Section 1 will show why the I-projection in Dutch root sentences constitutes a challenge to any acquisition procedure in GB-grammar. Section 2 gives an overview of the problems previous analyses ran into. Section 3 stipulates a potential grammar acquisition procedure for the Dutch I-projection. Section 4 presents a sample derivation. Section 5 considers some general consequences and Section 6 gives an attempt to apply the learning procedure to English.

1. The Problem

The problem of the I₀ projection arises if one accepts Lightfoot's Degree Zero Learnability and Den Besten's thesis about V2nd languages. According to Den Besten's thesis from 1977 (Den Besten 1989) the V2nd rule moves the finite verb from I-to-C if the Cᵩ position is empty. The prime examples are root sentences. The finite verb in V2nd root clauses is in the position Cᵩ preceding its complements. By contrast subordinate clauses do not trigger the V2nd rule and keep the finite verb in the I₀ position which appears to be predicate final in SOV Dutch. The finite verb in subordinate structures follows its complements.

All of this implies that simplex root clauses in V2nd languages by their very nature offer no direct indication about the position, or even the presence of a head I₀. At the same time there is direct evidence for Lightfoot's 'degree zero learnability'. Toddlers settle for a V2nd pattern quite early. Long before they use subordinate structures, they place an auxiliary or an aspectual in the first or second position and have the dependent lexical verb in predicate final position.

\[
\begin{align*}
\text{(1)} & & \text{XP} & \text{AUX} & \text{YP} & \text{ZP} & \text{V} & (85\% \text{ of the output}) \\
& & \text{XP} & \text{V} & \text{YP} & \text{ZP} & & (15\% \text{ of the output})
\end{align*}
\]

This acquisition result is attained early, i.e. at a moment that the amount of subordinate structures in the input and output files is still negligible to non-existent. Moreover, there are no signs that the introduction of subordinate clauses later on requires a revision of the grammar already acquired (Roeper 1973).

This is remarkable since the subordinate clause looks as if it overrules the well established V2nd clause pattern. We take this as an indications that support Lightfoot's Degree Zero Learnability. The grammar acquisition procedure seems strong enough to set the directionality parameters of the C/I/V projection by means of evidence from simplex root sentences only. The IP pattern that becomes manifest in the subordinate clause had already been constructed as an underlying subject predicate representation of root clauses. What we have in mind is an acquisition procedure which proceeds in the following way.

\[
\begin{align*}
\text{(2)} & \text{a} & \text{first sets the VP directionality as head final,} \\
& \text{b} & \text{subsequently identifies the V2nd phenomenon as a C₀ projection} \\
& \text{c} & \text{then postulates an IP complement to the C₀,} \\
& \text{d} & \text{and finally deducts that the IP directionality is not different from the VP directionality, i.e. deducts that the I₀ is predicate final.}
\end{align*}
\]

The first part of our problem can now be formulated.
Which universal acquisition function is strong enough to deduct the presence and the position of the head $l^0$ in the root clauses of V2nd languages?

This is the first part of the problem. The second part is a specific acquisition hurdle in Dutch, which is nevertheless highly significant. The finite verb in Dutch, i.e. the $l^0$, is not exactly predicate final. Its position in subordinate structures precedes the other verbs. This holds for all auxiliary-like constructions. Roughly speaking, one might say that the Dutch order of auxiliaries and main verbs is like in English, although the Dutch row of verbs is in predicate final position. whereas the English row of verbs is in predicate initial position. The order in Dutch is rigid and inevitably separates the theta-grid carrying main verb from its subcategorizing objects, as (4) shows.

(4)  

(4) a  

\[ C^0_{\text{subject}} [ \text{object}_1 \text{Auxfin-Aux2-Vth-grid}]^l \] (Dutch)

\[ C^0_{\text{subject}} [ \text{Auxfin-Aux2-Vth-grid object}_1]^l \] (English)

b  

\[ \text{als jij [ het boekje wil gaan lezen ]} \]

(when you the booklet want go read)

\[ \text{when you [ will start reading the booklet]} \]

The linear order in (4) prevents an analysis of the Dutch periphrastic construction as a stacked VP-structure, as is commonly done for English since Ross (1969). A standard solution for Dutch derives the verbal order in (4) by accepting Ross' stacked VP analysis as the underlying structure, be it that the V-projections are head final. Subsequently V-to-V raising is applied to this underlying stacked VP-structure. The $V_{\text{theta-grid}}$ is raised out of its projection to the right of $Aux_2$. The ensuing verbal complex is subsequently raised to the right of the $V_{\text{fin}}$.

The $V_{\text{fin}}$ heads the full verbal cluster which by standard assumption must now have the status of a complex head $l^0$. The trigger for these head to head movements is some matter of S-structure visibility. According to Evers (1981, 1994) D-structure VP-complements that lack marking by a head $l^0$ lack S-structure visibility. They are restructured by head-to-head movement, cf. Rutten (1991) for a recent discussion of the facts and Evers (1981, 1994), Bennis and Hoekstra (1989) for specifics about the trigger proposal. It is a remarkable outcome of the V-to-V Raising analysis that the subordinate clause contains no phonologically manifest V-projection ever, although it does contain a (complex) head $l^0$. 

\[ V_{\text{fin}} [ Aux_2 V_{\text{theta-grid}} ]^l \]

\[ \text{wil gaan lezen} \]
Even more impoverished is the Dutch root clause. It contains neither a phonologically manifest \( I^o \) position, nor a phonologically manifest \( V^o \) position ever. This is the paradoxical consequence of the V-to-V Raising analysis, combined with the V2nd rule. We recapitulate by means of the diagram (7) and a triple statement.

(i) Ad CP. The finite verb in the second position of main clauses projects according to the target grammar, a CP. The grammar acquisition procedure has to attain the target grammar. Therefore, the procedure has to figure out why all Dutch main clauses have to be CP by this V2nd effect.

(ii) Ad IP. The IP in main clauses lacks a phonologically manifest head \( I^o \). The grammar acquisition procedure will have to reconstruct the IP as the underlying complement of the head
The subordinated clause is more perspicuous. The IP head is manifest as the finite and its position is predicate final. If the finite verb is a modal or an aspectual, subordinated clauses will show an adjacency between the auxiliary and the lexical verb. According to the target grammar, the two adjacent verbs will constitute a complex head $I^o$, cf. the diagram (7). Therefore, we have to equip the acquisition procedure with a principle to deduce the complex head $I^o$ and to decide that the position of this complex head is predicate final.

(iii) Ad VP. The adjacent heads $I^o$ and $V^o$ in the predicate final positions of the subordinated clause constitute a complex head $I^o$, cf. (7) above. This causes the paradoxical effect that neither the main, nor the subordinated clause will contain a VP with a phonologically manifest head $V^o$ of its own. The $V^o$ head has been incorporated into the complex $I^o$ head. Therefore, we have to equip the acquisition procedure with a principle that will guide the procedure into the reconstruction of the VP as the underlying complement of the $I^o$ head. The main clause as well as the subordinated clause require the reconstruction of the VP constituent.

An alternative analysis of the same Dutch construction-type (7) is given in Santorini/Kroch (1991). They obviate the $I^o$ cluster introducing some mechanism to extrapose single infinitives. The major issue of their enterprise is probably to get rid of head-to-head movement altogether. Whatever the merits of this approach, it does not yet offer a clear trigger. The paradoxical effect of the non-manifest head positions $tV$ and $tI$ remains. Consequently, we may expect a corresponding acquisition problem. Be this as it may, the acquisition problem for the standard analysis of Dutch (7) is stated in (8).

\[(8)\]
\[
\begin{align*}
\text{a} & \quad \text{Which universal acquisition function is strong enough to deduct the presence and the position of the head } I^o \text{ in root clauses?} \\
\text{b} & \quad \text{How does the acquisition procedure figure out about the } V \text{-cluster as a complex head } I^o? \\
\text{c} & \quad \text{How does the grammar acquisition procedure deduct the head position of the VP?}
\end{align*}
\]

This outcome is a fairly straightforward consequence of the analysis in (5). An alternative analysis of the same Dutch construction-type is given in Santorini/Kroch (1991). It obviates the $I^o$ cluster and introduces some mechanism to extrapose single infinitives. Whatever the merits of this approach, it does not yet offer a clear trigger nor an escape from the paradoxical effect of the non-manifest head positions $tV$ and $tI$. Hence it is in for a parallel acquisition problem. The acquisition problem for the standard analysis of Dutch can be stated as in (9).

\[(9)\]
\[
\begin{align*}
\text{a} & \quad \text{Which universal acquisition function is strong enough to deduct the presence and the position of the head } I^o \text{ in root clauses.} \\
\text{b} & \quad \text{How does the acquisition procedure figure out about the } V \text{-cluster as a complex head } I^o. \\
\text{c} & \quad \text{How does the grammar acquisition procedure deduct the head position of the VP.}
\end{align*}
\]

2. Previous analyses

The acquisition problem posed by the VP-IP-CP projection in Dutch and German have been discussed in several studies, e.g. De Haan (1986), Clahsen (1991), Rothweiler (1989), Weissenborn (1991) and Tracy (1992). We feel that the basic problem has become clear while the solutions that were suggested basically failed. We see the study by Clahsen (1991) as a
development or a variant from the initial approach by De Haan (1986). De Haan proposes that the finite verbs in the second position and the non-finite verb in predicate final position are first acquired under different category labels. The acquisition procedure would subsequently find reason to identify the two categories as variants of the single category \(<+V>\). The proposal leads to several questions, sated in (10), about the learning procedure.

(10) a What kind of semantic, morphological or syntactic evidence causes the recategorization of \(<+aux>\) as a subclass of \(<+V>\)?

b Are there any consequences for the structure that has already been assigned?

(i) Has the finite verb in second position been understood as the head of a CP projection and if not when will this happen?
(ii) Does the non-finite verb in final position been understood as the head of a CP projection and if not when will this happen?
(iii) Does the grammar acquisition procedure find a reason to capture the difference between main and subordinate clause by means of a V2nd rule "Shift the finite verb from position \(I^0\) ot position \(C^0\)" and what is that reason?

A very interesting aspect of the approach by De Haan is that English reserves a specific category for the \(I^0\) and the \(C^0\) position. It seems then that some historical development of English must have blocked the identification of the \(<+aux>\) and the \(<+V>\) category. Clahsen (1991), somewhat differently from De Haan, makes use of an underspecified category \(<+F>\). Later on, after the appearance of subordinated clauses, the acquisition procedure figures out that the \(<+F>\) is subject AGR. This sets the \(<+F>\) projection in the subordinated clause as an IP with the \(I^0\) in final position. The same IP with the \(I^0\) in final position and marked by subject AGR is protected into the main clause. The initially spotted \(<+F>\) projection was not head final. It can now be identified as CP. Since it is not head final, it can not be IP. The solution is not compatible with Degree Zero Learnability. Another implication seems to be that the IP of a V2nd language could not be acquired if it had no AGR marking on the \(I^0\). Swedish and Afrikaans refrain from subject AGR. They are V2nd languages, which may cause a problem for an approach relying on morphology.

Weissenborn (1991) and Rothweiler (1989) get into another problem. They propose, each for a reason of his own, that the IP in main clauses is constructed without reliance on evidence from the subordinated clause. The head \(I^0\) would precede its VP complement. Compare Travis (1984, 1991) and Zwart (1991, to appear) for arguments that such an IP serves some purpose. Later evidence from the subordinated clause would lead to a revised decision, the IP-switch. The IP is reset as a structure where the head follows its complement.

Tracy (1992) obviates this directionality problem and suggests two kinds of IP, one type of IP for the main clause and one for the subordinated clause. The \(I^0\) in the main clause IP precedes its complement, whereas the \(I^0\) in the subordinated IO would follow its complement. The usual generalization to one kind of predicate shared by main clause and subordinated clause would not fall within the reach of the acquisition procedure.

We would like to consider the acquisition questions above in a somewhat aprioristic manner. How strong should the acquisition procedure be in order to attain the GB standard analysis of Dutch in an optimal way? The acquisition procedure for the Dutch CP-IP-VP projection is optimal in so far as it operates under the constraints in (11).
The procedure will not reset parameters. It can not temporarily decide that the Dutch IP in main clauses is head initial and later on, confronted with evidence from the subordinate clause, decide that the IP is after all head final. The procedure will not rely on intermediate categories. The procedure does not rely on evidence taken from the subordinated clause. It operates under Lightfoot's (1991) Degree Zero Learnability.

The procedure will not rely on morphological evidence to acquire the V2nd phenomenon. This constraint will cause a difference with previous analyses. The No Morphology restriction is proposed to account for V2nd languages that display no morphological marking for the finite verb. Afrikaans may be a candidate.

A consequence of all these a priori decisions is that the procedure proposed for acquiring Dutch is close to speculation. Nevertheless it might be useful to consider what would be necessary to arrive at a learnability proposal for the usual GB analysis of Dutch. The proposal can subsequently be checked by studying how it would handle other V2nd or residual V2nd systems, English for example.

3. A Priori's and Input Analysis

3.1. Introduction.
We will follow the approach to language acquisition taken by Berwick and Weinberg (1984). Language acquisition is driven by an attempt to understand input sentences provisionally analyzed by a bottom up analysis that applies universal principles. The solutions solidify into language specific grammar forms. Clearly, the input will have a phonological form to start with. Grammatical structure with categories, X-bar phrases, empty places, scope relations, argument structure and theta relations is assigned to this string by universal search functions. Below we will simply tailor the search functions for CP, IP, and VP in such a way that a bottom up grammar of Dutch is attainable from the input of root sentences. It is encouraging that the bottom-up grammars for Dutch used in the automatic translation projects Rosetta (Phillips) and Eurotra (ECM) independently of each other follow the same track. A subsequent crucial question is, how the universal search functions stipulated here for Dutch, handle periphrastic constructions in other languages. We will make no more than a few remarks about this adventurous issue.

2.1. An Implementation of Roeper's C/I/V A Priori.
We start the enterprise with Roeper's (1992) thesis that CP/IP/VP are structures which are given apriori. We conceive of this in the following way. The projections of C/I/V have the form of search functions that can be applied to input strings.
Assuming a priori

(i) the phrase structure form \([ \text{Spec} [\text{Head Complement}] ]\)
(ii) a head position C, I, and V,
    \(V\) with theta grid, C and I grammatical
(iii) IP as the complement of C
     VP as the complement of I

Find out the configuration of illocution (CP)
Find out the configuration of predication (IP)
Find out the configuration of theta-assignment (VP).

It is unreasonable to assume that a morphological or configurational complication could inspire someone to invent illocution, predication or argument structure. It has to be the other way around. A lexical item \(V\) has been understood and subsequently a learning procedure, equipped with the spec/head/complement frame, may search for the directionality that encodes the verbs argument structure.

The Berwick and Weinberg (1984) approach seems to us also present in e.g. Clahsen (1991), where a Specifier-head- complement structure has been spotted and provisionally labeled as a \(<+F>\) projection. Subsequently Clahsen has his acquisition procedure finding out, whether the X-bar frame \(<+F>\) fits the C-projection or the I-projection. There is an ordering problem here. Which structure - VP, IP or CP - can be figured out first?

2.2. Gibson and Wexler's VP First Requirement.

Gibson and Wexler (1992) demonstrate that the grammatical form of the VP has to be identified first. This opens the possibility to apply the same X-bar phrase a priori's for finding out the grammatical form encoding predication and illocution. They point out how an acquisition procedure that would inadvertently assign the CP parameter V2nd before it had figured out the internal VP directionality, may get itself into a 'local maximum'. It may have assigned the V2nd structure on spurious grounds and subsequently adapting the construction of its VP, never find out about the initial error of its ways. Gibson and Wexler assign the VP First antics of the acquisition procedure to a rather mysterious maturation.

We do not completely follow their problem, though. It seems to us that a CP or IP acquisition-search must decide whether the Specifier is a 'topic' or a 'subject'. To check on this, the CP has to call up an IP procedure and the IP-legitimization will in turn ask for a VP procedure. Otherwise the theta-requirements on the subject function can not be established. If the respective back up procedures (IP and VP) are not available, no CP parameter can be set. Hence the VP first tactic follows from an intrinsic ordering.

The conditional assignment of CP and IP should hold during the acquisition procedure. Later on after the CP and IP parameters have been set, CP and IP can be assigned without preliminary checks. Clearly in a language set for the V2nd parameter any well formed root clause has to be CP, without any intrinsically ordered checking procedure whatsoever. In a language set for residual V2nd each root clause has to be IP unless it is a non subject WH-question. Should such initial CP decision not lead to a grammatical outcome, it will be felt that the sentence itself is wrong rather than the initial CP structure assignment. But such shortcuts and judgments turn up after the parameters have been set.
2.3. Valian's 'Robust Evidence'.

The Dutch input of simplex root clauses presents conflicting evidence. Both the O+V and V+O orders are present (cf.(13a)/(13b). The V+O order in (13b) is due to the V-second rule, but the grammar acquisition procedure has as yet to be blind to such complications. By assumption it could not know about the CP structure and its V2nd when still busy to set the initial VP parameter.

The unambiguous evidence in the subordinated clause, where no V2nd applies, has led Roeper and Weissenborn (1990) to the assertion that the toddler overhears a sufficient number of subordinate clauses to surmise from these structures that O+V is the true setting of the parameter. Following an earlier suggestion in Roeper (1973), they are ready to give up the strong common sense position that the acquisition procedure is initially guided by simplex root sentences only, c.q. Lightfoot's Degree Zero Learnability. Honestly speaking, we doubt very much whether Roeper and Weissenborn can support their view with a real input-survey. But if they were able to show that a more than accidental input of subordinate clauses is available, a new problem would emerge rather than a solution. Subordination as such is highly unlikely to be noticed by the early acquisition procedure since subordinated clauses do not appear in the production until all root sentence problems have been solved and even then subordinates appear without C-elements like 'that'. The full grammatical marking of subordination is probably the last of the major phenomena to be mastered. Following nevertheless the suggestion in Roeper and Weissenborn (1990), we see that it feeds the grammar acquisition procedure with two sets of simplex root-sentences, the real root sentences and the pseudo-root subordinated sentences. The first set, the real roots, will soon allow a general settlement of the CP/V2nd parameter, - all roots are CP -, but only if the procedure somehow succeeds to disregard the conflicting evidence from the pseudo-roots. The pseudo-root subordinated clauses will settle the VP directionality, but only if the acquisition procedure succeeds to disregard the conflicting evidence from the real roots. This way we get from bad to worse. Having given up a real constraint (simplex root sentences only), we run into conflicting evidence all over the place. In a sense this was to be expected.

We will take a different approach. Parameters are not set on the grounds of just any minimal input evidence. Trivially, an afternoon's conversation is not sufficient to set all of the child's parameters and moreover the grammar acquisition should not be led astray by input mishaps and correct but idiomatc exceptions. Finally and more interestingly, the input for certain parameters may present conflicting evidence as in our O+V versus V+O problem for the Dutch VP parameter. If a grammar acquisition procedure could not side step any apparent evidence, a procedure of parameter-setting might conceivably start pendeling between two possible values and not reach a decision ever. Hence we take the advice of Valian (1990) and Lightfoot (1991) and require 'robust evidence' for parameter setting. To be less vague about this, we expect a parameter to be set as soon as a setting will covers 75% of the input data, cf. (13). The residue of non covered data will remain temporarily in the category 'puzzling idioms'.

The data in (13) about O+V and V+O orders in the input are taken from Klein (1974). See the following four patterns.

(13) a YP AUX XP V
   <+subject> <fin> <-subject> <+th-grid>
   jij gaat dit boek lezen
   you 'rgonna this book read
   (you'r gonna read this book)
Klein (1974) contains some 25 input types relevant to the V/O parameter. Besides variation by the presence or absence of an AUX, presence or absence of a preposed Topic, there are Initial Specifier Drop, AUX-drop, WH-forms, Yes/no question forms, imperative forms with certain variations. This variety can be reduced to 20 types if we consider only those V+O and O+V orders that are supported by a theta relation between V and O. By this criterion (13d) is in whereas (13c) is out.

Which percentages of mother's input and toddler's output support or give evidence of a O+V parameter setting?

(14) a mother's input

<table>
<thead>
<tr>
<th></th>
<th>types</th>
<th>tokens</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>O + V</td>
<td>15</td>
<td>275</td>
<td>82%</td>
</tr>
<tr>
<td>V + O</td>
<td>5</td>
<td>61</td>
<td>18%</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>336</td>
<td>100%</td>
</tr>
</tbody>
</table>
According to (14a) 75% of the types and a considerably higher percentage of the tokens supports the O + V parameter setting. Hence, in a first move, the learning procedure just proposed will set the parameter of VP directionality as O+V.

Although we feel that Klein's data can be used to set the VP parameter in Dutch on 'robust evidence', it should be pointed out that Klein saw his data in a completely different light. The output data roughly mirror the OV/VO distribution in the input, such that some 15% output is not rule covered. Klein concluded that the assumption of rule guided sentence construction was not in evidence. The output, he felt, only reflects patterns in roughly the same distribution as the input. It may be obvious that we have disregarded Klein's (1974) challenge to a rule based grammar, not answered it. We still have to figure out whether the pivot period shows an internal development from mixed VO/OV output towards rigid OV. If not, Klein (1974) was right and we are done with.

4. Parameter Setting

4.1 The CP directionality.
Suppose the VP parameter were set as O+V during the pivot period. If a procedure for VP wellformedness is available, it becomes feasible to check how root patterns fit the pattern of CP (illocution) or IP (predication), cf. (15).

(15) a  XP     V^o  {string}

        Topic^Spec,C   C^o  [ . . . ]IP
Subject^Spec,I  [ . . . ]VP    I^o  (unmarked)
Subject^Spec,I  I^o  [ . . . ]VP  (marked)

We assume that illocution and predication are present on the level of pragmatic understanding anyway. We assume further that IP is any V-projection that defines its own subject position. Further that I^o is a V^o with a positional and/or morphological marking <+I>. Last but not least we assume that IP has a provisional default directionality. If VP is head final, IP is too. Assuming all this as a priori orientation of the acquisition procedure, we get an easy ride. Almost the full 100% root sentence input has a head preceding a potential complement string, hence does not fit the default IP pattern and may fit a C^o + IP pattern only. This
provisionally sets the CP parameter. The condition for a definite CP setting is that the complement string appearing to the right of the head C⁰ can be analyzed as IP.

4.2 The IP structure
If the string to the right of the V⁰ in (8)a. is an IP, it should end on a <+I> marked V by a provisional default setting. Suppose the string does not end on a category V⁰ at all. In Klein's set this represents 31% of the root input. The acquisition procedure insisting on the IP nature of the string may now insert a final empty place t₁.

(16) Spec.C C⁰ [. . . t₁]IP

The t₁ supports the IP legitimately if it is head and antecedent governed by the first head up, C⁰. The identification is possible when C⁰ is interpretable as a (may be marked) V⁰. We will express the identification of the t₁ and C⁰ by a reversion of the V2nd rule, inserting the form in C⁰ back into the empty place t₁. The reverse movement reconstructs the IP constituent as it will appear in the subordinate clause. The complement of the IP should be a VP/theta structure. The reverse of V-to-I movement follows the same pattern, cf (17).

(17) a The derived IP projection, no VP complement present:
[ . . . . I⁰]IP

b From the postulation of a VP complement:
[ . . . . VP I⁰]IP
c From the insertion of an empty VP head:
[ . . TV VP I⁰]IP
d From the reverse of V-to-I movement:
[ . . V VP I⁰]IP

A far more difficult situation arises when the C⁰ position is filled with an Auxfin element. A state of affairs that represents 58% of the cases in Klein's analysis of the input. A remaining group characterized by AUX drop (11%) is not considered for the present argument. The string following the AUX element in C⁰, cf.(18a), does end with a head V⁰.

(18) a Spec,C [Vfin]Co [. . . . V⁰]IP

b Spec,C [Vfin]Co [. . t₁ V⁰]IP
c Spec,C [Vfin]Co [. . [t₁ V⁰] V ]IP
d Spec,C [0]Co [. . [Vfin V⁰] V ]IP

One might motivate the insertion of the trace t₁ in (18b) with the assertion that the lexical verb in the final position of (18a)/(18b) was spotted as non-finite, hence <-I>, e.g. (Clahsen 1991). This is a dubious argument though.
In the first place, the morphology of finiteness is often flimsy or, if not, it is at least flimsy to non-existent in the initial stages of grammar acquisition. In the second place, the morphology assertion invites the incorrect claim that SOV V2nd languages without finiteness morphology, e.g. Afrikaans, can not attain predication structure. Finally, the morphology assertion begging the question. Why should finiteness morphology in V2nd languages be spotted as <+I> rather than as <+C> marking? Certainly, the <+I> nature of finiteness morphology is obvious in subordinate clauses but the reasons to exclude subordinate structure from the initial acquisition procedure are forbidding, as argued above. So, probably it is the other way around. The AGR remnants can be learned because the inverse of V2nd has been applied first.

Again, why did the learning procedure apply the inverse of V2nd? We propose that the contents of V2nd have been recognized as V o and that all V o’s as predicate heads, by a priori categorial definition have to fit a predicate head position, i.e. a right peripheral position within an IP projection of SOV languages. This does not yet suffice to justify the verbal cluster stipulated in (18d). Hence we assume further that the IP at predicate structure consists of a Spec.IP (the subject) and some set of maximal projections functioning as its complements and adjuncts. None of these complements/adjuncts may have the form of a plain VP, since a VP identified at predicate structure should have an <+I> marking, following the wellformedness definition of predicate argument structure. By contrast CP and IP are possible complements at the level of predicate structure. However a subordinate CP or IP does not fit the initial restriction to kernel sentences. Assuming all of that, the heads  and at the end of (18c) are acceptable only if they are interpreted as a complex head as in (18c) and (18d). The first and only head that m-governs the head or is C o. Hence t i is head and antecedent m-governed and presumably receptive to the inverse V2nd.

4.3 The VP structure Again.

A remarkable effect of the ’create IP’ function is the explicit dismissal of the VP string, although the VP has been used already to set the [ ... V]VP parameter. However, we get away with it. The disappearance of the VP string as a piece of preliminary structural evidence does not imply a disappearance of the VP parameter setting. The VP is easily restored in the next step, which makes the transition from Predicate/NP-structure in the sense of Van Riemsdijk and Williams (1981) towards the emergence of D-structure/theta structure. The identification of the IP triggers the search function for the I complement VP: create VP.

\[ \text{(19)} \] \[ (\text{topic}) \ C^o \ [ \text{string tV} ]_V^v \ [V_{\text{fin}} V]_I^t ]_C^e \]

Again the empty place tV in (11)a supports a VP only if she is properly antecedent and head governed. This again can be tested by the inversion of V-to-V. The head of the cluster remains in place upstairs and its complement is inserted downstairs.

\[ \text{(20)} \] \[ (\text{topic}) \ C^o \ [ \text{string V} ]_V^v \ V_{\text{fin}} \ ]_t^I \ ]_C^e \]

assign the theta roles

The VP complements were deliberately excluded at predicate structure, but not at D-structure. D-structure rather excludes compound heads. Each head should have its own projection in order to assign the theta roles. The projection from CP to IP to VP is also a
progression to different levels of representation, i.e. illocutionary structure, predicate structure, theta structure.

4.4 An Example.

(21) jij wilt dat boekje gaan lezen
    you will that booklet go read
    (you'll gonna read that booklet)

(22) a (i) CP-function XP + Vfin : create CP.
    (ii) [[Spec,C] [[Vfin][C] [string }]C ]CP
        [[jij] [[wil] [dat boekje gaan lezen] ]]

b (i) IP-function [[Vfin][C] [string (V)] ]C : create IP.
    (ii) [[Vfin][C] [string [ti [ V V ] ]i]IP ]C
        [[wil] [ {dat boekje} [t [gaan lezen] ]]]

c (i) Reverse V2nd/I-to-C (cover up ti)
    (ii) C^0[ {string} [Vfin [ V V ] ]i ]IP
        0[ {string} [wil [gaan lezen] ]]

d (i) Find predicate adjuncts and arguments
    (ii) [XP [Vfin [ V V ] ]i ]IP
        [dat boekje [wil [gaan lezen] ]]

e (i) VP-function : create VP
    (ii) [[XP [Vfin [ V V ] ]i ]VP
        [[Vfin][V V ]V ]i
        [[dat boekje] [wil [gaan lezen] ]]

f (i) Reverse I-to-V (cover up tv)
    (ii) [XP [ V V ]V ]VP ]i^0
        [dat boekje [gaan lezen] ]]

g (i) VP-function (repeat)
    (ii) [[XP [ V V ]V ]VP ]VP
        [[Vfin][V V ]V ]VP
        [[dat boekje lezen]

h (i) Reverse V-to-V (cover up tv)
    (ii) [[XP [ V V ]V ]VP ]V^0
        [[dat boekje lezen]

i Assign theta roles of V^0
5. General consequences

5.1. Cyclic Structure Building.
The bottom up analysis just suggested serves to convert phonological form into syntactic form. The insertion of empty places is clearly a procedure of structure building. It operates in a cyclic way. The insertion of the empty position $t_1$ in (22b) is conditioned by the previous establishment of a C-projection. The same holds for the insertion of $t_5$ in order to create VP. The VP creation in (22e) by head insertion can not legitimately take place before the complex head $I_o$ has been established in (22c). The counterpart of structure building, structure pruning, appears if we reverse the procedure and derive phonological form from syntactic form. It seems reasonable that a pruning rule is implied in the transition from syntactic to phonological form. It now looks as if this pruning procedure must be cyclic as well. We do not yet see how to handle the awkward consequences for the theory of Government and Binding.

5.2. The Phrase Structure Rules.
The analysis from parts-to-whole, c.q. from bottom-to-top, assigns CP structure before it assigns IP structure. There is an intermediate structure where the $C^o$ complement lacks a finite verb. The IP structure is assigned before VP structure. In the same vein, there is an intermediate structure in which the $I^o$ complement lacks a V. Phrase structure unfolds cyclically. This type of cyclic rule application does not derive from Binding of empty places. It rather follows from the head complement relation.

The Projection Principle serves to reconstruct D-structure, especially the $V^o$ projection. But the Projection Principle is not particularly helpful and in fact disregarded otherwise. The reconstruction of the CP and IP follows from wellformedness conditions of S-structure and Predicate structure. At that moment the grammar is still engaged in an effective procedure that will ultimately reconstruct the canonical conditions on lexical insertion. None of this supports the spirit of the Government and Binding theory and its Projection Principle.

The X-bar Phrase structure scheme has been reapplied for each level of representation. It reminds of the flexible assignment of phrase structure advocated in Steedman (1985) in an analysis of the Dutch V-cluster according to the principles of Categorial Grammar. The phrase structure alternatives have been applied here to reconstruct different levels of representation, a way of thinking felt to be spurious in Categorial Grammar.

6. English

6.1. Reanalysis in English.
It was our original intention to compare the learnability of the V-movements in Dutch and the Aux-movements in English. The Aux-movements in the English Subject-Aux inversion are marred by a pattern of acquisition errors. Such a pattern of errors is absent in the Dutch V-movements. The V-movements in Dutch have nevertheless blown us off course. Be this as it may, the acquisition procedure sketched so far is the first one to attain the Dutch V-cluster analysis. Another more weird implication is that the periphrastic constructions in all languages has to be analyzed as an $I^o$ verb cluster. The auxiliary construction in English has to be analyzed as in (23)a, before it is analyzed as in (23)b.
We are not immediately willing to give up our learning procedure for Dutch for fear of this unintended consequence and hence we have found the following four arguments defending the non-standard analysis in (23)a.

(1) X-bar principles. Ross' (1969) argument that each head V⁰ should have its own projection is respected at D-structure level, cf. (23)b. The analysis of the auxiliaries as a complex head was not uncommon, cf. Chomsky (1957:110). The present analysis combines these two representations as D-structure and Subject-Predicate structure respectively.

(2). Adverb distribution. The complex head I⁰ may not contain non heads. Adverbs like 'often' and 'not' may be inserted if we assume they are not of the category projecting kind. Full adverbial phrases can not be included. This predicts rather than asserts the pattern in (24).

\[
\begin{align*}
(24) & \quad \text{a} \quad \text{J. may have been hitting the ball often/ any time he got a chance} \\
& \quad \text{b} \quad \text{J. may have been often/*any time he got a chance hitting the ball}
\end{align*}
\]

(3) Transparency. The auxiliary verbs + main verb construction of the type presented in (24) is transparent for A-movements, A-bar movements, clitic movements and complement extrapositions.

This transparency is accounted for in various GB proposals. One may assume additional landing sites, or one may postulate a `verbal chain' (Rouveret and Vergnaud 1980, Chomsky 1986). The verbal chain is construction specific and defined in such a way that several facts of A-movement and clitic movement are saved. The verbal chain is ad hoc in the sense that it does not fit an approach of local configurations as barriers. All of the movements that are problematic in a D-structure (23)b react much better to derived structures like (23)a. The scope of the movements
follows in (23)a without any additional assertion about the structure.

(4) The absence of 'Move V' in English.
The proposals in Pollock (1989) and Chomsky (1989) present an arrangement to explain among other things the two basic facts in (25) and (26).

(25)  a  John may often hit the ball  
b  ?John often may hit the ball
(26)  a  Does John hit the ball?  
b  *Hits John the ball?

Major devices are the postulation of a projection AGR, which blocks by means of the feature <weak> the head-to-head raising of the lexical Vo to the position Io. The Io elements 'Tense' and 'AGR' are subsequently lowered into the position Vo. Ingenious though the arrangement is, its learnability is a difficult problem that has not been confronted. One may notice that the following hurdles are posed for an acquisition account of the Pollock/Chomsky system.

First. The evidence in (25) and (26) is negative and for that reason not available to the learning procedure.

Second. The evidence in (25) is not robust. It supports the arrangement in so far as the specific adverbs are present. Hence, these adverbs are unlikely to guide the acquisition of the verbal distribution rules in the general case.

Third. The competent speaker knows that the form in (26b) is ungrammatical, but if he has the rule 'move V' freely available, it is not crystal clear how he has his knowledge stored in the rules of grammar.

6.2. An alternative. Parametrize 'Move Alpha'.
The scheme 'Move Alpha' may not belong to the language specific grammar, but rather to the general frame of grammar that is available to the learning acquisition procedure. In order to enter a language specific grammar 'Move Alpha' has to be parametrized for specific categories. Things may now be arranged in such a way that the input of English gives reason to fill in 'Move Alpha' as 'Move Aux', whereas the input of Dutch leads to 'Move V'.

6.3. String vacuous reanalysis.
Let us suppose now that the acquisition procedure is insufficiently pressed to add the rule 'Move V' to the grammar of English. It did bring about the rule 'Move Aux', though in order to handle the English Subject-Aux inversion.

The transition from the derived Subject-Predicate structure in (23)a to the underlying structure in (23)b implies among other things a repositioning of the Vo hit. It is possible to get this repositioning between (23)a and (23)b by a different application of the same X-bar schemata. The same string satisfies the different requirements of D-structure and Subject-Predicate structure by reanalysis. Movement of the Vo is not necessary assuming such an arrangement. Movement now appears as a last resort measure. Only if a string vacuous reanalysis does not deliver the next level of representation, the acquisition procedure will be forced into the more
6.4. Reanalysis and I\textsuperscript{0} morphology.

It is possible now to turn the V-cluster in (23)a into the stacked VP structure in (23)b without rearrangement of elements in the terminal string. The more simple structure of *John hits the ball* may ask for a rearrangement of V\textsuperscript{o} and the AGR-'s', if we assume that AGR is a projecting head in D-structure. The structure [V + AGR]\textsubscript{0} is often derived by assuming a lowering of the AGR element on the head V\textsuperscript{o}. This is a way out if we assume that AGR belongs to the category Aux and if we assume as well that the acquisition procedure will prefer to move AGR in a lowering rather than to move V in a raising. This may be possible but it does not look like reacting to 'robust evidence'. The better solution may be to reject AGR as a projecting head. It is a morpheme that belongs to Subject-Predicate structure and it does not have a reflection in D-structure. Therefore, if the string (23a)/(23b) is read for D-structure relevance, the AGR element is simply not taken into account. Like phonological form, it has at D-structure no status beyond being a part of the element V\textsuperscript{o} *hits*. AGR does not belong to the D-structure vocabulary. A definite advantage may be that the possibility of lowering rules can be eliminated in general.

6.5. Conclusion.

The absence of *move V* from English yields a direct explanation for the ungrammaticality in (26b) *Hits John the ball*. The feature <weak AGR> is probably difficult for a learning procedure to spot and acquire. But in the present approach <weak AGR> has been evaded. The reading of AGR as a surface morpheme allows an escape from a rule lowering a D-structure head AGR next to the V\textsuperscript{o}. Finally *Move Aux* has been acquired from input strings with Subject-Aux inversion. It is a reduced variant from the Germanic V2nd rule. The V2nd rule moves a single head I\textsuperscript{0}, not a verb cluster. The same holds for *Move Aux*. For some reason, a complex head does not move into a functional head position. Although we have proposed complex heads like [(adverb} + Aux + V] e.g. in *may [often have hit]*. Raising into the position I\textsuperscript{0} or C\textsuperscript{o} is for some reason not possible with complex heads.

The learnability of the Dutch complex I\textsuperscript{0}, given above, can not be rejected for its ill compatibility with the present GB analyses of the English I-projection. The English system as analyzed in Pollock (1989) and Chomsky (1989) is not yet backed up with a learnability account.

References


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