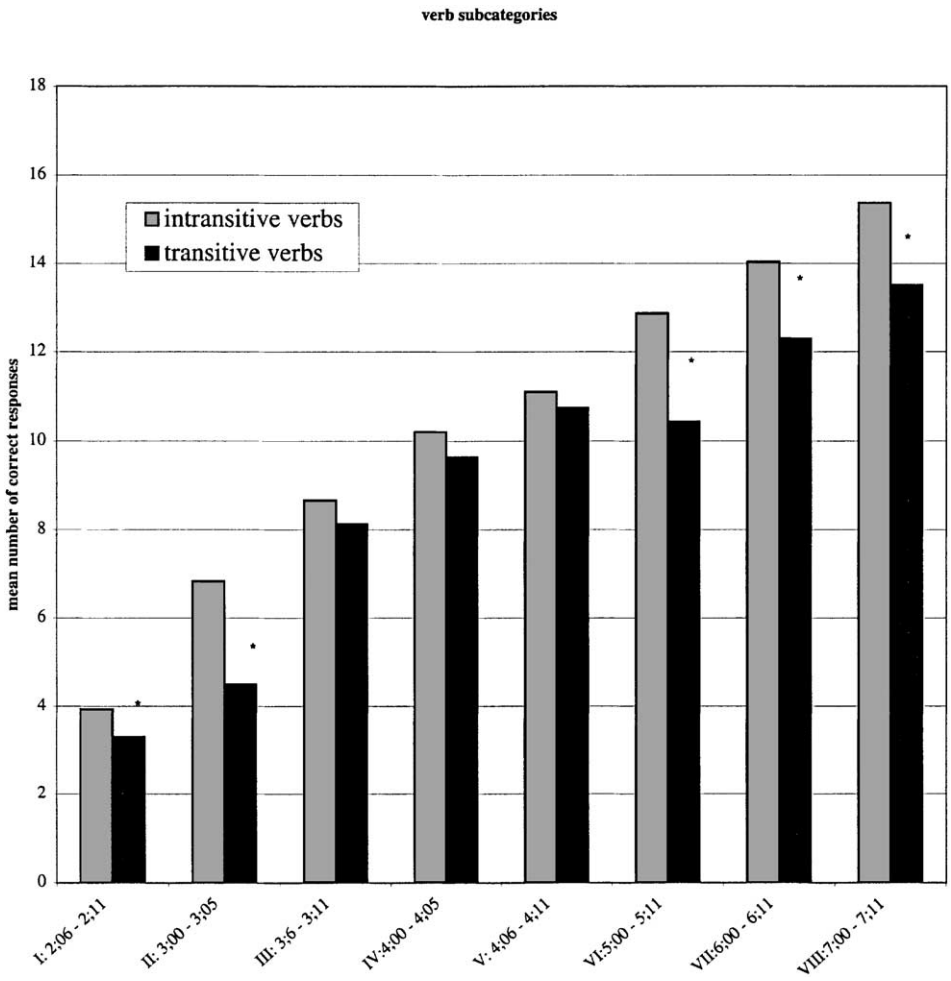

Fig. 2. Results of eight age bands of children for verbal subcategories.

transitives (Wilcoxon: $p = 0.01$). The man-made superiority also held in 8/11 single cases, but this was significant in only one subject. There was a tie between man-made and biological subcategories in 3/11 subjects. The intransitive superiority also held in 8/11 subjects, there was one tie between intransitive and transitive verbs and one reversal. However, there was no single case in which these differences reached significance.

3.4. Loss of naming nouns and verbs in German aphasics

As a group, the aphasic patients ($n = 11$) do not significantly differ from the older controls ($n = 11$) in naming nouns generally nor for biological items. The controls' naming of man-made nouns was significantly better than that of the aphasics (Mann–Whitney-*U*-Test: $p = 0.01$). However, as would be expected, the individual global

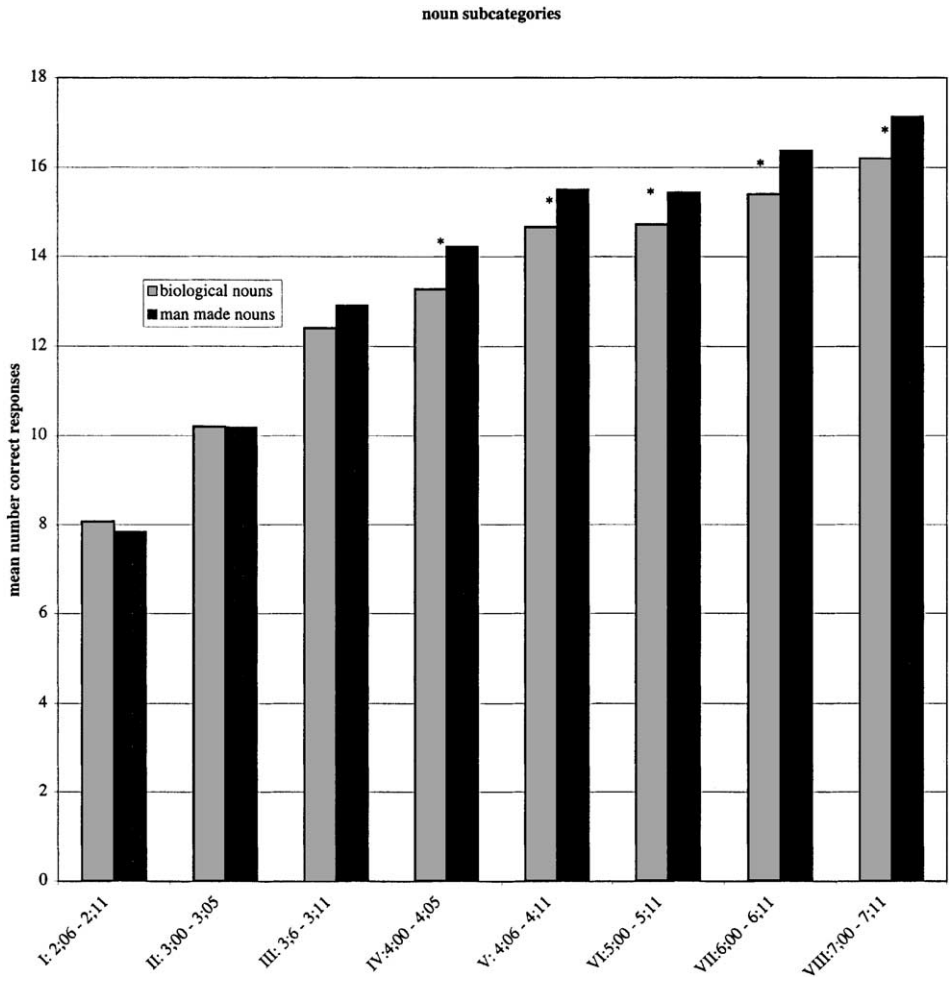

Fig. 3. Results of eight age bands of children for nominal categories.

aphasics ($n = 2$) were seriously impaired in noun naming as well. If they are removed from the analysis (aphasics: $n = 9$), no significant differences remain for man-made nouns. The difference between controls and aphasics in naming verbs for general and both verb subcategories was highly significant with and without inclusion of the globals (Mann–Whitney-*U*-Test: $p = 0.00$).

In general, nouns were preserved significantly better than verbs (Wilcoxon: $p = 0.00$) and intransitives better than transitives (Wilcoxon: $p = 0.01$), but there was no significant difference between man-made and biological items. These category effects remain stable after eliminating the global aphasics from the analysis.

Table 1 gives the individual results of the patients.

The results for the subgroup of the five non-fluent Broca's with agrammatic production show no difference from the controls in noun naming but verbs in general as well as each

verb subcategory are significantly impaired (Mann–Whitney-*U*-Test: $p = 0.00$). For the group, nouns are named significantly better than verbs (Wilcoxon: $p = 0.04$) but there is no significant difference between intransitive and transitive verbs nor between manufactured and biological nouns.

On an individual basis, there is a tendency for four of five patients to name intransitive verbs better than transitives and this reaches significance for three patients (chi-square: $p = 0.02, 0.04, 0.04$). For one of the patients, the difference is so outspoken that naming intransitive verbs does not significantly differ from nouns.

The results for the subgroup of four fluent patients shows no difference from the controls in naming nouns, but verbs in general and each verb category are clearly impaired. In contrast to the Broca's, nouns do not significantly differ from verbs for the group, although all four patients are numerically worse for verbs, which reaches significance in three patients (including the two anomics, chi-square: $p = 0.02, 0.00, 0.00$). Within the verb class, there is no significant difference for the group between transitive and intransitive verbs and, although intransitives are numerically better for each patient, this difference never reaches significance.

To summarize the results of the adult aphasics, we did not find a general naming deficit in aphasia. The naming abilities for nouns in patients with fluent as well as non-fluent aphasia (except for the globals) were within the normal range and, independent from the type of aphasia, nouns were numerically named better than verbs. This finding contradicts the notion of a double dissociation which assumes superior verb naming in fluent aphasia. Additionally, our data do not support the hypothesis proposed by Jonkers and Bastiaanse (1996, 1998) that the subcategory of transitive verbs is easier than intransitives for fluent as well as non-fluent aphasic subjects. We did not find any single case with a pattern pointing in this direction. Instead, our results show a clear preference for intransitive verbs, which is significant for the majority of individual cases with agrammatic speech production.

The results of the four populations, young and old controls, children and adult aphasics, are compared for noun and verb naming in Fig. 4 and for verbal categories in Fig. 5.

4. Discussion

Some general conclusions can be drawn from the developmental and neurolinguistic data reported earlier. Concerning the noun–verb difference, a stable and significant noun advantage in naming emerges, which holds for undisturbed German children, all aphasic patients and even for the older control group.

The developmental results are at variance with recent cross-linguistic studies of spontaneous vocabulary acquisition, where a developmental sequence from nouns to verbs was found for pure verb-second languages (like English) and either a verb-dominance or an equal proportion of nouns and verbs in verb-final languages (like Korean). German has an in-between status. It is a verb-final language in its underlying structure and it surfaces as such in subordinate clauses, but the surface form of main clauses is verb-second. For spontaneous acquisition of German, it has been noticed that verbs already appear at an early age (1; 3 years) but there is a larger proportion of nouns. Later on, the proportion of verbs increases and at age three, they outnumber nouns in type as well as token frequencies

Table 1
Individual results of 11 aphasic patients

Case	Nouns $n = 36$	Verbs $n = 36$	Diff.	Intr. $n = 18$	Trans. $n = 18$	Diff.	Manuf. $n = 18$	Biol. $n = 18$	Diff.
1 F	20	29	0.02	11	9	ns	11	18	0.004
2 F	35	15	0.000	10	5	ns	18	17	ns
3 F	34	21	0.000	13	8	ns	18	16	ns
4 F	30	25	ns	14	11	ns	15	15	ns
5 NF	33	14	0.000	10	4	0.04	18	15	ns
6 NF	30	18	0.003	12	6	0.04	16	14	ns
7 NF	31	20	0.004	9	11	ns	15	16	ns
8 NF	34	17	0.000	12	5	0.02	18	16	ns
9 NF	34	15	0.000	9	6	ns	18	16	ns
10 G	16	8	0.04	5	3	ns	10	6	ns
11 G	14	2	0.001	1	1	ns	8	6	ns

F: fluent aphasic, NF: non-fluent agrammatic aphasic, G: global aphasic.

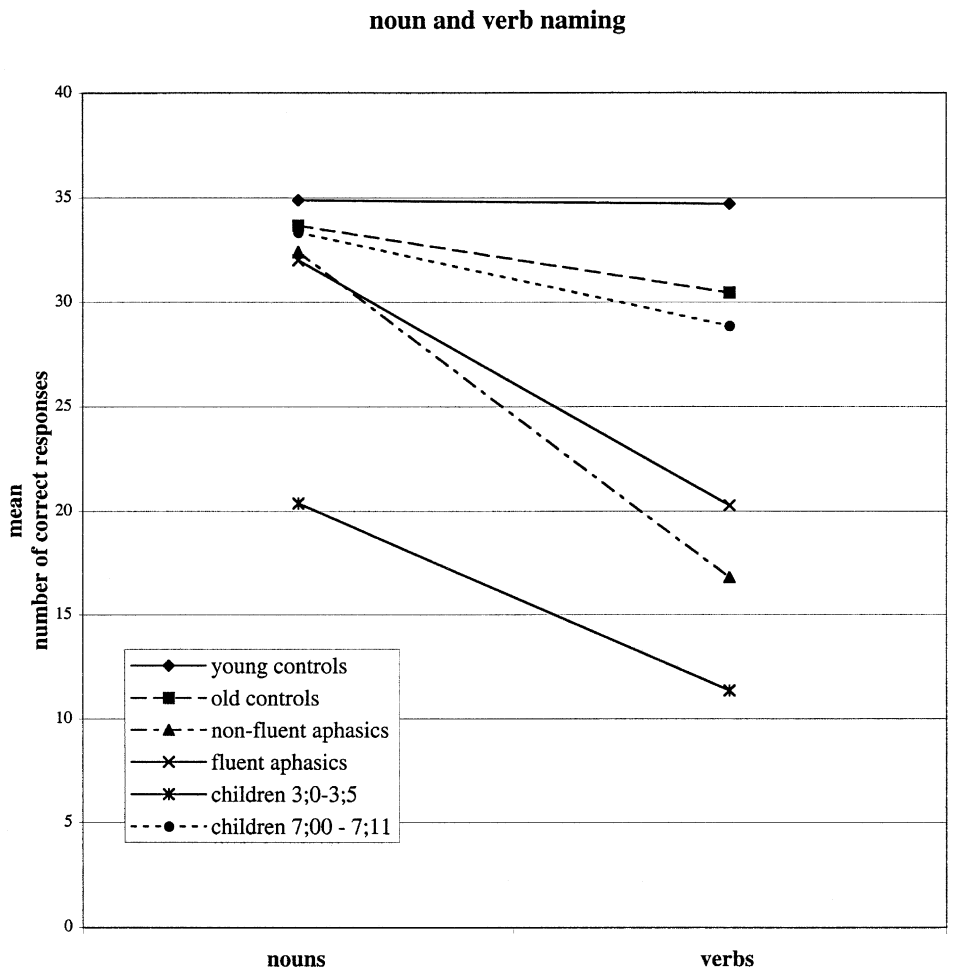

Fig. 4. Comparison of the results of young and old controls, young and older children and fluent and non-fluent aphasics for naming nouns and verbs.

(Kauschke, 2000). The stable noun superiority from age 2; 6 to 8 and the lack of a verb overtake in this naming study may be due to task-specific factors. Possibly, verb naming is inferior because naming depicted actions is less natural than naming depicted objects, thus generally restricting naming abilities for verbs.

The results from aphasic subjects also differ from studies of language loss emphasizing a double dissociation with respect to noun and verb categories between aphasic groups. In contradiction to this literature, the fluent aphasics in this study showed a noun superiority effect similar to that of the non-fluents and even of the older controls. With the exception of the global patients, noun-naming was generally within the normal range. That this effect is not material-specific is shown by the lack of such an effect in the group of younger controls. Apparently, if category-effects occur in aphasia, they generally seem to be in

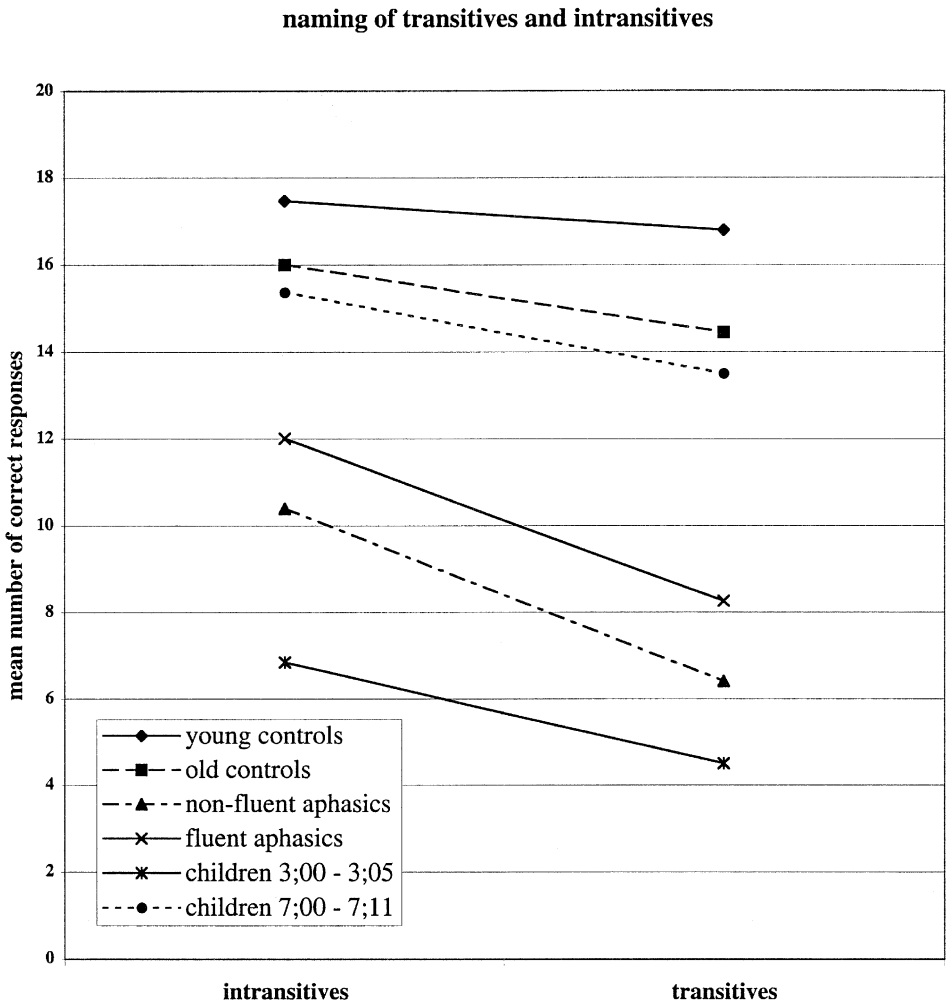

Fig. 5. Comparison of the results of young and old controls, young and older children and fluent and non-fluent aphasics for verbal subcategories.

favor of nouns, although the reverse pattern of verb superiority has been found in some anomic patients (Luzzatti et al., 2000).

The subcategories of nouns and verbs also seem to influence naming abilities. In children as well as aphasic adults, there is a tendency to prefer intransitive verbs and man-made nouns, although these factors do not always lead to significant differences. In fact, aphasic patients are in the normal range for man-made nouns. With respect to verbal subcategories, the result for agrammatic aphasic patients is in agreement with studies by Thompson and coauthors (Kim & Thompson, 2000; Thompson, Lange, Schneider, & Shapiro, 1997), who found an impairment of verb production in the face of preserved comprehension, reflecting the argument structure

of the verbs such that verbs with less arguments (e.g. intransitives) were produced better than verbs with more arguments (e.g. transitives). They argue that the locus of impairment is in accessing the lemma level of representation for production. Given the intact comprehension of their patients, Thompson et al. propose that the lemma-level itself is intact and accessible in 'comprehensionlike tasks requiring automatic, non-conscious, implicit processing of externally provided information' (p. 17). They suggest that agrammatic patients experience difficulty in 'accessing the verb's lexical-syntactic entry in production tasks requiring conscious recall and self-generation of information' (p. 17). This difficulty reflects the argument structure properties of the verbs, with increasing arguments leading to increased difficulty of lexical access and thus to a superiority of intransitive verbs over transitives.

The similar pattern found in our study for lexical acquisition gives further support to this interpretation. In a different context (deep dyslexia), Gerhand and Barry (2000) have demonstrated that within a two-stage model of word production, age of acquisition affects lemma activation, with early acquired words reaching threshold more easily than late acquired ones. In our study, intransitive verbs were generally acquired earlier than transitive ones, and they were also more resistant to loss, supporting the idea of a critical role of age of acquisition for patterns of word production deficits.

The superiority of nouns as well as the preference of certain subcategories of nouns and verbs were similar in the development of picture naming and in acquired language loss. In this sense, there is a specific correspondence between acquisition and breakdown of the ability to name nouns and verbs. Our data on the acquisition and loss of grammatical categories and subcategories do not allow us to share Caramazza's (1994) rejection of a more specific parallelism between the processes on the grounds that 'there is no correspondence between category-specific deficits in dysphasic patients and stages of acquisition of lexical knowledge' (p. 126). We have demonstrated that, at least in naming, such parallelism may exist and is likely due to similar general principles of verb argument structure guiding the acquisition and dissolution of lexical functioning

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Appendix A

See Table A1.

Table A1
German test items, matched by age of spontaneous production, listed in alphabetical order, and their English translations (by C. Schelleter, Hertfordshire)

Age of spontaneous production	Transitive verbs		Intransitive verbs		Biological objects		Man-made objects	
2; 6.2; 11 ($n = 10$ each)	Gießen	Pour	Bellen	Bark	Apfel	Apple	Auto	Car
	Kaufen	Buy	Klettern	Climb	Baum	Tree	Besen	Broom
	Kitzeln	Tickle	Lachen	Laugh	Birne	Pear	Brille	Glasses
	Küssen	Kiss	Rutschen	Slide	Fisch	Fish	Hammer	Hammer
	Schieben	Push	Schlafen	Sleep	Hahn	Cockerel	Hut	Hat
	Schneiden	Cut	Sitzen	Sit	Igel	Hedgehog	Korb	Basket
	Schubsen	Shove	Springen	Jump	Mond	Moon	Leiter	Ladder
	Tragen	Carry	Spucken	Spit	Sonne	Sun	Schlitten	Sledge
	Werfen	Throw	Tanzen	Dance	Spinne	Spider	Schlüssel	Key
	Ziehen	Pull	Weinen	Cry	Stern	Star	Uhr	Clock
3; 0–3; 5 ($n = 5$ each)	Füttern	Feed	Kämpfen	Fight	Insel	Island	Bank	Bench
	Kneifen	Pinch	Krabbeln	Crawl	Pilz	Mushroom	Drachen	Kite
	Messen	Measure	Niesen	Sneeze	Schwan	Swan	Kleid	Dress
	öffnen	Open	Schwimmen	Swim	Zebra	Zebra	Zaun	Fence
	Pflücken	Pick	Zaubern	Magic	Zwiebel	Onion	Zelt	Tent
3; 6–3; 11 ($n = 1$ each)	Retten	Save	Tauchen	Dive	Krebs	Crab	Zopf	Plait
4; 0–4; 5 ($n = 2$ each)	Grüßen	Greet	Gähnen	Yawn	Pfau	Peacock	Kreuz	Cross
	Wiegen	Weigh	Wandern	Walk	Ratte	Rat	Schürze	Apron
Practice items	Treten	Kick	Zittern	Tremble	Kirsche	Cherry	Tisch	Table

For one noun, a local variant had to be accepted in addition to the standard name (Krebs/Krabbe), for one verb, a monomorphemic synonym to the intended target was considered correct (kneifen/zwicken) and for two verbs, a particle verb had to be considered correct (kaufen/einkaufen; grüßen/begrüßen), Transitive and intransitive verbs were comparable in frequency but were of higher frequency than the nouns, thus putting a general noun-bias at a disadvantage while not favoring a particular verb subtype.

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