Studies in Language 9.1. 77-107 (1985).

COGNITIVE CONSTRAINTS ON THE ORDER OF SUBJECT AND OBJECT IN GERMAN[1]

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ABSTRACT

The ordering of subject and object, especially in the so-called clause "middle-field," is a perennial problem both for the grammar of German, and for syntactic theories of linearization. While formalist accounts (e.g. Engel, 1977) and semantic accounts (e.g. Lerenz, 1977a) have made valuable contributions to an understanding of S/O order, their monocausal approaches have only limited descriptive adequacy. This paper presents evidence that the ordering of S and O in the clause middle-field in German results from the interaction of multiple cognitive performance factors: agency, animacy, situational definiteness, and contextual givenness.

Our data base was elicited in a controlled acceptability judgment task. Twenty eight active verb-final and 28 active verb-second clauses were constructed to contain an equal number of S-O and O-S orders, with *animate/inanimate*, *definite/indefinite*, and *pronoun/noun* systematically varied. Each clause was embedded in an appropriate text-fragment context which described an event in a German soccer match, e.g.:

> *Der Ball fliegt hoch. Jetzt hat der Torwart ihn zur Ecke gelenkt.*
> 'The ball flies into the air. Now the goalie has brought it to the corner'

All text fragments were presented to native German speakers in random order, preceded by a typical soccer sportscaster's monologue to establish a general thematic context. The respondents rated each fragment for acceptability on a 7-point scale. Results show that a) each cognitive factor, taken separately, has an effect on the acceptability of specific S-O and O-S orders;

b) a predictive model based on the strength of individual factors produces a good fit with averaged informant judgments; c) there is a threshold of acceptability effect for clauses combining positive values on at least some of the cognitive variables; and d) both fixed order and preferences within variable order can be seen as consequences of the same production mechanism: fixed order is simply a conventionalization of extreme preferences.

In German, the order of subject (S) and object (O)[2] is highly variable, but this does not mean to say it is free. Speakers of German operate under constraints which determine, or at least influence, the order in which they produce the subject and object of a transitive clause. This paper will report an experiment aimed at determining both the strength and the interactional nature of these constraints. On the basis of these results and other proposals in the literature, we will then present a series of arguments bearing on the issues of competence vs. performance, and language-specific vs. general cognitive production mechanisms.

Although variable order of S and O occurs in all clause types, the factors affecting this order differ markedly in different contexts. The following four examples give the most important variants. S and O are double underlined, and the finite verb is single underlined. In (1) there is a main clause with the finite verb in second position, and either S or O in clause-initial position before the verb, often referred to as the "front-field" (Vorfeld) of the clause. Example (2) gives the yes-no question corresponding to (1); the finite verb is in initial position, and both S and O follow it in the so-called "middle-field." This clause type can also occur as the antecedent condition of a hypothetical clause-pair. Example (3) shows a main clause in which the front-field has been occupied by a secondary constitutient (x), here an adverb. Both S and O occur in the middle-field after the finite verb. In (4) we have a subordinate clause with the finite verb in final position, so that there is no front-field in the clause, thus placing both S and O in the middle field.

(1) verb second, S or O initial.
  (a) S-O *Eine Fahne hat den Torwart behindert.*
    'A flag (nom) interfered with the goalie (acc)'
  (b) O-S *Den Torwart hat eine Fahne behindert.*

(2) verb initial
  (a) S-O *Hat eine Fahne den Torwart behindert?*
    'Did a flag (nom) interfere with the goalie (acc)?'
  (b) O-S *Hat den Torwart eine Fahne behindert?*

(3) verb second, X initial
  (a) S-O *Der Ball fliegt hoch. Jetzt hat der Torwart ihn zur Ecke gelenkt.*
  'The ball flies into the air. Now the goalie (nom) has brought it (acc) to the corner.'
  (b) O-S *...Jetzt hat ihn der Torwart zur Ecke gelenkt.*

(4) verb final
  (a) S-O *Der Ball ist aus dem Spiel, weil der Torwart ihn zur Ecke gelenkt hat.*
  'The ball is out of play, because the goalie (nom) brought it to the corner'
  (b) O-S *Der Ball ist aus dem Spiel, weil ihn der Torwart zur Ecke gelenkt hat.*

The position of the verb has a strong effect on the factors which influence S/O order. When the verb is in second position, as in (1) and (3), the occupant of the initial "front field" position is determined largely by considerations of discourse topicality, discourse connectivity, and emphatic stress (Gabelentz, 1901; de Groot, 1957; Beneš, 1965; Daneš, 1968; Kirkwood, 1969; Engel, 1977; Lenerz, 1977a). To some extent these discourse factors still influence the order of S and O in verb-initial clauses as in (2) although their effect is considerably diminished compared to clauses of type (1), which have a front-field (Lenerz, 1977b; Connolly, 1981). In clause types (3) and (4) these discourse determinants of S/O order are strongly diminished (if not absent altogether), so that S and O in the midddle field take on a different distributional pattern which is subject to other kinds of determinants (Behaghel, 1929; Lenerz, 1977b; Engel, 1977). The failure of discourse factors to affect S/O order in these clauses may be due to the fact that in (3) the topical front-field is already occupied by another element, and in (4) the whole clause is backgrounded in discourse. The final two clause types (3) and (4) were selected for experimental study because they represent a phenomenon less well understood than the discourse phenomenon affecting S/O order in types (1) and (2), and because on the other hand they seem to closely resemble each other in the ordering of S and O, as Engel (1977) claims. Only accusative objects were used in the study as exemplified in (3) and (4) above. There are important differences in the distribution of accusative, dative, and prepositional objects, as Engel (1977) and Lenerz (1977a and b) show. Nevertheless, the latter two object types were eliminated from the study in

the interest of maintaining a manageable experimental protocol. The interested reader is referred especially to Lenerz (1977a) and to the debate between Lange (1978, 1979) and Lenerz (1979) for a discussion of agency, focus, and the difference between dative and accusative objects.

What kind of constraints do determine the order of subject and object in clause types (3) and (4)? The standard answer has been that they are syntactic constraints: pronouns must precede nouns, and the subject must precede the object except when the pronoun constraint applies (e.g. Schulz and Griesbach, 1970). This formalist approach finds a sophisticated expression in Engel (1977, pp. 207-208) in a schema for ordering elements in the middle-field of the clause, the relevant portions of which are given in (5).[3]

(5) S/pn - O/pn - S/defNP - O/defNP - S/indefNP - O/indefNP

The schema predicts preferences for pronouns to precede definite NPs, and for these to precede indefinite NPs; further, within each of these categories, for S to precede O. The only categorically absolute ordering identified by Engel is S-O when S only or when both S and O are personal pronouns. The schema represents a considerable improvement over the traditional position, but still does not predict all the categorical orderings (as will be seen later), and fails to reveal the relation between categorical orders and ordering preferences.

Semantic constraints have also been proposed. Lenerz (1977b) in particular suggests agency as a monocausal principle controlling S/O ordering. Although we will return later to Lenerz' proposal to support our position, our data will show that agency does not play a ubiquitous role.

We therefore tried to isolate as many factors as we could find that might influence the order of S and O in clauses of type (3) and (4), and settled on the following grammatico-semantic categories, which are directly related to the pragmatic processing of information in sentence production and comprehension (performance): animacy, definiteness, contextual givenness, and action-role salience (agency), as in (6) below:

(6) Grammatico-semantic factors affecting the order of S and O in the study

(a) animacy *Jetzt hat der Matsch den Torwart behindert.*
'Now the mud has interfered with the goalie'

(b) situational definiteness *Jetzt hat der Torwart den Ball aufgenommen.*
'Now the goalie has picked up the ball'

(c) contextual givenness — *Der Fanatiker überwindet den Zaun. Jetzt hat er das Spielfield erreicht.*
'The fanatic is getting over the fence. Now he has reached the playing field'

(d) action-role salience — agent vs. goal of activity (nom vs. acc case)
Jetzt hat der Linksaussen den Torwart gerempelt.
'Now the left wing has jostled the goalie'

First is animacy. In (6a) we have *subject-object* order, with an inanimate subject and an animate object. A reversal of the order placing the animate object first sounds equally acceptable. The second factor (b) is situational definiteness. In (6b) a goalie and a ball are mentioned. In the situational context of a soccer match these are always uniquely identified entities, whether or not they have been previously mentioned. If the goalie had picked up a bottle off the field, this entity would have been new to the discourse context if mentioned for the first time. The third factor (c) is contextual givenness. In (6c) one of the two participants in the target sentence (the fanatic) is mentioned in the first clause, then reiterated as a pronoun in the second. The givenness is anaphoric, established by reiteration and pronominalization. The fourth factor (d) is action-role salience. Other things being equal, the agent of an action (the leftwing) is more active and potent than the goal (the goalie), and therefore more salient, independent of the discourse context. In our experiment agent and goal roles always coincided with nominative and accusative case marking, respectively, so that we did not independently vary action-role and case marking. Lenerz' (1977a and b) study, which focuses on the effect of agency to some extent independent of case marking, will be drawn into the discussion of our results.

We constructed 28 text fragments (hereafter called "sentences") representing 28 different systematically varied combinations of these factors with the finite verb in second position, as in (3) and (6), and another 28 sentences with the verb in final position, as in (4). Each factor was counterbalanced, so that an equal number had *animate before inanimate* order and vice versa, and so on for the other factors.[4] Two randomized protocols were constructed out of the 56 sentences such that of the two versions of a sentence (S-O and O-S), one occurred in the first half of a protocol, and the other in the second half. The text fragments are listed in appendices 1 and 2.

All the sentences described events which might occur in the context of a German soccer match, and were preceded in the experiment by a sportscaster's monologue such as might be heard on the radio at the beginning of a

match. This setting had a number of planned effects, the most important of which are:

a) the setting made the overall task a pragmatically more natural one in which all sentences were related by thematic content, although they did not form a narrative since they were, of course, in a randomized order.

b) the soccer match setting gave full pragmatic plausiblity to sentences which otherwise sound unnatural out of context; for example (7a) could easily sound pragmatically unnatural to some speakers, since agency is attributed to a ball which in itself has no ability to act. In (7b) however, the agency of the ball is motivated by the soccer match context: players get hit by the ball all the time.

(7a) *Jetzt hat der Ball einen Mann getroffen.*
'Now the ball has hit a man'

(7b) *Das Spiel ist von Zufälligkeiten bestimmt, jetzt hat der Ball einen Stürmer unglücklich getroffen.*
'All kinds of accidents are happening. Now the ball has hit a player.'

c) the setting provided a controlled context for the referentiality of pronouns, definite NPs, and indefinite NPs. All pronouns were anaphoric to a mention of the entity in a preceding clause. All definite NPs were "situationally definite" in the sense that they referred to unique entities within the sphere of this discourse. It was assumed that the experimental subjects were familiar with soccer and would immediately attach a unique referent to definite NPs such as "the goalie" or "the ball." In a different discourse context, or out of context, a definite NP such as in the following sentences used by Connolly (1981) may have widely varying pragmatic properties:

(8) *Oft hat der größte Dummkopf die besten Chancen.*
'Often the biggest idiot has the best prospects'

'The best prospects' is not referential at all in a strict sense; while 'the biggest idiot' is pragmatically indefinite, referentially equivalent to 'an idiot.'

There were six native German-speaking adult respondents in this pilot

study. After hearing the sportscaster's prologue and general instructions they were each given a text booklet. On each page was one of the 56 sentences and a seven-point rating scale. The seven points were anchored as follows:

1. The sentence seems fluent without any hesitation in judgment
2. The sentence seems fluent, but with some hesitation
3. The sentence seems unusual, but acceptable
4. The acceptability of the sentence is questionable
5. The sentence seems doubtful
6. The sentence seems unacceptable, although with some hesitation
7. The sentence seems impossible without any hesitation in judgment

The results of the experiment are given in Figures 1 and 2. There are two scales on the left-hand side of each figure. The first scale, numbered 1 through 7, represents the 7-point acceptability scale. Individual points on the graph represent the averaged informant responses to each of the individual sentences. The second scale on the left, ranging from −10 to +10, represents a numerical weighting of the four grammatico-semantic factors discussed above. Since we had no way to independently determine the relative strength of each of the factors affecting acceptability, we arithmetically isolated each factor out of the test sentences as a whole. We then arbitrarily fixed the factor weight of animacy at 1, and calculated the weight of the other factors in relation to animacy. These factor weights are given at the end of Appendices 1 and 2. To determine a theoretical acceptability value for each sentence the positive or negative weights of each factor present in the sentence were added together. These *combined factor weights* for each sentence, which can be positive (+) or negative (−) depending on whether the summed factors weigh for or against the acceptability of a sentence, are given in the right-hand column of Appendices 1 and 2, and are plotted on the solid-line curves of Figures 1 and 2. Appendices 1 and 2 further show the (+), (−) or (0) loading of the sentences for each factor.

There are three main effects to be reported:

Effect 1: As an overall effect, the order of subject and object which produced a *positive* combined factor weight was preferred by the respondents. Table 1 shows that in a majority, but not all cases, this order is *agent* (S) *before goal* (0), and that in addition there is a weaker tendency for animates to precede inanimates. This supports Lenerz' (1977a, p.118) finding that agency is an important factor in the acceptability of O-S order (indeed, he claims it

Figure 1: Cognitive factors affecting the order of S and O in German. The figure gives a comparison of values predicted from the model and actual informant responses to test sentences.

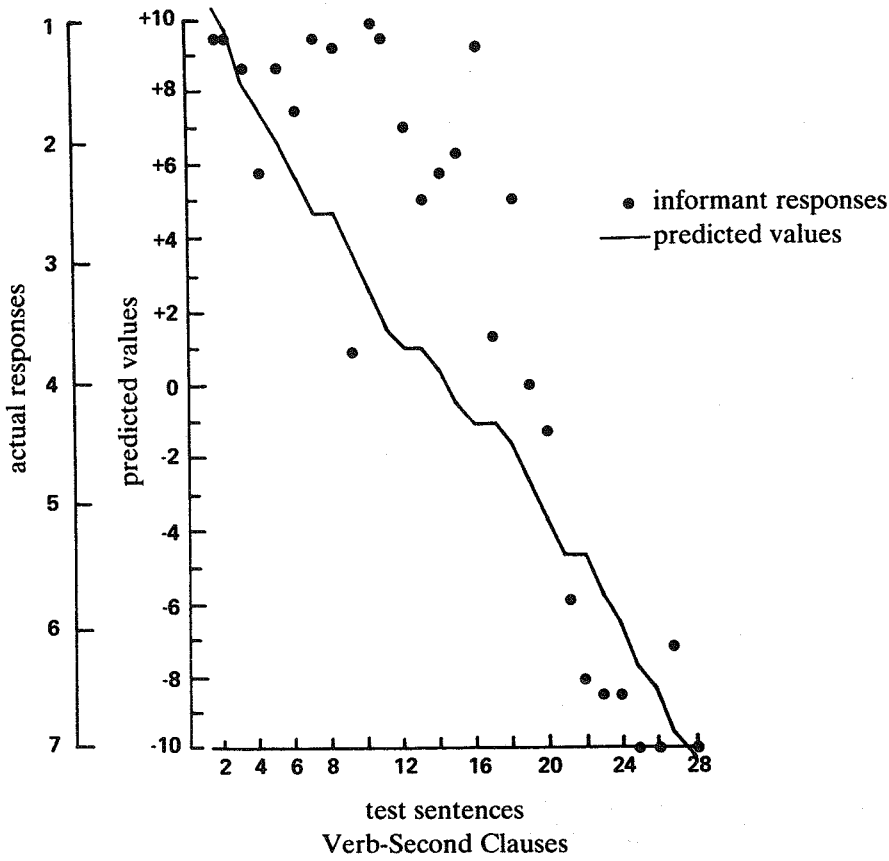
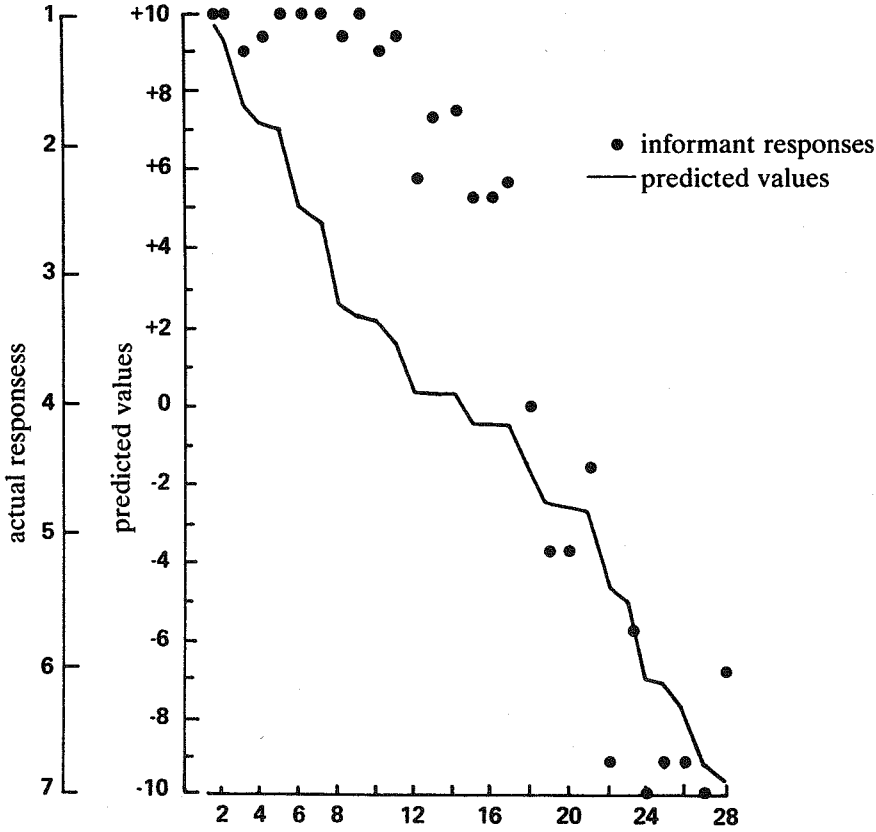


Figure 2: Cognitive factors affecting the order of S and O in German. The figure gives a comparison of values predicted from the model and actual informant responses to test sentences.



Verb-Final Clauses

to be *the* factor), but shows his rejection of animacy (p. 107) to be unfounded. His and others' emphasis on monocausation is a point to which we will return in the conclusion. The overall preference for S-O order is, of course, subject to the influence of other factors. For example, among the verb-final clauses sentence 10 (O-S) is preferred over sentence 19 (S-O) because these sentences are loaded for both situational definiteness and contextual givenness (pronoun *before indefinite NP*). The sequence *pronoun before indefinite NP* may in fact be considered a categorical ordering, one not recognized by Engel (1977).

Table 1: overall ordering preferences for *action role*: nominative agent (S) vs. accusative goal (0); and for *animacy*: animate (A) vs. inanimate (I). Each unit represents a sentence pair. "Equal" means that both orders, on the average, received ratings within one point of each other on the 7-point scale.

ACTION ROLE

	S-O preferred	*equal*	*O-S preferred*
verb-second clauses	11	1	2
verb-final clauses	9	3	2
Total	20	4	4

ANIMACY

	A-I preferred	*equal*	*I-A preferred*
verb-second clauses	7	1	6
verb-final clauses	7	3	4
Total	14	4	10

Table 2 shows that situational definiteness plays a role as an ordering principle, with *definite NP-indefinite NP* the preferred order, contrary to Lenerz' (1977a, p. 107) claim that this factor plays no determining role. On the other hand, Table 2 also contradicts Engel's (1977) schema, which predicts that definite NP-indefinite NP is *always* the preferred order. Specifically, the reverse order is preferred when the indefinite NP is simultaneously animate and agent compared to an inanimate goal definite NP. Among the

Table 2: average ratings on the 7-point scale for specific sentences involving the factor *situational definiteness*: definite NP (D) vs. indefinite NP (I).

	definite NP 1st		*indefinite NP 1st*		*preferred*
	sen.no.	*rating*	*sen.no.*	*rating*	*order*
verb-second clauses	5	1.5	24	6.8	D-I
	8	1.3	22	6.6	D-I
	19	4.0	10	1.0	I-D
	21	5.8	7	1.2	I-D
	Average	3.2		3.9	
verb-final clauses	5	1.0	24	7.0	D-I
	6	1.0	23	5.8	D-I
	17	2.3	12	2.3	D=I
	20	5.2	9	1.0	I-D
	Average	2.4		4.0	

verb-second clauses, agency by itself was able to produce a preferred *indefinite-definite* order.

Table 3 reveals that *pronoun before definite NP* is the strongly preferred order, but that in one instance, the order *definite NP before pronoun* is preferred, again contrary to Engel's schema. Here it is again the factors animacy and agency which overcome the effect of contextual givenness. In

Table 3: average ratings on the 7-point scale for specific sentences involving *contextual givenness*: pronoun (P) vs. definite NP (D).

	pronoun 1st		*definite NP 1st*		*preferred*
	sen.no	*rating*	*sen.no.*	*rating*	*order*
verb-second clauses	2	1.2	27	6.1	P-D
	4	2.3	25	7.0	P-D
	15	2.1	14	2.3	P=D
	18	2.5	11	1.2	D-P
	Average	2.0		4.1	
verb-final clauses	2	1.0	27	7.0	P-D
	4	1.2	25	6.8	P-D
	11	1.2	18	4.0	P-D
	15	2.4	13	1.8	D=P
	Average	1.5		4.9	

general, Tables 1, 2 and 3 show that no one factor is supreme in determining the order of subject and object. Each is in at least a few instances subordinate to the effect of some other factor, or to the cumulative effect of other factors. This observation will play a critical role in our conclusions concerning the mechanism underlying the ordering of subject and object in the middle-field.

Effect 2: The *extent* to which a sentence was judged acceptable or unacceptable was mirrored by the extent to which that sentence manifested or violated the four grammatico-semantic factors. Figure 1 gives the results for verb-second (main) clauses, and Figure 2 for verb-final (subordinate) clauses. They show that as a general trend the actual rating for individual sentences made by our respondents ran parallel to the predicted ratings made on the basis of factor weights. To be sure, the factor weights were derived from the respondents' cumulative responses. What Figures 1 and 2 show in the narrowest sense is that informant responses are *systematically associated* with the factors action-role, animacy, contextual givenness, and situational definiteness.

Effect 3: The strikingly similar distribution of data points in Figures 1 and 2 suggests that the same grammatico-semantic factors exert approximately equal influence in determining the order of subject and object in the middle-field in both main and subordinate clauses. This verifies Engel's (1977) and Lenerz' (1977a) claim that both these clause types exhibit the same middle-field ordering phenomena, and strongly suggests that the ordering of S and O is determined by linearization strategies operating on surface structures, not by rules operating on underlying structures.

There are two important secondary effects to be noted:

Effect 4: A threshold effect can be observed in both figures. If a sentence has a combined factor weight of about +2 or above, the respondents consistently judged it to be "fluent with or without hesitiation", that is, 1 or 2 on the acceptability scale. This suggests that to a certain degree competition among grammatico-semantic factors is tolerated without appreciable effect on the acceptability of a sentence. When negative factors increase in strength, however, they begin to markedly affect sentence acceptability, which then drops rapidly, parallel to the theoretical values. In other words, relative acceptability of sentences is promoted on the one hand by communicative function, requiring that a variety of content categories be combinable with each other to produce a range of different message types, and is limited on the other hand by the competition among these same factors.

Effect 5: Each respondent was remarkably consistent in his or her judgments about individual sentences. But the respondents occasionally differed markedly from each other in their judgments. Some responded more strongly to situational givenness, a factor associated with the context of communication, and others responded more strongly to action-role, a factor inherent in the utterance itself. This suggests important differences among individuals in their strategies for ordering S and O. Although strategies varied, no subject preferred S-O ordering exclusively, i.e. all subjects depended on multiple factors. Individual differences will play a role in our reflection on the cognitive nature of the linearization process in the concluding section of the paper.

The limitations of our experimental method prevented us from distinguishing between semantic action-roles (agent vs. goal), and the overt marking of these roles (nominative vs. accusative case), which marks not only action-role, but also Focus of Speaker's Interest (Zubin, 1979), a concept related to discourse topic. Lenerz (1977a), in his thorough investigation of the role of agency in determining word order, was able to demonstrate the efficacy of agency independent of case marking. His examples (33) and (34) from Chapter 4 are repeated here as (9) and (10).

(9a) *Ich glaube, daß diese Tänzerin dem Kritiker der Abendzeitung gefallen würde.* (S-O order)
'I believe that this dancer (nom) would be pleasing to the critic (dat) of the Evening News.'

(9b) *Ich glaube, daß dem Kritiker der Abendzeitung diese Tänzerin gefallen würde.* (O-S order)

(10a) *Ich glaube, daß diese Tänzerin dem Kritiker der Abendzeitung gefallen wollte.* (S-O order)
'I believe that this dancer (nom) wanted to please the critic (dat) of the Evening News'

(10b)[5] **Ich glaube, daß dem Kritiker der Abendzeitung diese Tänzerin gefallen wollte.* (O-S order)

The sentence pairs (9) and (10) are identical, including the verb *gefallen* 'to please, be pleasing to,' which Lenerz identifies as a "psychic" verb. This verb has the property of attributing a greater or lesser degree of agency to the nominative participant depending on the context. In (9) and (10) context is provided by the modal verbs *würde* (would) and *wollte* (wanted to). The *relative degree* of agency is in general crucial for the assignment of case morphology and for the choice of predicates, as demonstrated in Zubin (1975,

1977). Whichever of two participants is *greater* in potency or activity in the event is placed higher on the "Scale of Contribution," which in part determines case marking. In example (10) the girl is more active/potent than the critic, since she is willfully engaged in the activity of pleasing, whereas the critic is the passive recipient. Here the greater degree of agency as well as subject marking (nominative) fall on the same constitutent, and the S-O order is strongly preferred over the O-S order. In (9) the dancer is not willfully engaged in pleasing the critic; she is perhaps not even aware of his presence. The event focuses on the critic's activity of passing judgment (the difference in message between (9) and (10) is rendered to some extent by the translation difference 'want to please' vs. 'be pleasing to'). Thus, in (9) the critic has a greater degree of agency than the dancer, but the dancer is case-marked as the subject: greater agency and subject marking fall on different constituents. Here both S-O and O-S orders are approximately equally acceptable. In sum, Lenerz' examples show that when agency is manipulated independent of case marking, it still has a considerable effect on the acceptability of the O-S order.

The same effect is apparent in Lenerz' examples (54) and (55), here repeated as (11) and (12). The Prague School Thema-Rhema distinction is included as an additional factor affecting the order of S and O. One constituent is established as rhematic by a question, and then its rhematic status is marked with stress in the answer.

(11) *Wem ist der Coup gelungen?*
Lit: 'To whom (dat) was the coup (nom) successful?'
a. *Ich glaube, daß der Coup einem Baron gelungen ist* (S-O order)
'I believe that the coup (nom) was successful to a Baron (dat)'
(i.e., 'a baron succeeded in carrying out the coup.')
b. *Ich glaube, daß einem Baron der Coup gelungen ist* (O-S order)

(12) *Was ist dem Baron gelungen?*
Lit: 'What (nom) was successful to the baron (dat)?'
a. *Ich glaube, daß dem Baron ein Coup gelungen ist.* (O-S order)
'I believe that a coup was successful to the baron.'
b. **Ich glaube, daß ein Coup dem Baron gelungen ist.* (S-O order)

In at least some contexts, the object (dative) participant with the verb *gelingen* has greater agency than the subject (nominative) participant, as suggested by the necessary reversal in an English translation:

(13) X (nom) gelingt Y (dat) → Y succeeds in doing X

Both (11a) and (12a) have the favored order *definite-indefinite* and *Thema-Rhema*, and both are fully acceptable in spite of the order *lesser-to-greater agency* order in (11a) and O(dat) — S(nom) in (12a). Example (11b) has the disfavored order *indefinite-definite*, *Rhema-Thema*, and O-S, yet as an apparent consequence of its *greater-to-lesser agency* order it is more acceptable than (12b), which has S-O order in its favor but *lesser-to-greater agency* order working against it. This suggests that semantic action-role is actually a stronger determinant of order in these cases than is the surface case marking of S and O.

Lange (1978) attempts to counter Lenerz' (1977a and b) contention that action-role is a controlling factor with his example (5), repeated here as (14):

(14a) *Ich glaube, daß der Professor das Buch erhielt.* (S-O)
'I believe, that the professor (nom) received the book (acc).'
(14b) **Ich glaube, daß das Buch der Professor erhielt.* (O-S)

Lange points out (p. 194) that the professor is not agent-like, and yet resists being moved to second position. This technically refutes Lenerz' principle as he stated it, but does not contradict our revised version in which greater-to-lesser agency, *i.e. relational agency*, produces a preferred order. As pointed out in Zubin (1978), in an activity of receiving the recipient is low in potency/activity, but the received entity is even lower since it does nothing at all! Thus (14b) has the disfavored order *lesser-to-greater agency*, O-S, and *inanimate-animate*, and thus predictably has a very low acceptability rating. We therefore conclude on the basis of Lenerz' examples, and in spite of Lange's objection, that the order *greater-to-lesser agency*, independent of case marking, is an important factor determining the order of S and O.

In the introduction we described the four order-determining factors included in our study as "grammatico-semantic," avoiding the issue of whether the determinants are based on form (syntax/surface morphology) or on meaning (semantics/pragmatics). We are now prepared to show, or at least suggest, that semantic/pragmatic content, and not formal structure, is decisive. Animacy needs no further defence as a purely semantic/pragmatic factor, since it is not formally marked in German, either syntactically or morphologically.[6] Lenerz (1977a), especially in his examples (9)-(12) above, shows that action-role as a semantic/pragmatic factor plays a determining role independent of its surface case marking (nominative/dative/accusative). Finally, an example from Connolly (1981), which we have repeated as (8) above and (15) below, suggests that the formal marking of definiteness with

the definite article is not as important as the pragmatic referentiality (situational definiteness and contextual givenness) of the NPs in question.

(15a) *Oft hat der größte Dummkopf die besten Chancen.* (S-O order, rated 1.1)
'Often the biggest idiot (nom) has the best prospects (acc).'

(15b) *Oft hat die besten Chancen der größte Dummkopf.* (S-O order, rated 2.6)

In an experimental procedure somewhat similar to ours, Connolly showed that on a 5-point scale (15a) received an average rating of 1.1, and (15b) received an only moderately worse rating of 2.6. In the introduction we argued that although both NPs are marked as definite, "the best prospects" is not referential at all in a strict sence, while "the biggest idiot" is pragmatically indefinite, referentially equivalent to "an idiot" (the definite article is locally determined by the superlative). The results of our experiment suggest that if formal structure were critical, (15b) should have been rated much lower, based on equal marking for definiteness and the order O-S plus inanimate-animate. Our equivalent sentences were both rated 6.8, almost the bottom of our scale (sentence 23, App. 1, and sentence 22, App. 2). The difference seems to be that from a referential-pragmatic point of view, Connolly's sentence (15b) has the order non-referential (hence situationally given) before indefinite, for which we would predict the higher rating which Connolly's actually received. Thus Connolly's sentences (15a) and (15b) in conjunction with our results suggest that when formal marking of definiteness is held constant, referential certainty as a pragmatic factor makes a strong difference in the acceptability of an O-S order. Based on the evidence from Lenerz and Connolly, we therefore have reason to believe that in general the semantic/pragmatic properties underlying our four factors, and not their formal syntactic or morphological marking, constitute the decisive phenomenon producing the results presented in Figures 1-2 and Tables 1-3.

A common theme in Engel's (1977), Lenerz' (1977a), and Lange's (1978) approaches to the linearization of S and O is the attempt to construct one semantic principle or one syntactic rule-structure underlying all instances of linearization. Lenerz' (1977b) monocausal emphasis on agency is incapable of accounting for the instances in our data in which the order *goal before agent* is preferred (Table 3). On the other hand, his (1977a) "communicative center" principle is too vague to have any predictive power, as he admits. Engel's (1977, p. 208) schema is an attempt to account for S-O linearization

with a syntactic formula. Our data show that the tendencies predicted by his schema do not always hold. Under certain circumstances the orders indefinite NP before definite NP (see Table 2) and definite NP before pronoun (see Table 3) are actually preferred. Neither is it possible to correct Engel's schema by reversing some of the categories. A rule-like schema which could account for all the observed preferences would have to list each combination of definiteness, pronominalization, agency, and animacy separately, and would achieve no generality. In addition, such a schema could in principle not achieve predictive power, since, as we hope to have shown, the relevant categories are semantic/pragmatic in nature, and are not mechanically bound to the surface structure.

The attempt to construct rules in the domain of a competence grammar could nevertheless be rescued by establishing S-O as the underlying order, constructing syntactic rules for the categorical instances, e.g. $[^{pnS}_{O}] \rightarrow$ pnS - O, and then adding an optional rule providing for O-S inversions. The disadvantage of this approach is that it depicts categorical ordering as a set of arbitrary exceptions to the preference pattern established by the performance mechanism, whereas in fact categorical ordering appears to be nothing more than a rigidification of the extreme cases in the preference pattern. When the categories *pronoun* and *agent* are combined they produce a "force" much more powerful than the remaining factors *animate* and *definite*. Likewise, *pronoun* and *indefinite* represent the two extremes on a scale of referentiality, so that *pronoun* "overpowers" *indefinite*, even if the indefinite NP is agent and subject. Thus the performance mechanism is capable of characterizing categorical cases as extremes in the pattern of preferences in addition to characterizing the preferred order in performance, and thus includes the purported competence rules as a set of special cases. In particular, we view Lenerz' (1977a, p. 23) observation:

> *"Wir sehen also, wie eine bestimmte Erscheinung... sich sowohl als rein grammatische ... als auch als bloß stilistische Abweichung ... niederschlagen kann."*

as an instance of putting the grammatical cart before the pragmatic horse.

Our alternative solution to the problem of accounting for preferences in the linearization of S and O, as we have already intimated, is a polycausal linearization mechanism which operates with the "weights" of individual factors: it calculates the cumulative weight of factors favoring S-O in an individual instance and compares this with the cumulative weight of factors

favoring O-S in a competition model like the one proposed in MacWhinney, Bates, and Kliegl (1983). The heavier side wins, and that order is produced. For example, the compilation in NPa of *animate*, *agent*, and *contextually given*, as opposed to the compilation of *inanimate*, *goal*, and *situationally indefinite* in NPb would produce the order of NPa-NPb, and would lead to the rejection of the order NPb-NPa as an impossible utterance:

(16a) *Der Mittelfeldspieler flankt, endlich hat er* (NPa) *eine Lücke* (NPb) *gefunden.*
'The center is flanking, now he (NPa) has finally found an opening (NPb).'

(16b) **Der Mittelfeldspieler flankt, endlich hat eine Lücke* (NPb) *er* (NPa) *gefunden.*

On the other hand, the compilation in NPa of *inanimate*, *goal*, and *contextually given* as opposed to the compilation in NPb of *animate*, *agent*, and *situationally indefinite* produces a slight preference for the order NPa-NPb, which is therefore the preferred linearization, although the order NPb-NPa should be regarded as quite acceptable in comprehension:[7]

(17a) *Der Ball fliegt ins Aus, jetzt hat ihn* (NPa) *ein Gegenspieler* (NPb) *aufgehoben.*
'The ball is out of play, now an opposing player (NPb) has picked it (NPa) up.'

(17b) *Der Ball fliegt ins Aus, jetzt hat ein Gegenspieler* (NPb) *ihn* (NPa) *aufgehoben.*

The linearization process thus seems to be a performance construct making use of a decision-making mechanism which assesses the relative strength of opposing forces in a dynamic system. Such a mechanism clearly lies outside the domain of rule structures in a competence grammar. Just as we have shown the individual factors to be based on content, rather than formal structure, so do we believe the linearization mechanism to be an instance of general cognitive problem solving, rather than a rule mechanism specific to language. Although this is conjecture on our part, we think the evidence is strongly suggestive. Well-known multi-causal mechanisms in the cognitive psychology of vision include those which resolve the competition between two portions of a picture for figure and ground status, those which resolve the competition among various elementary precepts (lines, angles, surfaces, brightness) to produce perception of a figure, and those which resolve the competition among individual salient features resulting in the categorization

of an object (e.g. as a bird, or a chair). The latter in particular borders on the linguistic problem of categorization in the lexicon (Rosch, 1977).

A set of evidence which supports our argument in favor of a multi-causal, general cognitive mechanism was presented in *Effect 5* above. The fact that some respondents reacted more strongly to a contextual factor (situational givenness) and others to an inherent factor (agency) suggests important differences among individuals in the linearization mechanism. If this mechanism resides in their linguistic competence, it would follow that this competence varies strongly from individual to individual, a conclusion not consonant with the present notion of linguistic competence. On the other hand it is already well known that individuals differ widely in their general problem-solving strategies. We thus find good reason to hypothesize that the linearization of S and O in the middle field of German sentences is the result of a general cognitive mechanism, rather than a rule-structure specific to language.

In conclusion, we sum up the individual findings and claims made in this paper as a set of hypotheses, and suggest how a common theme might be established among the individual factors affecting linearization:

Hypotheses for the linearization of S and O in the clause middle-field.

H1: linearization is deterministic, i.e. not open to random choice.

H2: linearization is polycausal, i.e. no one principle can predict the ordering of S and O.

H3: specific principles (factors) determining the order of S and O are (at least):
- a. relative degree of agency: greater agency before lesser agency
- b. animacy: animate before inanimate
- c. contextual givenness: pronominal anaphoric reference before lexical reference
- d. situational definiteness: uniquely determined reference (definite NP) before non-uniquely determined reference (indefinite NP)
- e. Thema-Rhema dynamic: nonrhematic references before rhematic references. This principle includes stressed constitutents and may be extendable to (c) and (d).

H4: The principles in (H3) operate on semantic/pragmatic content rather than on morphological/syntactic structure.

H5: Dominance: no one principle completely dominates the others, although individual principles differ in strength.

H6: Mini-max solution: linearization is determined by the cumulative weight of principles favoring S-O vs. the cumulative weight of principles favoring O-S, i.e. *relative*, and not *absolute* loading is criterial.

H7: The mechanism by which the minimax solution of (H6) is arrived at is a (set of) general cognitive problem-solving strategy(ies), rather than a mechanism specific to language.

H8: Preferred (but variable) order and categorical ("grammatical") order are manifestations of the same performance mechanism (H7). The presence of apparent absolute "ungrammaticality" in some instances is due to the extreme weight of performance factors favoring one order over the other.

H9: Individuals may differ considerably in their reactivity to particular principles in (H3).

Although we do not believe it is possible to rigorously derive the five principles in (H3) from some still deeper principle, there may be a common theme which runs through them. A possible candidate is the "ego-center" principle proposed in Ertel (1974, 1977) and Zubin (1975, 1978) applied to case marking, the "me-first" principle applied by Cooper and Ross (1975) to the ordering of binomials, or the "communicative center" principle applied by Lenerz (1977a) to the ordering of S and O. Such principles, however vague, would suggest that the cognitive encoding underlying language performance starts with that which is most familiar, most like ourselves: we view ourselves as potent and therefore begin encoding with agents (H3a); we start with animates because they are more like ourselves (b); we begin with what has just been established in the context (c) or with uniquely identifiable references (d) because these are more familiar; and finally, we begin with certain, uncontroversial information and proceed into the unknown (e).

FOOTNOTES

1) An earlier stage of this research was originally reported at the Linguistic Society of America Meeting, Los Angeles, December 1979.

2) By "subject" and "object" we mean the nominative-marked and the oblique-marked constituents of a transitive clause, respectively, i.e. surface subject and object. This usage is to be

distinguished from "syntactic subject," i.e. the constituent which has the most syntactic subject properties, and from "psychological subject," i.e. the constituent which conveys the topic, or center, of the utterance (see Chafe, 1976).

3) Engel's schema includes other constituents such as datives, adverbials, and indefinite pronouns. We have substituted a more transparent notation for Engel's letter/number indexes.

4) Clauses with two pronouns were not included, since an experiment is not necessary to show that here S-O order is categorical. Combinations of two indefinte NPs were eliminated due to the pragmatic improbability of this type (although it is possible and does occur). Combinations of two animates and of two inanimates were also eliminated to shorten the experimental protocol somewhat. In other words, in all sentences one NP was animate and the other inanimate, systematically varied with the other categories.

5) Lenerz emphasizes that for him the (*) notation does not necessarily mean "ungrammatical," but in many cases means only "less acceptable than the alternative."

6) There are a few derivational devices of low or zero productivity which are used only for animates, e.g. *-in* used to derive feminine gender from masculine gender nouns for people, and *-rich* as an occasional suffix for plants and for male people and animals. These are limited devices in the lexicon, and by no means qualify as a general marking for an animacy distinction in the grammar of German.
There is a strong tendency for the dative case, as opposed to the accusative, to be associated with animacy. But this is a statistical correlation, rather than a grammatical encoding. The dative does not signal 'animate.'

7) In judging this proposal it should be kept in mind that a) we have only begun to unravel the factors underlying the linearization of S and O, and to fix their weights; b) different individuals have different overall criterion levels for what they will accept as "possible;" and c) individuals may differ in the weight they attribute to specific factors.

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Appendix 1: Test sentences with factor ratings for verb-second sentences. Sentences are listed in order of decreasing total factor weights. In the columns for individual factors (+) means that the sentence is favored by that factor, (−) means the sentence is disfavored, and (0) means the factor does not apply, or the sentence is neutral.

test sentence	*individual factor values*					
	S-O	*anim*	pn-*defN*	defN-*indefN*	pn-*indefN*	*combined factor* weight
1. Der Mittelfeldspieler flankt, endlich hat *er eine Lücke* gefunden.	+	+	0	0	+	10.2
2. Ein Fanatiker überwindet den Zaun, jetzt hat *er das Spielfeld* erreicht.	+	+	+	0	0	9.7
3. Ein Stein fliegt über das Spielfeld, jetzt hat *er einen Ersatzspieler* gestreift.	+	−	0	0	+	8.2
4. Eine Fahne fliegt auf das Spielfeld, jetzt hat *sie den Torwart* behindert.	+	−	+	0	0	7.7
5. Das war ein grobes Foul, jetzt hat *der Schiedsrichter einen Elfmeter* gepfiffen.	+	+	0	+	0	6.6
6. Der Freistoß wird getreten, jetzt hat *der Torwart den Ball* gerade noch erwischt.	+	+	0	0	0	5.6
7. Teile der Zuschauer versuchen das Spielfeld zu stürmen, jetzt hat *ein Fanatiker den Zaun* überwunden.	+	+	0	−	0	4.6

test sentence	*individual factor values*					
	S-O	*anim*	pn-*defN*	defN-*indefN*	pn-*indefN*	*combined factor* weight
8. Das Spiel ist von Zufälligkeiten bestimmt, jetzt hat *der Ball einen Stürmer* unglücklich getroffen.	+	–	0	+	0	4.6
9. Pfützen machen das Spiel schwer, jetzt hat *der Matsch den Torwart* behindert.	+	–	0	0	0	3.6
10. Im Spiel herrscht ein heilloses Durcheinander, jetzt hat *eine Unebenheit den Linksaussen* stolpern lassen.	+	–	0	–	0	2.6
11. Das Spiel geht seinem Ende zu, jetzt hat *der Schiedsrichter es* abgepfiffen.	+	+	–	0	0	1.5
12. Der Ball fliegt ins Aus, jetzt hat *ein Gegenspieler ihn* aufgehoben.	+	+	0	0	–	1.0
13. Der Verteidiger kommt angerannt, jetzt hat *ihn eine Pfütze* aufgehalten.	–	+	0	0	+	1.0
14. Der Torwart blickt hoch, dabei hat *ihn die Sonne geblendet.*	–	+	+	0	0	.5
15. Der Torwart blickt hoch, dabei hat *die Sonne ihn* geblendet.	+	–	–	0	0	-.5
16. Der Ball fliegt ins Aus, jetzt hat *ihn ein Gegenspieler* aufgehoben.	–	–	0	0	+	- 1.0

test sentence	*individual factor values*					
	S-O	*anim*	pn-*defN*	defN-*indefN*	pn-*indefN*	*combined factor* weight
17. Der Verteidiger kommt angerannt, jetzt hat *eine Pfütze ihn* aufgehalten	+	–	0	0	–	- 1.0
18. Das Spiel geht seinem Ende zu, jetzt hat es der Schiedsrichter abgepfiffen.	–	–	+	0	0	- 1.5
19. Im Spiel herrscht ein heilloses Durcheinander, jetzt hat *den Linksaussen eine Unebenheit* stolpern lassen.	–	+	0	+	0	- 2.6
20. Pfützen machen das Spiel schwer. Jetzt hat *den Torwart der Matsch* behindert.	–	+	0	0	0	- 3.6
21. Teile der Zuschauer versuchen das Spielfeld zu stürmen, jetzt hat *den Zaun ein Fanatiker* überwunden.	–	–	0	+	0	- 4.6
22. Das Spiel ist von Zufälligkeiten bestimmt, jetzt hat *einen Stürmer der* Ball unglücklich getroffen.	–	+	0	–	0	- 4.6
23. Der Freistoß wird getreten, jetzt hat *den Ball der Torwart* gerade noch erwischt.	–	–	0	0	0	- 5.6
24. Das war ein grobes Foul, jetzt hat *einen Elfmeter der Schiedsrichter* gepfiffen.	–	–	0	–	0	- 6.6

test sentence	*individual factor values*					
	S-O	*anim*	pn-*defN*	defN-*indefN*	pn-*indefN*	*combined factor* weight
25. Eine Fahne fliegt auf das Spielfeld, jetzt hat *den Torwart sie* behindert.	–	+	–	0	0	- 7.7
26. Ein Stein fliegt über das Spielfeld, jetzt hat *einen Ersatzspieler er* gestreift.	–	+	0	0	–	- 8.2
27. Ein Fanatiker überwindet den Zaun, jetzt hat *das Spielfeld er* erreicht.	–	–	–	0	0	- 9.7
28. Der Mittelfeldspieler flankt, endlich hat *eine Lücke er* gefunden.	–	–	0	0	–	-10.2

Factor weights

anim (animacy difference between agent and goal)	1.0
S-O (order of agent and goal)	4.6
pn-defN (givenness difference between pronoun and definite NP)	4.1
defN-indefN (situational definiteness difference between a definite NP and an indefinite NP)	1.0
pn-indefN (combined effect of a difference in givenness and situational definiteness)	4.6

Appendix 2: test sentences with factor ratings for verb-final sentences.

	individual factor values					
	S-O	*anim*	pn-*defN*	defN-*indefN*	pn-*indefN*	*combined factor weight*
1. Der Mittelstürmer jubelt, weil *er ein Tor* geschossen hat.	+	+	0	0	+	9.7
2. Der Mittelstürmer flucht, weil *er den Ball* verloren hat.	+	+	+	0	0	9.1
3. Das Wurfgeschoß wird aufbewahrt, weil *es einen Spieler* verletzt hat.	+	−	0	0	+	7.7
4. Das Wurfgeschoß wird aufbewahrt, weil *es den Schiedsrichter* verletzt hat.	+	−	+	0	0	7.1
5. Die Siegeschancen sind gestiegen, weil *der Mittelstürmer ein Tor* geschossen hat.	+	+	0	+	0	7.0
6. Die Leute lachen, weil *der Ball einen Zuschauer* getroffen hat.	+	−	0	+	0	5.0
7. Die Gefahr ist vorüber, weil *der Torwart den Ball* aufgenommen hat.	+	+	0	0	0	4.7
8. Dieses Tor ist nur gefallen, weil *der Schnee den Torwart* geblendet hat.	+	−	0	0	0	2.7
9. Die Leute lachen, weil *ein Zuschauer den Ball* aufgefangen hat.	+	+	0	−	0	2.4

	individual factor values					
	S-O	*anim*	pn-*defN*	defN-*indefN*	pn-*indefN*	*combined factor weight*
10. Der Schiedsrichter liegt auf dem Boden, weil *ihn eine Flasche* getroffen hat.	–	+	0	0	+	2.3
11. Der Spieler stöhnt, weil *ihn der Ball* getroffen hat.	–	+	+	0	0	1.7
12. Der Trainer ist besorgt, weil *eine Flasche den Torwart* getroffen hat.	+	–	0	–	0	0.4
13. Der Ball ist aus dem Spiel, weil *der Torwart ihn zur Ecke gelenkt hat.*	+	+	–	0	0	0.3
14. Der Torpfosten ist zerbrochen, weil *ihn ein Fanatiker* umgerissen hat.	–	–	0	0	+	0.3
15. Der Ball ist aus dem Spiel, weil *ihn der Torwart* zur Ecke gelenkt hat.	–	–	+	0	0	-.3
16. Der Torpfosten ist zerbrochen, weil *ein Fanatiker ihn* umgerissen hat.	+	+	0	0	–	-.3
17. Der Trainer ist besorgt, weil *den Torwart eine Flasche* getroffen hat.	–	+	0	+	0	-.4
18. Der Spieler stöhnt, weil *der Ball ihn* getroffen hat.	+	–	–	0	0	-1.7
19. Der Schiedsrichter liegt auf dem Boden, weil *eine Flasche ihn* getroffen hat.	+	–	0	0	–	-2.3

	individual factor values					
	S-O	*anim*	pn-*defN*	defN-*indefN*	pn-*indefN*	*combined factor weight*
20. Die Leute lachen, weil *den Ball ein Zuschauer* aufgefangen hat.	–	–	0	+	0	-2.4
21. Dieses Tor ist nur gefallen, weil *den Torwart der Schnee* geblendet hat.	–	+	0	0	0	-2.7
22. Die Gefahr ist vorüber, weil *den Ball der Torwart* aufgenommen hat.	–	–	0	0	0	-4.7
23. Die Leute lachen, weil *einen Zuschauer der Ball* getroffen hat.	–	+	0	–	0	-5.0
24. Die Siegeschancen sind gestiegen, weil *ein Tor der Mittelstürmer* geschossen hat.	–	–	0	–	0	-7.0
25. Das Wurfgeschoß wird aufbewahrt, weil *den Schiedsrichter es* verletzt hat.	–	+	–	0	0	-7.1
26. Das Wurfgeschoß wird aufbewahrt, weil *einen Spieler es* verletzt hat.	–	+	0	0	–	-7.7
27. Der Mittelstürmer flucht, weil *den Ball er* verloren hat.	–	–	–	0	0	-9.1
28. Der Mittelstürmer jubelt, weil *ein Tor er* geschossen hat.	–	–	0	0	–	-9.7

Factor Weights

anim	1.0
S-O	3.7
pn-defN	4.4
defN-indefN	2.3
pn-indefN	5.0