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1. Introduction

Clahsen’s (1999) claim:

Language faculty has a modular structure and consists of two basic components:
- a lexicon of (structured) entries and
- a computational system of combinatorial operations to form larger linguistic expressions from lexical entries.

Adults have access to two distinct processing routes:
- one accessing (irregularly) inflected entries from the mental lexicon
- another involving morphological decomposition of (regularly) inflected words into stem + affix representations.

The same evidence for child language:
- regular and irregular inflection are used under different circumstances and the constraints, under which they apply are identical to those of the adult linguistic system.
Clahsen (1999) has to be understood against the background of two related debates:
- the single-mechanism vs. dual-mechanism debate
- the rules vs. analogy debate

Table 1

<table>
<thead>
<tr>
<th>single-mechanism models</th>
<th>dual-mechanism models</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>rules</strong></td>
<td>Chomsky/Halle (1968)</td>
</tr>
<tr>
<td><strong>analogy</strong></td>
<td>connectionist (associative) models</td>
</tr>
<tr>
<td></td>
<td>Clahsen (1999);</td>
</tr>
<tr>
<td></td>
<td>Pinker/Prince (1994)</td>
</tr>
</tbody>
</table>

at least two kinds of single-mechanism models:
- Chomsky’s (1965), Chomsky and Halle’s (1968) model: *symbol-manipulating* (rules operate on abstract symbols (N, V, etc.) the speaker/hearer is assumed to have mentally represented),
- connectionist or *associative* models (cf. Rumelhart and McClelland 1986, Pinker and Prince 1994): deny any kind of such abstract representations in the mental grammar of the speaker/hearer and assume simple associations both for the acquisition and the adult processing of language (in a behaviouristic, stimulus–response style)

*associative* or *connectionist* models:
- both regular and irregular forms are stored (not necessarily whole-word representations)
- associative connections between word(form)s which can also account for similarity relations

acquisition process from the connectionist perspective (roughly and simplified):
- example: past tense development
- child learns to associate two corresponding forms, for example, *sing* and its past tense form *sang*
- if the child then wants to produce the (unknown) past tense form of, for example, *ring*, it “recognizes” the similarity between the two stems *ring* and *sing* and forms the corresponding past *rang* analogous to the past of *sing* (every association has a certain strength)
- associations between words vary in the course of the acquisition process
- analogous to *sing* and *ring* the child might set up an association between the similar stem *swing* and *swang* as its supposed past tense (typical child error)
- this association will be weakened in the following (partly by corrections of parents or others, partly by simply hearing the correct form *swung* and comparing it to the false one already stored) \(\rightarrow\) strength (weight) of association is adjusted
- parallelly it develops an associative connection between *swing* and *swung*
- the same kind of association (and development of associations) is assumed for regular verb pairs like *walk* and *walked* (processing of *walked* not via rule but by association between *walk* and *walked*)
\(\rightarrow\) the need of the processing of a certain past tense form is always answered by the activation of a corresponding association (between stem and past)
\(\Rightarrow\) difference to models like that of Chomsky: associative component and the lack of rules; frequency plays an important role for the development and adjustment of associations
2. Background information concerning the target structures of investigation

2.1. Subject of investigation

Characteristics of regular and irregular inflection

Regular inflection:
- captures the true productive aspects of inflectional morphology
- can be easily decomposed into stem + affix
- involves affixation processes that may operate on the outputs of other morphological operations (derivation, compounding)
- extends to novel items

Irregular inflection:
- shows sublevel regularities but also ideosyncratic aspects
- often not predictable from their corresponding base forms
- rarely extended to new forms
- Most of the empirical work within the connectionist-symbolist debate has been done on the English past tense but the representation and analysis of the past tense is still controversial
- Clahsen: “… the English past tense is not the most appropriate inflectional system for examining the distinction between memory- and rule based representations …” (Clahsen 1999: 994), because:
  - English is inflectionally poor
  - regular inflection is confounded with:
    - the presence of an overt affix (-ed)
    - type-frequency (regular verbs = 95% vs. irregular verbs = 5%)

  ! Several alternative interpretations are possible for differences in processing forms such as walk-ed and came.

⇒ The study of past participle inflection and noun plurals in German offers better insights in the underlying representation of regular and irregular forms.

Why is the German past participle an attractive research object?

- three (arbitrary) verb classes:
  - weak: kaufen (‘to buy’) – kaufte (‘bought’) – gekauft (‘bought’)
  - strong: gehen (‘to go’) – ging (‘went’) – gegangen (‘gone’)
  - mixed: brennen (‘to burn’) – brannte (‘burnt’) – gebrannt (‘burnt’)

- both the regular and the irregular form have a segmentable affix (-t, -n)
- the -t- and -n- participles show similar frequencies: 1000 verb types account for 96% of all verb tokens (Ruoff 1981); the token- and type frequencies are as follows:

Table 2

<table>
<thead>
<tr>
<th>Token frequencies</th>
<th>Type frequencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>47% of the strong class</td>
<td>502 strong verb type</td>
</tr>
<tr>
<td>32% of the mixed class</td>
<td>50 mixed verb type</td>
</tr>
<tr>
<td>17% of the weak class</td>
<td>448 weak verb type</td>
</tr>
</tbody>
</table>
comparing to English no frequency preference for the regular (weak) form

Which noun plural affix is according to Clahsen the regular plural form in German and why?

Table 3

<table>
<thead>
<tr>
<th>Affix</th>
<th>Adult writing and speech CELEX database (4571 noun stems) Tokens (Types)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0</td>
<td>not counted</td>
</tr>
<tr>
<td>-e</td>
<td>28% (22%)</td>
</tr>
<tr>
<td>-er</td>
<td>5% (2%)</td>
</tr>
<tr>
<td>-en</td>
<td>65% (68%)</td>
</tr>
<tr>
<td>-s</td>
<td>2% (7%)</td>
</tr>
</tbody>
</table>

Fact: The plural -s is extremely rare in terms of token and type frequencies. Nevertheless Clahsen considers the -s as the default plural affix in German and gives the following reasons:

- the -s plural applies when the phonological environment does not permit any other plural allomorph
- it occurs on masculine, feminine, and neuter nouns, on words that exhibit the canonical stress pattern and on those that do not, on monosyllables and polysyllables, and on both vowel-final and consonant-final stems
  → compared to the other plural suffixes the usage of -s is much less restricted to particular morphophonological conditions
- it is used for a range of atypical nouns (cf. Marcus et al. 1995):

  onomatopoeica  | Wauwaus  
  proper names    | Manns    
  unassimilated borrowings | Cafés    
  truncations     | Sozis    
  acronyms        | GmbHs    
  Nominalized conjunctions | Wenns & Abers 
  Eponyms         | Fausts   
  Products        | Golfs    
  Nominalized VPs | Rührmichnichtans

2.2. Minimalist Morphology within Clahsen’s interdisciplinary approach – the linguistic perspective

Clahsen uses the framework of Minimalist Morphology (Wunderlich and Fabri 1995; Wunderlich 1996) to formulate his assumptions of the underlying representations of regular and irregular inflection.

Two qualitatively distinct linguistic mechanisms:

1) **affixation** (= regular inflection)
   → combinatorial process
participle inflection | noun plurals
---|---
\(\text{-t}/: \ [V] \rightarrow [\_]+\text{part} \) | \(\text{-s}/: \ [N] \rightarrow [\_]+\text{plur} \)

2) **structured lexical entries** (= irregular inflection)

- not rule based
- irregular forms are represented as subnodes of lexical entries
- families, based on shared subnodes (*werfen*, *sterben*, *helfen*)
- “… structured lexical entries are maximally underspecified, and, at the same time, account for the overall similarity of irregularly inflected verb forms to their base forms and for the family resemblance structure …” (Clahsen 1999: 1011)

!! Note: The presented analysis of noun plurals is Clahsen’s application of Wunderlich and Fabri’s (1995) analysis of participles. Wunderlich (see critical commentaries) does not agree with it.

⇒ If the dual architecture (comprising combinatorial principles and a structured lexicon) is a core property of the language faculty, then one would expect to find corresponding dissociations in human language processing, with respect to the brain structures involved in processing and in child language.

### 3. Experiments on adult language processing

Experiments in this subpart of the study deal with two questions concerning the proposed dual architecture of language faculty:

(i) How are the two mechanisms used in speech production and comprehension?
(ii) How are the two different mechanisms represented in the brain?

- Clahsen favours the so-called *correspondence hypothesis* (originally proposed by Miller and Chomsky 1963)

**correspondence hypothesis**:  
- mental grammar is used directly in language processing  
- grammatical rules and principles are mentally represented  
- in recognition and production the language processor constructs representations using the normal structures and operations of the grammar → the parser makes basically the same distinctions as the grammar
Psycholinguistic investigations → different answers to the question whether there is a correspondence between the decomposition of a morphological complex word made by the linguist and the way it is segmented by the speaker/hearer during online production and comprehension:

**full listing models:**
- morphological structure of words plays no rule for the production or perception of morphologically complex words
- both regular and irregular forms are said to be stored in associative memory
- connectionist models as implementations of full listing models

**full parsing models:**
- everything is decomposed
- affix-stripping mechanisms do not necessarily correspond to the morphological structure of a complex word

**dual-route models:**
- both full-form representations of complex words and decomposition
- crucial factors for determining which route is chosen: word frequency and phonological transparency
- ≠ dual-mechanism model of Clahsen where frequency or transparency do not play a rule in determining if a certain form is stored in memory or processed by rule application

Clahsen’s expectations according to the correspondence assumption:
- inflected words that have stem + affix representations should be computed via their constituent morphemes (experiments should provide evidence for morphological decomposition in those cases)
- inflected words that are represented in terms of (structured) lexical entries should exhibit associative memory effects in processing experiments

### 3.1. Experiments on generalizing of inflectional processes

- prediction of the dual-mechanism model: generalization properties are different for regular and irregular inflection
  - structured lexical entries (irregulars) should generalize only by analogy (that is, to novel words that are similar to existing ones)
  - regular –t participle and –s plural inflection may apply to a given category (V or N) irrespective of any kind of similarity to lexical entries
  - ⇒ affixation-based generalizations should apply also in those cases, where similarity-driven analogies fail, to unusual sounding novel words, for example

#### 3.1.1. Generalization to nonsense words

**Experiment A:**
- on past participles
- data base: nonsense verbs with both the infinitive form and the past tense form divided into strong verbs (vowel change and no –te) and weak verbs (past tense with –te, no vowel change)
Step 1:
- subjects were given each nonsense verb in the infinitive and the past tense form, cf.


(‘One day, my friend Peter came to me and asked me whether I could teiden [= infinitive] his Zatt. That was no problem for me, and I tied [= 1st person past tense] his Zatt.’)

Step 2:
- subjects were asked to use the past tense form from step 1 to fill in a blank in another sentence, cf.

> “Es war nicht das erste Mal, dass ich einen Zatt _____”

(‘Is was not the first time that I _____ a Zatt.’)

Step 3:
- subjects had to fill in a second blank, this time they had to provide the participle form of the nonsense verb, cf.

> “Peter sagte: Danke, dass du meinen Zatt _____ hast.”

(‘Peter said: Thank you that you have _____ my Zatt.’)

[→ the same kind of example sentence for regular nonsense verbs]

three main results:
1. even in cases in which subjects correctly reproduced the strong past tense form in step 2, the (irregular) –n participle form is used less often than expected: only 31% (196/637) of the items that subjects reproduced in the strong past tense form had –n participle
2. in contrast, the –t participle appeared in nearly all of the expected cases: 97% (665/685), and (!) it was heavily extended to strong verbs (correctly reproduced with strong past tense forms): 69% (178/196)
3. 91% (178/196) of the –n participles were produced on verbs that rhyme with existing strong verbs

the results are as expected:
- generalization properties are quite different for regulars and irregulars
- -t generalizes widely to all kinds of nonsense verbs
- -n participle generalization is narrowly restricted to novel verbs that are similar to existing ones

⇒ these differences correspond to the linguistic distinction between affixation and structured lexical entries:
  o -t participles are affixation-based and restricted only by general principles and may apply to any kind of verb
  o –n participles are subnodes of lexical entries that can be accessed only by similarity-based analogy
Similar results have been obtained in an experiment on plural formation of nonsense nouns (Marcus et al. 1995):

**Experiment B:**
- paper-and-pencil judgment experiment on plural formation
- experimental items:
  - 12 monosyllabic novel nouns that rhymed with existing German nouns that take irregular plural forms (*Pund – Hund ‘dog’*) and
  - 12 monosyllabic novel nouns that don’t rhyme with existing nouns
- each item was first presented in a context sentence in its singular form, cf.
  ‘Ich habe einen grünen Kach gegen meine Erkältung genommen.’
  (‘Because of my cold, I took a green Kach.’)
- then followed eight test sentences, each containing one of all possible plural forms
  ‘Aber die weißen Kach sind oft billiger und helfen auch besser.”
  “Aber die weißen Käche …”
  “… Kacher …” etc.
- subjects had to rate each sentence on a 5-point scale for acceptability
results:
- irregular plural forms were judged as significantly better for nouns that rhymed with existing (irregular) ones than for nouns that do not rhyme
- –s plural forms were judged as significantly worse in the Rhyme-condition than in the Non-Rhyme condition

conclusion:
- extensions of irregular plural formation are sensitive to similarity, whereas –s plurals are applied elsewhere, even to nouns that are not similar to any existing German noun

### 3.1.2. Matching sentences containing nonsense participles

- the next experiment (Clahsen et al. 1997) investigates effects of violations of affixation processes
- affixation-violation effects can be captured in terms of reaction times: people are supposed to respond more quickly to words that are well-formed than to words that are ill-formed

expectation:
- affixation-violation effects should be observed only with participles of incorrectly inflected regular verbs (violation of affixation)
- in contrast, we expect no such affixation-violation effects for incorrectly inflected irregular forms, because they are stored in lexical entries as a whole and are not formed by affixation
**Experiment C:**
preparation of subjects:
- subjects had to learn a set of 20 nonsense verbs in the infinitive and corresponding past tense form
- 10 of the verbs: weak (for example, *praupen* – *praupte*)
- 10 of the verbs: strong (for example, *flauden* – *flied*)
- in the experiment subjects were presented with two stimuli on a screen and had to decide as quickly and accurately as possible whether these two stimuli are the same or different
- there were four types of test items: nonsense verbs learned as weak or strong verbs, and participles presented with $-t$ or $-n$

example:  
(i) **gepraupt** **gepraupt**  
(ii) **gepraupen** **gepraupen**  
(iii) **geflauden** **geflauden**  
(iv) **geflaudet** **geflaudet**  
   (learned as weak verb $\rightarrow$ correct participle)  
   (learned as weak verb $\rightarrow$ incorrect participle)  
   (learned as strong verb $\rightarrow$ correct participle)  
   (learned as strong verb $\rightarrow$ incorrect participles)  

- comparison of the reaction times of correctly formed participles and incorrectly formed participles of the same verb [(i) with (ii) and (iii) with (iv)]
- Question: Which influence has the incorrectness of a form on the reaction time?

results:
- weak novel verbs incorrectly presented with $-n$ [(ii)] produced longer reaction times than the grammatical control condition, that is weak verbs correctly suffixed with $-t$ (1,643 msec vs. 1,483 msec)
- for strong novel verbs there was no such effect; rather $-t$ suffixation, which is ungrammatical for existing strong verbs, produced even slightly faster reaction times than (grammatical) $-n$ participle formation (1,513 msec vs. 1,552 msec)

→ the above expectation is borne out by the experiment and can be explained by the dual-mechanism analysis:
   - the $-t$ participle formation for weak verbs involves an affixation process and a violation of that process (incorrect $-n$ participle formation) results in ungrammaticality and hence, in a longer reaction time
   - in contrast, a $-t$ participle form of a novel strong verb does not violate any affixation process or constraint, because $-t$ affixation may apply to any verb
   - $-n$ affixation – according to the linguistic analysis proposed here – does not involve a corresponding $-n$ affixation process, hence no longer reaction times for novel strong verbs with $-t$ participle (because of lack of affixation-violation)

3.1.3. **Generalization to unusual words**
- “unusual words”: words derived from other categories or words borrowed from other languages
- don’t have canonical lexical entries
example: to spit (‘to put the chicken on a spit’)
- derived from the noun spit
- headed by a derivational affix (zero-affix) that determines the category of the whole word (cf. Olsen 1990)
- does not have a lexical entry as a verb but is computed by category-changing affixation

- unusual verbs inflecting for past tense → access to lexical entries is blocked → regular default affix is used (Paul spitted the chicken.)
- the same applies to plurals of nouns derived from proper names and from borrowings, for example:

  the Helmut Schmidts and Helmut Kohls
  the cappuccinos

Experiments D:
participle study:
- subjects were presented with novel denominal verbs each of which appeared in two test sentences, one with a –t and one with an –n participle form
- subjects had to rate the sentences on a 7-point scale for acceptability
- to control for similarity based generalizations all the denominal verbs were homophonous to existing strong verbs

result:
- subjects judged –t participles as significantly better than –n participles (mean ratings 3.3 vs. 2.1), even though the novel verbs were similar to existing strong verbs

plural experiment:
- recall: we found similarity-based generalizations for plurals of nonsense nouns if the nonsense nouns were similar to existing ones taking irregular plurals (see Experiment B)
- when the same items were presented as proper names or borrowings

  proper names: Hans Kach und Inge Kach
  borrowings: die französische Kach (‘the french Kach’)

  the preference for irregular plural forms disappeared:
  o –s plurals of borrowings were judged as significantly better than –s plurals of the same items used as simple nonsense nouns (Ich aß einen grünen Kach)
  o –s plurals of proper names were judged as significantly better than irregular plurals, even for items that rhyme with existing irregulars

  explanation: no lexical entries for derived and borrowed words, but affixation can be applied to any element, hence the clear preference for the (default) –t participles and –s plurals

3.2. Frequency effects in visual lexical decision

- by lexical decision experiments inflected words can be tested for memory effects
- reaction times on noninflected simplex words depend on frequency (shorter RTs for high frequency items)
- for inflected words, we have to distinguish root frequency and word-form frequency predictions of the dual-mechanism analysis:
- word-form frequency effects should be more likely to occur for irregularly inflected forms than for regulars (→ irregular forms are based on lexical entries whereas regular forms are computed on-line)

**Experiment E:** (cf. Clahsen et al. 1997)
on participles:
- data: 20 –n participles of different subclasses of strong verbs
  - 20 –t participles of weak verbs
- -t and –n participles were divided into two subclasses according word-form frequency (high-frequency group (60 per million) + low-frequency group (13 per million))
- stem frequency was held constant across the high- and low-frequency groups to isolate word-form frequency as the decisive factor

results:
- word-form frequency effects for participles of different subclasses of strong verbs (the more frequent the word-form, the shorter the reaction time)
- no word-form frequency effects for regular –t participles

on plurals:
- comparison of lexical decision times of –er plurals and –s plurals (-er plurals are – similar to –s plurals – relatively infrequent)
- data: 20 –er plurals and 20 –s plurals devided again into a high-frequency and a low-frequency class, respectively

results:
- strong frequency effect for –er plurals (as expected)
- -s plurals produced similar reaction times, irrespective of a low or high frequency of the word-form

Conclusion:
- -er plurals and –n participles are based on lexical entries (that is, have full form representations) ⇒ high-frequency forms can be accessed more quickly than low frequency ones
- -s plurals and –t participles lack full-form representations ⇒ no frequency effect for the complex word as a whole

### 3.3. Morphological priming

- priming experiments: two stimuli are presented to subjects and it is tested whether the first stimulus (word) has influence on the recognition of the second
- general assumption: repetition of a word facilitates access to the lexical entry
- Question: Do morphologically complex words show such priming effects, too?
- see the following experiment (cf. Sonnenstuhl et al. 1999), where German participle and noun plural inflections were investigated for morphological priming effects
Experiment F:
- spoken prime followed by a visually presented target (simple form of noun or verb)
- on the target word subjects had to make a lexical decision
- in half of the trials the target was a non-word
- three different subgroups of prime/target pairs:

<table>
<thead>
<tr>
<th>I</th>
<th>prime</th>
<th>target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>plane</td>
<td>plane</td>
</tr>
<tr>
<td></td>
<td>'I plan'</td>
<td>plane</td>
</tr>
<tr>
<td></td>
<td>werfe</td>
<td>werfe</td>
</tr>
<tr>
<td></td>
<td>'I throw'</td>
<td>werfe</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II</th>
<th>prime</th>
<th>target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>geplant</td>
<td>plane</td>
</tr>
<tr>
<td></td>
<td>'planned'</td>
<td>plane</td>
</tr>
<tr>
<td></td>
<td>geworfen</td>
<td>werfe</td>
</tr>
<tr>
<td></td>
<td>'thrown'</td>
<td>werfe</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III</th>
<th>prime</th>
<th>target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>schätze</td>
<td>plane</td>
</tr>
<tr>
<td></td>
<td>'I estimate'</td>
<td>plane</td>
</tr>
<tr>
<td></td>
<td>beuge</td>
<td>werfe</td>
</tr>
<tr>
<td></td>
<td>'I bend'</td>
<td>werfe</td>
</tr>
</tbody>
</table>

- the same set of conditions was constructed for the plurals: again three groups of prime/target pairs (according to conditions I–III)
- expectations according to the dual-mechanism approach:
  - so-called full priming for –t participles and –s plurals, because –t participles and –s plurals are decomposed into stem + affix, which both have a presentation of their own \( \Rightarrow (\text{I} = \text{II}) < \text{III} \)
  - only partial priming for –n participles and irregular plurals, because they activate their corresponding base entries only indirectly via subtrees, so that they should produce less facilitation than identical primes \( \Rightarrow \text{I} < \text{II} < \text{III} \)

results for participles:
- for both types of verb the Identity condition (I) produces shorter reaction times than the two control conditions
- differences between the verb subclasses concerning condition II:
  - regular –t participles produce significant morphological priming, and the size of the effect is similar to the size of the effect in the Identity condition (RTs after presentation of –t participles do not differ significantly from those of the Identity condition) \( \Rightarrow \) full priming effect
  - for irregular verbs, prior presentation of the participle produces shorter RT than prior presentation of an entirely unrelated verb, but RTs in condition II are significantly longer than in the Identity condition \( \Rightarrow \) partial priming effect

results for plurals:
- the same picture as in the participle experiments:
  - strong morphological priming for –s plurals compared to the control condition III; the effect does not differ significantly from the Identity condition \( \Rightarrow \) reaction times in both cases nearly the same)
O for –er plurals the effect is much weaker: RTs in the morphological priming are shorter than in the control condition, but significantly longer than in the Identity condition.

O third observation: lexical decision times for nouns that take –s plurals are generally longer for each of the three conditions than the corresponding reaction times for nouns that take –er plurals → this results from frequency differences between the two classes of nouns: nouns that take –er plurals are more frequent than nouns that take –s plurals (cf. Clahsen 1999: 1013, note 8).

Conclusions:

- findings (full priming for regulars, partial priming for irregulars) correspond to the assumed differences between regular and irregular inflection in the dual-mechanism approach:

  - -s plurals and –t participles are decomposed into stem + affix and therefore priming toward other corresponding word-forms can be directly mediated by the stem.
  - this is not the case for irregular plurals and participles, because they are represented on subnodes of lexical entries and from there they can only indirectly prime their corresponding base form.

3.4. Conclusion adult language processing

Reported experiments demonstrate clear processing differences between –t participles and –s plurals on the one hand and –n participles and irregular noun plurals on the other hand, cf. Table 4:

Table 4. Summary processing properties of plurals and participles

<table>
<thead>
<tr>
<th>-t participles, -s plurals</th>
<th>-n participles, non –s plurals</th>
</tr>
</thead>
<tbody>
<tr>
<td>generalize to novel and derived words, irrespective of similarity</td>
<td>similarity-based generalization only</td>
</tr>
<tr>
<td>show no frequency effect in visual lexical decision</td>
<td>faster lexical decision times for high-frequency forms</td>
</tr>
<tr>
<td>fully prime their base forms in the cross-modal priming task</td>
<td>reduced priming of base forms</td>
</tr>
<tr>
<td>elicit affixation-violation effects in the sentence matching task</td>
<td>no affixation-violation effects</td>
</tr>
</tbody>
</table>
4. Acquisition and usage of inflection in child language

- Clahsen belongs to the advocates of one of the three main approaches of the ‘continuity hypothesis’. While assuming “that all UG principles are available to the child from the onset of acquisition [...] the grammar of the particular language the child is acquiring is claimed to develop gradually, through the interaction of available abstract knowledge [...] and the child’s learning of the lexicon”. (Clahsen 1996: xx)

- Grammatical operations, such as affixation are (latently) available from earliest stages. What the child has to learn are the particular vocabulary items (e.g. the participle suffix -t and the plural suffix -s) that undergo these operations. Because affixes are mostly unstressed, monosyllabic, not used in isolation and perceptually nonsalient it is difficult for the child to pick them up from the input. The child initially stores items like autos (cars) and gefragt (asked) and decomposes them as soon as the -s and -t suffixes have been identified as the default cases.

4.1. Studies on the development of inflection

English Past Tense

Three major findings in Marcus et al. (1992):
1. only one type of inflectional error is produced: overapplications of the regular past tense affix -ed (*go-ed)
2. overregularizations are rare at all ages (less than 10%) and their occurrence is preceded by a stage at which all overtly marked past tense forms are correct
3. overregularizations are sensitive to frequency and similarity

→ these findings are interpreted in two different ways:
  a) as evidence for two distinct mechanisms (Marcus et al. 1992)
  b) as evidence for associative models (Plunkett and Marchman 1991)

4.2. German-speaking children’s participle formation

Longitudinal data from 9 children between the ages of 1,4 and 3,9:
- 116 incorrect endings with 93% t-errors (*gekommen); but these overregularisations are quite rare (10%) and their occurrence is preceded by a stage at which all participle forms are correct

Elicited production experiment with existing verbs where 70 children between 3,6 and 8,10 were tested:
- 152 incorrect endings on participles of existing verbs with 90% t-errors
- clear frequency effect among these t-overregularizations: higher error rate for strong verbs with lower token frequency ⇒ indication that strong verbs form lexical entries; the -t applies where lexical access is unsuccessful

Elicited production experiment with nonsense verbs:
- from the 454 produced forms 93% showed -t ⇒ children apply -t under default circumstances
4.3. German-speaking children’s noun plural formation

Elicited production experiment with 66 children between 3,1 and 8,11:
- by using 16 object denoting low-frequency nouns (Feder ‘feather’, Tuch ‘towel’, Fassung ‘socket’, etc.) children were asked to name each object and then were prompted to produce the appropriate plural forms
- results: overall overregularization rate of 18.5%, whereby the different affixes were used with different frequencies:
  - 58.5% -s
  - 26.2% -e
  - 14.6% -(e)n
  - 0.8% -er
⇒ children (like adults) tend to use -s for unknown words

Acceptability judgment experiment with 37 children between 3,6 and 6,6:
- two kinds of nonsense words were constructed in order to control similarity-based generalizations: “Rhymes”, like Pund (Hund-Hunde) and Kach (Dach-Dächer) and “Non-Rhymes”, like Pnähf and Fneik
- these items appeared in two different contexts, as canonical root nouns and as non-canonical roots (proper names)
- each item was embedded in a story and illustrated by picture cards, followed by the presentation of two plural forms (one with -s and one with –en)
results:
- for non-rhyme canonical root nouns children preferred -s, whereas there was no clear preference for ‘rhyme’ roots
- for non-canonical nouns (proper names) children preferred -s pluralization in both the rhyme and the non-rhyme condition
- → children prefer (like adults) -s pluralization for unusual-sounding words (non-rhymes) and for non-canonical words (proper names)
⇒ Because children’s usage of regular and irregular inflection resembles that of adults one can assume, that the dual structure of the language faculty is in place from early on. The driving force in children’s grammatical development is (according to Clahsen) the gradual acquisition of new lexical and morphological items. As soon as the child is able to isolate inflectional affixes from stems and to create lexical entries for them it uses affixation in the same way and under the same circumstances like adults.

4.4. Plurals inside compounds – constraints on word formation processes

- The plural forms that occur as nonhead elements inside compounds are the irregulars and never the plural affix -s. This can be shown for English: mice eater vs. *rats eater, teeth marks vs. *nails marks, and also for German: Lampengeschäft vs. *Autosgeschäft (German examples: DB)
- The distribution of plurals-inside-compounds coincides with the distinction between structured lexical entries and affixation. Lexical compounding is a process that concatenates lexical entries. Because units of noun + regular plural -s are not memorized as lexical entries, it is not surprising that these regular plural nouns are not involved in the process of compounding. In contrast the irregular plural forms stored as lexical entries
can be fed into the compounding process. This feeding relationship between compounding and plural inflection can be explained with a grammatical ordering constraint.

- How could children learn this constraint directly from input data? If the constraint is inherent in the child’s language faculty (as assumed from the perspective of ‘continuity’ and ‘lexical learning’) children should not use the overregularization form of their intra-individual grammars for the nonhead noun.

Data from spontaneous speech:
- children used -e, -er, -n plural forms, but never -s
- some children who use the -n form as default, do not use it inside compounds, even in those cases where the -n is required

Elicited production experiments with existing and with novel root compounds (66 children aged 3,1 to 8,11):
- children omit default plural affixes significantly more often than nondefault plural affixes

5. Conclusions regarding the topic of the class

- both mechanisms analogy and rules are exploited in inflecting new forms
- because of the genuine differences in the conditions under which they apply (analogy → similarity-based, rules → restricted only by general principles) the scope for the latter is wider
- concerning productivity we would – according to this approach – expect, that regular generalizations have a higher “productivity value” because of the lack of specific restrictions

6. Critical commentaries

Joan Bybee (p. 1016f.)

- “… no innate structures are necessary to explain the grammar of human language”
- “… properties of usage often correspond to the proposed properties of structure …”
- “… the regular "rules"of morphology usually have high type frequency …”
- → the default nature of particular affixes follows from their high frequencies

Bybee does not agree with Clahsen’s attempt to show that regular rules do not necessarily correspond to high frequency and criticizes the following points:

- different counting of the German and English irregular verbs (ausschreiben, abschreiben, aufschreiben = 3 Types vs. write out, write up, write down = 1 Type); Bybee argues that the default nature of the -t affix follows directly from its relatively high frequency
- the s-plurals with their low type frequency are not free of lexically based similarity effects; Köpcke (1988) showed that subjects in a nonce-probe task tended to use the -s plural on nouns with a full vowel ending, in analogy to Autos, Pizzas
- high frequency regulars show word frequency effects which suggests that they are stored in the lexicon rather than derived from rules (experimental evidence comes from Stemberger and McWhinney 1986)
⇒ “… it is frequency of use that determines the nature of storage and access, not structure”

Clahsen’s response concerning the verb counting:
- German has many families of particles and prefix verbs, such as ankomen, bekommen, aufkommen, which
  - have noncompositional meanings
  - behave orthographically and phonologically like single verbs
  - appear in their participle form always as a single verb

Clahsen’s response concerning the similarity effects for the regular plural affix -s (p.1051):
- (he has not explicitly denied a similarity effect for regulars, see Table 4)
- what is crucial here is what children and adults do under no-similarity conditions, when they can not form an analogy to items stored in memory; under these circumstances there is a clear preference for -s (and -t) irrespective of frequency

Clahsen’s response concerning the assumption that frequent regulars are stored (p.1052):
- data from speech errors provide more evidence for morphological decomposition: stranding errors, like he is schooling to go (instead of he is going to school) where the suffix -ing has been stranded in its original position and the stem go- being moved somewhere else show that a decompositional mechanism must be at work even for such a high frequent word form like going

**Dieter Wunderlich** (p. 1044)
- The dual-mechanism (as proposed by Clahsen) can not capture “the several kinds of conditions under which morphological regularities have to be described”.
- It is not correct to identify regular affixation with default affixation.
- The default status of -s:
  - for atypical nouns:
    - nouns with a back vowel (o, u, a)
    - words and (even phrases) without the categorial specification [+N], where the syntactic context (‘many X’) requires a plural noun
  - for low-frequency nonfeminine (and nonumlauting) nouns ending in a consonant for which the speaker has not stored a plural form (schwa is also often used in these cases)

Some regularities, where no lexical entry is necessary:
- all (nonumlauting) feminines have an -n plural, for instance nouns derived with some productive derivational suffixes (-ung, -heit, -keit)
  (!!! in contrast to irregular -n plural of nonfeminines, like Professoren ‘professors’, Muskeln ‘muscles’, Rhythmen ‘rhythms’ – these forms must be lexically fixed)
- all masculines ending in schwa take -n (Hasen ‘hares’, Russen ‘Russians’)
- all nouns that end in a reduced syllable have an unmarked plural (Laken ‘sheet’, Gebirge ‘mountains’); they are subject (like all typical nouns) to the prosodic constraint REDUCEDFINSYLL in the plural
“It is unmotivated to assume that the plural form is lexically fixed for regular instances of German plural nouns.” (p. 1045)

Clahsen’s response:
- There may indeed be more than one rule per inflectional category, like “‘minor’ rules for the -n plural in German or class defaults in Italian” (p. 1047). The central claim of the dual-mechanism model that there is a distinction between lexical entries and productive morphological operations can still be maintained.

Robert Schreuder, Nivja de Jong, Andrea Krott, Harald Baayen (p. 1038f.)
- show different experimental results that contradict Clahsen’s claim that regular complex words are not stored
- full-form effects for regular inflection could be shown for:
  - verbs and nouns in English (Taft 1979; Sereno and Jongman 1997)
  - noun plurals in Dutch (Baayen et al. 1997b) and in Italian (Baayen et al.1997a)
  - verbs in Dutch (Schreuder et al.); inflectional ‘default’ suffix –t, as in clint ‘climbs’:
    visual lexical decision experiment with 74 inflected verbs (selected from the CELEX lexical database)
    - 37 verbs with high surface frequency: mean RT 571
    - 37 verbs with low surface frequency: mean RT 630
    ⇒ 59 msec effect of full-form frequency for a regular inflectional suffix
    ⇒ this result “negates the linguistic projection of defaulthood onto lexical processing”

- “… the lexical access is attempted in parallel both by rule and by rote […], that on average the parsing route will be the winning route for lower frequency words, and that on average the direct route will be the winning route for higher frequency words.”

Clahsen’s response (p.1052):

- the two mechanisms (storage and combinatorial rules) may work in parallel
- frequency effects can only be shown for regular items above a certain frequency threshold and regulars below this threshold do not show these effects (Clahsen refers to experiments done by Alegre and Gordon 1999)

⇒ this observation accounts for the different experimental results of
  - Schreuder et al., who looked at items which were on average 80 times more frequent than the low-frequency ones and
  - Clahsen, who showed that in case of less extrem frequency contrasts a frequency effect appears only for irregulars and not for regulars

“… even though high-frequency regulars may produce memory traces, the processing of regulars does not depend on stored representation.”
Summery

By looking at the regular and irregular inflection of the German past participle and the noun plural formation from various perspectives Clahsen achieved his main goal namely to show that the language faculty has a modular structure of two basic components: a lexicon of structured entries and a computational system of combinatorial operations. Because he argues for the strong position that only irregular inflected words are stored in the lexicon, whereas all regular inflected words are processed by rule some problems arise. His proposed model is not fine grained enough to capture for instance all the nuances of regularities within the German plural inflection system and it can’t deal with frequency effects for regular inflected words.

References


