

Clausal coordination and coordinate ellipsis in a model of the speaker*

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Abstract

This article presents a psycholinguistically inspired approach to the syntax of clause-level coordination and coordinate ellipsis. It departs from the assumption that coordinations are structurally similar to so-called appropriateness repairs — an important type of self-repairs in spontaneous speech. Coordinate structures and appropriateness repairs can both be viewed as “update” constructions. Updating is defined as a special sentence production mode that efficiently revises or augments existing sentential structure in response to modifications in the speaker’s communicative intention. This perspective is shown to offer an empirically satisfactory and theoretically parsimonious account of two prominent types of coordinate ellipsis, in particular “forward conjunction reduction” (FCR) and “gapping” (including “long-distance gapping” and “subgapping”). They are analyzed as different manifestations of “incremental updating” — efficient updating of only part of the existing sentential structure. Based on empirical data from Dutch and German, novel treatments are proposed for both types of clausal coordinate ellipsis.

The coordination-as-updating perspective appears to explain some general properties of coordinate structure: the existence of the well-known “coordinate structure constraint”, and the attractiveness of three-dimensional representations of coordination. Moreover, two other forms of coordinate ellipsis — SGF (“subject gap in finite clauses with fronted verb”), and “backward conjunction reduction” (BCR) (also known as “right node raising” or RNR) — are shown to be incompatible with the notion of incremental updating. Alternative theoretical interpretations of these phenomena are proposed.

The four types of clausal coordinate ellipsis — SGF, gapping, FCR and BCR — are argued to originate in four different stages of sentence production: Intending (i.e., preparing the communicative intention), conceptualization, grammatical encoding, and phonological encoding, respectively.

1. Introduction

This article deals with the syntactic aspects of coordination and coordinate ellipsis in clause-level coordination with the conjunction *and*. The theoretical framework to be presented here proceeds from the assumption that two key elliptical phenomena, “forward conjunction reduction” (FCR) and “gapping”, result from an *update* process that also underlies certain types of self-repairs in spontaneous speech — in particular so-called appropriateness repairs. These repairs occur when speakers revise the meaning underlying all or part of what they have just said in the current sentence and replace it by wordings that fit in with the revised meaning. Often, the ensuing “update” (revision, edit) does not replace the entire utterance but only a part that includes the new wordings. Coordination and self-repair thus appear as cognate processes of conceptual and syntactic updating.¹ I show that this perspective enables an empirically satisfactory and theoretically parsimonious analysis of FCR and gapping in Dutch and German.

FCR and gapping are illustrated by sentences (1) and (2), respectively. The elision in (1) targets the second conjunct — more precisely, the left periphery of that conjunct (marked by the dots). In (2), the head verb of the clause is elided. This elliptical variant often gives rise to elision of a non-left-peripheral (e.g., medial) fragment.

- (1) FCR: *The town [S where Jan lives and . . . Piet works]*
 (2) Gapping: *Jan lives in Leiden and Piet . . . in Nijmegen*

Two other forms of coordinate ellipsis are “backward conjunction reduction” (BCR) (also known as “right node raising or RNR; see Postal 1974) and SGF (“subject gap in finite clauses with fronted verb”; see Höhle 1983). BCR (3) refers to elision of a right-peripheral part of the left conjunct. In SGF (4), the second clausal conjunct is finite but has no overt subject; the implied subject is identical to the overt, non-left peripheral subject of the preceding clause. (The non-left peripherality of the overt subject precludes an analysis in terms of FCR.)

- (3) BCR: *Jan lives . . . and Piet works in Leiden*
 (4) SGF: *Into the wood went the hunter and . . . shot a hare.*

1.1. Preview

As will become clear shortly, the coordination-as-updating approach to be developed in this article does not presuppose an existing declarative

grammar formalism, nor does it embody a new declarative formalism. Instead, I advocate an analysis of coordination and (some of) its elliptical variants in procedural terms, as resulting from full or partial updates (revisions, edits) of structures that have already been built. Hence, it does not serve much purpose to review theoretical treatments of coordination in the literature extensively. (For detailed overviews, see Dik 1968; Neijt 1979; Van Oirsouw 1987; Seuren 1996; Johannessen 1998; Schwabe and Zhang 2000; Haspelmath 2004; te Velde 2006.) But a survey of the key phenomena of FCR and gapping with emphasis on their similarity to phenomena of self-repair, is an essential ingredient. This is the topic of Section 2. Section 3 outlines Levelt's (1989) model of sentence production that is presupposed in the remainder of the article. Then, in Section 4 I sketch the place of FCR and gapping in the sentence production model. Section 5 develops an incremental updating analysis of FCR and gapping in monoclausal sentences and in sentences with nested clauses. In Sections 6 and 7, I turn to BCR and SGF, respectively. Given the fine-structure of these ellipsis types, I argue that both are incompatible with the notion of coordination-as-updating (although for entirely different reasons), and suggest directions for adequate treatments. In Section 8, I argue that the novel perspective explains two fundamental but ill-understood properties of gapping and FCR: why they (1) obey the "coordinate structure constraint" (CSC) with "across-the-board" (ATB) application of movement operations, and (2) invite structural representations in terms of (a notational variant of) three-dimensional trees. In Section 9, finally, I point out a number of unresolved research issues.

2. Coordination and self-repair: a comparison from the viewpoint of sentence production

Levelt (1983, 1989: 485–489) observed a relationship between FCR and *self-repair* in spontaneous speech. Such corrections usually consist of three elements (see [5]):

- reparandum, that is, the original utterance containing an error
- editing term (... *uh* . . . , . . . *I mean* . . . , . . . *or rather* . . .), and
- repair text.

The speaker interrupts the ongoing speech, signals this to the listener by means of a pause and/or an editing term, retraces to an earlier point in the utterance, and reformulates it from there. This type of self-repairs is called *retracing repairs*. Levelt noticed that only certain positions in

the reparandum qualify as potential points of resumption (“retracing targets”) and advanced a descriptive rule demarcating these positions. The rule presupposes that the three basic elements of retracing repairs correspond to three parts of a coordination: the lefthand (or “anterior”) member, the conjunction, and the righthand (or “posterior”) member, as shown in (5b).² The resumption point in (5a) is the position just before the verb. The fragment preceding this point (i.e., the subject NP) is incorporated into the final utterance and, spliced together with the repair text, forms a correct sentence.

- | | | | | |
|-----|----|----------------------|---------------|-----------------------|
| (5) | a. | <i>Jan koopt ...</i> | <i>eh</i> | <i>steelt fietsen</i> |
| | | Jan buys ... | uh | steals bikes |
| | | reparandum | editing term | repair text |
| | b. | <i>Jan koopt ...</i> | <i>en ...</i> | <i>steelt fietsen</i> |
| | | Jan buys ... | and ... | steals bikes |
| | | anterior conjunct | conjunction | posterior conjunct |

In essence, Levelt’s rule states that a position within the reparandum qualifies as a suitable resumption point if and only if it yields a repair that corresponds to a grammatical coordination (FCR). For instance, the positions marked by “→” in (6a) and (7a) do not qualify as potential resumption points because the corresponding coordinations (6b) and (7b) are ungrammatical. In fact, the only permissible resumption points are located before the subject NP, as shown in (6c)–(6d) and (7c)–(7d). The symbol “⊥” marks the position of the *interrupt*, i.e., the position where the original utterance comes to a halt. (In Section 5.2.1, I will account for ill-formedness of coordinations such as [6b] and [7b].)

The sentences in (6) and (7) also exemplify the “update diagrams” that accompany many FCR and gapping cases in the sequel. The first line of such a diagram represents the reparandum or the anterior conjunct from the beginning of the utterance up to the interrupt. The second line shows the repair text or the posterior conjunct. A continuous line (——) printed below a left-peripheral string of the reparandum or anterior conjunct indicates that this string, in effect, functions as part of the repair text or the posterior conjunct. For instance, the continuous line below *is* in (6c) indicates that the meaning of the finally resulting utterance should be based on the analysis of *is the doctor interviewing the patient* rather than *the doctor interviewing the patient*. The strings of asterisks (*****) in (7a) and in (7b) indicate illegal applications of the combinatorial process. In the remaining examples, I will suppress the “→” symbol, which always follows immediately after the coordinator or the editing term and therefore is entirely redundant.

- b. *I met their eldest son yesterday, and their youngest one*
 I met their eldest son yesterday
 and their youngest son
- (9) a. *Then, the blue car crashed into the red one, I mean, the Jaguar into the Porsche*
 Then, the blue car crashed into the red one
 I mean, the Jaguar into the Porsche
- b. *Then, the BMW crashed into the Volvo, and the Jaguar into the Porsche*
 Then, the BMW crashed into the Volvo
 and the Jaguar into the Porsche

Another similarity between substitution repairs on the one hand and gapping on the other concerns the fact that the righthand conjunct cannot include an overt head verb, as illustrated in (10a). Apparently, the head verb in a posterior clausal conjunct rules out gapping and sets the ellipsis mode to FCR (10b).

- (10) a. **As a boy he read all novels by Scott, or rather devoured*
 b. *As a boy he read all novels by Scott, or rather devoured them*
 As a boy he read all novels by Scott
 ————— or rather devoured them
- c. *As a boy he read all novels by Scott and devoured *(them)*
 As a boy he read all novels by Scott
 ————— and devoured them

As suggested by the “grammatical” examples of self-repair above, the repair text is a string of *complete* major constituents. Resumption points appear to be located preferably before a major constituent of a clause, not within one. Similarly, the elision process in both gapping and FCR leaves major constituents intact.³

The similarities between self-repair on the one hand and FCR and gapping on the other can now be summarized as follows:

- The elision in FCR is left peripheral; in self-repair, the repair text together with all major constituents preceding the resumption point make up the new clause.
- In gapping, a posterior conjunct may consist of major constituents whose counterparts in the anterior (initial) conjunct are not adjacent; in substitution repairs, the repair text may replace nonadjacent major constituents in the reparandum.
- The elisions in FCR and gapping respect major constituent boundaries (except for long-distance gapping; see Section 5.2.2).

- In both FCR/gapping and their self-repair analogs, the presence or absence of an overt clausal head verb determines the continuation options: gapping is ruled out by the presence of the overt head verb in the posterior clause; substitution repairs only occur if the repair text does not contain the overt clausal head verb.

These remarkable points of resemblance invite an account of coordination and coordinate ellipsis based on their similarity with self-repairs — in particular, with self-repairs where “appropriateness” is at stake. They occur when — halfway through, or at the end of, a sentence — speakers modify the communicative intention underlying the current utterance in such a way that at least part of the utterance needs to be *updated*. In such repairs, some or all of the originally intended content that already has been encoded conceptually and grammatically⁴ and surfaced as an overt utterance, is replaced by more appropriate content, which requires at least a partially different overt realization.

An obvious objection against the suggested theoretical course follows from the observation that in self-repairs the reparandum fragment to the right of the resumption point is overwritten completely so that only one constituent remains: the string consisting of the initial reparandum fragment that precedes the resumption point, followed by the repair text. This contrasts with coordinate structures, where the initial conjunct is NOT superseded by a later one and at least two constituents see the light of day. However, this observation is incorrect. While formulating the repair text, the speaker presupposes that the entire reparandum forms part of the utterance and that the listener has understood it. In variant (8c) of (8a), for instance, the repair text contains two pronouns (*their* and *one*) which both take a part of the reparandum (*the Johnsons* and *son*, respectively) as antecedent. Hence, the part of the reparandum rightward of the resumption point must be assumed to belong to the resulting sentence.

- (8) c. *I met the eldest son of the Johnsons, sorry, their youngest one, yesterday*
 I met the eldest son of the Johnsons ↴
 sorry → their youngest one yesterday

In descriptions of updating processes, one needs to define the *target domain*, the *substitution units*, and the *substitution algorithm*. To illustrate, consider the situation of a software company that continually works on improvements of its software product — some complex program — and regularly distributes updates among its clients. If every update comprises a complete version of the program, the “program” is target domain and

substitution unit at the same time. Alternatively, an update could contain a new version of only the modified functions (“routines”) within the program; and installing the update only requires replacing the modified functions in the program code and removing those that have become superfluous (outdated). In that case, the function is the unit of substitution. Yet another option is to include in an update package only the individual modified lines of program code together with a list of to-be-removed lines, thus sizing the substitution units down to the level of individual lines of code.

The three options mentioned in this example presuppose different substitution algorithms. In the first case, the complete code of the current (original) program version is replaced by the new code. In the second case, the update package includes a list of addresses of the to-be-replaced and to-be-removed functions, with replacements for the former; and the substitution algorithm performs the modifications, probably in the order of mention of the addresses. The substitution algorithm for the third type of substitution unit may be similar, except that the addresses now refer to individual lines of code.

Now I can define the notions of incremental and nonincremental updating. An updating process is nonincremental if the substitution units coincide with the target domain; it is incremental if the substitution units are smaller than the target domain, thus enabling partial updates. Incremental updates usually cost less transmission and execution time, and therefore tend to be more efficient than nonincremental ones.

It is not hard to see that the structural updates in self-repairs are often incremental. Consider the self-repair in example (9a) whose target domain spans the complete clause before the editing term. Rather than formulating and transmitting an updated version of the entire clause, the speaker selects the major constituents of the clause as substitution unit and includes only the two modified exemplars in the update package.

3. Structural updating in a model of the sentence production process

Structural updating may be viewed as a special mode of operation of the human sentence production mechanism aiming at processing economy. In order to characterize this mode of operation more precisely, I now sketch Levelt’s (1989) widely accepted “model of the speaker” (see also Kempen 1977, 1987; Kempen and Huijbers 1983; Kempen and Hoenkamp 1987). According to this model, sentence production is a five-stage process: *intending*, *conceptualizing*, *grammatical encoding*, *phonological encoding*,

and *articulating*. In this article, I leave the fifth stage, which deals with the phonetic aspects of sentence production, out of consideration.

The first stage of sentence production — called “thinking for speaking” (Slobin 1996) or simply “intending” — comprises the creation of a communicative intention. During the second stage, the “conceptualization” process maps the intention onto a set of concepts and conceptual (thematic) relations retrieved from the “mental lexicon”. Output from this stage is a conceptual structure (“message”) in the form of a tree with branches whose linear order is undefined. Conceptual messages are input to the “grammatical encoding” stage.

The mental lexicon also contains *lemmas* — “syntactic words” that will be attached to syntactic trees as terminal nodes. I assume a one-to-one correspondence between concepts and lemmas. Associated with every lemma is information specifying how it can be used in sentences. For instance, a lemma that corresponds to an action concept, specifies how the concept’s thematic relations are mapped onto grammatical functions (often: actor onto subject, patient/theme onto direct object, location onto adverbial or prepositional modifier, etc.). Based on this information, the grammatical encoder computes the hierarchical (dominance) and the linear (precedence) structure of the sentence. Within the grammatical encoder, I assume that one processing component is responsible for computing the unordered hierarchical structure, and another one for linearizing the branches of the syntactic tree (cf. Kathol [2000] for a similar division of labor within an HPSG-type formalism; see also Harbusch and Kempen 2002). As part of the tree formation process, lemmas are adorned with features whose values, during the fourth stage, guide the selection of inflectional properties of every terminal node and mark the position of sentence accents.

Taking linearly ordered trees as input, the “phonological encoder” lays the groundwork for the spoken form of sentences. In response to the inflectional information attached to terminal nodes, the lemmas are replaced by *lexemes* (phonological wordforms). Lexemes are a third type of lexical entries in the Mental Lexicon, in addition to concepts and lemmas. The phonological encoder also computes an (abstract) intonation contour based on — among other things — the sentence accent marks placed during the second and third stages.

Given this blueprint of the sentence production process, the similarities between generating self-repairs and (a subset of) coordinate structures can be summarized as in Table 1.

One of the goals of the present article is to show that the phenomena of FCR and gapping can be understood as originating from the same source as self-repairs of the appropriateness type: incremental structural

Table 1. *Generating self-repairs and coordinate structures: a comparison*

Self-repair	Coordination
Intentional and conceptual updates: (part of) the content of the reparandum is <i>replaced</i> by novel content	Intentional and conceptual updates: (part of) the content of the reparandum is <i>augmented</i> by novel content
Grammatical encoding of the revised conceptual content begins	Grammatical encoding of the augmented conceptual content begins
Speaker announces upcoming correction by inserting an <i>editing term</i>	Speaker announces upcoming augmentation by inserting a <i>coordinating conjunction</i>
<i>Retracing repairs</i> : Grammatical encoding of revised conceptual content continues. Determination of resumption point by comparing the reparandum with the encoding of the revised content	<i>FCR</i> : Grammatical encoding of augmented conceptual content continues. Determination of resumption point by comparing the first conjunct with the encoding of the augmented content
<i>Substitution repairs</i> : Grammatical encoding of revised conceptual content continues.	<i>Gapping</i> : Grammatical encoding of augmented conceptual content continues.
<i>Retracing repairs</i> : Phonological encoding and overt expression of updated text rightward of the resumption point (“repair text”)	<i>FCR</i> : Phonological encoding and overt expression of updated text rightward of the resumption point (“second conjunct”)
<i>Substitution repairs</i> : Phonological encoding and overt expression of substitute constituents	<i>Gapping</i> : Phonological encoding and overt expression of ‘remnants’.

updating processes. I will focus on clausal coordination here, although the approach may advance our understanding of coordination at other hierarchical levels (NPs, PPs, APs) as well.

4. Forward conjunction reduction and gapping in the sentence production model

If the sentence production model and the hypothesis of elliptical coordination as incremental updating are basically correct, then the following assumption is plausible as well. Every stage of the sentence production process should be able to work “in update mode”: to assemble and output to the next stage only novel structure, i.e., only the fragments that reflect the replaced or augmented conceptual content. The unchanged fragments can be left untouched and need not be forwarded to the next stage. In case of gapping, the conceptual content underlying the verb is shared between conjuncts. This also holds for the thematic relations contracted by the verb and for the mappings between thematic relations and grammatical functions. Only some arguments or adjuncts need to be replaced

or added. This means *gapping can come into existence already during the conceptualization stage of sentence production*. Only the newly constructed conceptual arguments and/or adjuncts need to be selected as output, together with markers telling the grammatical encoder which original arguments/adjuncts they are supposed to augment. In example (9b), the augmentation is restricted to the fillers of the actor argument and the direction adjunct. Notice that the grammatical encoder need not initialize a new clause for the posterior conjunct; it only computes, in the context of the anterior clause, the surface shape of the substitute major constituents and delivers the product at the phonological encoder's door. This means that, in contradistinction to FCR (see below), Gapping does not involve determining a resumption point.

- (9) b. *Then, the BMW crashed into the Volvo, and the Jaguar into the Porsche*

In case of clause-level FCR, the circumstances are radically different. As the verb of the conjunct-under-construction differs from that of the first conjunct, it cannot be elided. Moreover, the new verb may license a very different set of thematic relations and different mappings between thematic relations and grammatical functions. Hence, the conceptualization stage does not qualify as a possible origin of clause-level FCR. But could it originate in the grammatical encoding stage? As the new verb may introduce grammatical functions that are absent from the first conjunct, or leave out functions that were present there, the only option is to construct a new clause for the posterior conjunct, headed by the new verb, with all constituents ordered from left to right. In update mode, grammatical encoding proceeds slightly differently than in normal mode. Traversing the *anterior* clause from left to right, the encoder checks the identity of each major constituent and determines whether it could become a constituent of the posterior clause in the same ordinal position. If so, the constituent is not constructed from scratch but gets incorporated into the posterior clause. The encoder returns to normal mode as soon as it runs into an anterior constituent that violates the incorporation criteria. From then onward, all constituents of the posterior clause are assembled in the standard fashion. This procedure entails the determination of the resumption point, which is located to the immediate left of the first constituent that blocks incorporation. In (10c), for example, the constituents dominating *as a boy he* can be incorporated into the posterior clause; the direct object *all novels by Scott* cannot, however, due to its position rightward of the resumption point. In order to avoid repetition of this NP, the encoder can opt for pronominalization instead, as in (10d). Finally, and crucially, *the output to the phonological encoder does not include the incorporated*

left-peripheral string. In sum, FCR can plausibly be assumed to originate at the level of grammatical encoding.

- (10) c. *As a boy he read all novels by Scott and devoured *(all novels by Scott)*
 As a boy he read all novels by Scott
 ————— and devoured all novels by Scott
- d. *As a boy he read all novels by Scott and devoured *(them)*

In the next section, I propose detailed accounts of FCR and gapping in German and Dutch based on the incremental updating hypothesis and on the presumed place of the two phenomena in the sentence production model.

5. Gapping and FCR as incremental updating

5.1. *Some definitions*

I use the term “major constituent” (or “major phrase”) of a clause in a broad sense that includes:

- *Heads*, i.e., main, auxiliary or copula verbs. I assume that every exemplar of each of these verb types is the head of a clause, and that every finite or nonfinite clause has exactly one head.⁵ The subcategorization frame of the head verb is one of the factors determining which other constituents figure in the clause as obligatory or optional major phrases. Auxiliaries will be treated as heads of clauses that govern a complement clause headed by an infinitival or participial head.
- *Arguments* and *adjuncts* of the head verb: subject, direct object, indirect object, predicate, complement (i.e., a finite or nonfinite subordinate clause), adverbial modifier, and particle.⁶
- *Subordinating conjunctions*, i.e., complementizer (in a complement clause: *that, whether*) or subordinator (in an adverbial clause: *while, although, when*, etc.).

As will become clear in the next subsection, we need an extended definition of major constituent to deal with a special form of gapping called “long-distance gapping” (LDG). The target domain of clausal coordination and ellipsis (for short: “clausal coordination domain”) is not necessarily a simple clause including only one verb. Empirical observations to be addressed below necessitate the introduction of coordination domains spanning a hierarchy of several complement clauses. For want of a better

term, I will refer to such a hierarchy as a *superclause*. A superclause is a clause of any type (main or subordinate; finite or nonfinite; complement, adverbial or relative) with all its major constituents *except for major constituents consisting of clauses that include a subordinating conjunction*. For example, sentence (11a) forms one superclause together with the stack of two nested object complement clauses. The highest complement clause (headed by *want*) is a superclause that includes the complement headed by *sell*. The latter is a “simple” superclause without any embedding (see the strings surrounded by “[SC . . .]”). Variant (11b) is also a superclause but it does *not* include the object complement or the adverbial clause (both printed in italics), which open with a subordinating conjunction.

- (11) a. [SC *Jan expects the thief* [SC *to want* [SC *to sell the stolen bike*]]
 b. [SC *Jan expects* [*SC that the thief wants to sell the stolen bike*] [*SC because . . .*] . . .]

The above list of major constituents includes complement clauses as major constituents of clauses headed by complement-taking verbs. The notion of superclause enables a slightly broadened definition of “major constituent”: *The major constituents of complement clauses that belong to the same superclause, all count as major constituents of the superclause*. For instance, superclause (11a) includes as major constituents *to want to sell the stolen bike*, *to sell the stolen bike* and *the stolen bike*. In (11b), both *the stolen bike* and *to sell the stolen bike* qualify as major constituents in the superclause headed by *wants* (but not in the superclause headed by *expects*).

The *left periphery* of a superclause covers the string of major phrases preceding the resumption point in FCR, i.e., the region before the first to-be-updated major constituent of the current superclause. Non-updated major phrases in the left periphery can be “borrowed” by the posterior conjunct (e.g., the phrases containing *as a boy he* in example [10c]). A borrowed major constituent functions as a normal (overt) constituent of the borrowing (posterior) clause. *In FCR, Left-peripheral major constituents are borrowed obligatorily. In gapping, borrowing of all non-updated major constituents is obligatory.*

5.2. *Forward conjunction reduction and gapping*

Superclauses are the application domains of incremental updating. Any superclause can spawn a clausal coordination and become its anterior

conjunct. The shape of the posterior conjunct depends crucially on the nature of the substitution units and the substitution algorithm. I propose to view the major constituent as the fundamental substitution unit in FCR and gapping. That is, whenever at least one word of a major constituent of a superclause is outdated and needs to be replaced, this constituent will be updated *in its entirety*.

In line with the assumption (Section 3) that gapping originates at an earlier stage than FCR, the update process first checks whether the set of outdated (i.e., to-be-updated) major constituents does *not* contain the *head verb of the superclause* (i.e., the head of the highest clause in the stack). If so, the posterior conjunct will consist of updated versions of all outdated major constituents, possibly extended with additional major phrases that have no counterpart in the anterior conjunct (e.g., *Mary sang, and beautifully!*). All non-outdated major phrases are obligatorily borrowed by the posterior conjunct (i.e., may not reappear there). Hence, the posterior conjunct consists exclusively of a string of remnants.

If the “highest” head verb of the superclause *does* need an update, then all left-peripheral major constituents are borrowed obligatorily (and no constituents rightward of the resumption point). The result is FCR.

To prevent a potential misunderstanding, I should point out that speakers are free to choose between incremental or non-incremental updates of the current superclause. For instance, they can repeat the two initial words of (12a) in the posterior conjunct or leave them out. However, if the update proceeds in incremental mode, the substitution algorithm dictates which major constituents are allowed to show up in the posterior conjunct. In (12a)–(12b), the temporal modifier *vanmorgen* is not allowed to become a remnant because it is not outdated.⁷

- (12) a. **omdat Jan vanmorgen een DVD leende en*
 because Jan this-morning a DVD borrowed and
 ~~*omdat Jan vanmorgen een CD kocht*~~
 ~~because Jan this-morning a CD bought~~
- b. **Jan leende vanmorgen een DVD van Marie*
 Jan borrowed this-morning a DVD from Marie
 en vanmorgen een DVD van Anna
 and this-morning a DVD from Anna

In the remainder of this Section, I apply incremental updating to the key elliptical coordination phenomena in simple clauses (i.e., superclauses consisting of a single clause without subordinate clauses) and in nested clauses spanning one or more superclauses. The target language is Dutch.

5.2.1. *Incremental updating in simple clauses.* The examples in (13) each contain two coordinated clauses. While no ellipsis has been applied to (13a), the other versions illustrate FCR and gapping, respectively

- (13) a. *Jan koopt auto's en Peter steelt fietsen*
 'Jan buys cars and Peter steals bikes'
 Jan koopt auto's
 en Peter steelt fietsen
- b. *Jan koopt auto's en steelt fietsen* (FCR)
 'Jan buys cars and steals bikes'
 Jan koopt auto's
 — en steelt fietsen
- c. *Jan koopt auto's en Peter fietsen* (gapping)
 'Jan buys cars and Peter, bikes'
 Jan koopt auto's
 en Peter fietsen

The sentences in (14) illustrate that borrowing in FCR is left peripheral only, as predicted by incremental updating. In (14a), the posterior conjunct borrows its subject NP *Jan* from left. Variant (14b) is ungrammatical because the direct object *fietsen* cannot be borrowed right-peripherally, implying the obligatory presence of an overt direct object (here: the pronoun *ze* 'them'). In subordinate clause (14c), with SOV word order, the posterior clause can legally borrow the direct object, which now is within the left periphery. The examples in (15) confirm the constraint on left-peripheral borrowing in FCR.

- (14) a. *Jan koopt fietsen en steelt ze*
 'Jan buys bikes and steals them'
 Jan koopt fietsen
 — en steelt ze
- b. **Jan koopt fietsen en steelt ze*
 * Jan koopt fietsen
 — en steelt *****
- c. *dat Jan fietsen koopt en ze steelt*
 that Jan bikes buys and them steals
 'that Jan buys bikes and steals them'
 dat Jan fietsen koopt
 — en ze steelt
- (15) a. **dat Peter fietsen steelt en Jan ~~fietsen~~ koopt*
 * dat Peter fietsen steelt
 — en Jan ***** koopt

- b. **Dit soort fietsen steelt Peter en verkoopt hij*
 this kind bikes steals Peter and sells he
 ‘This kind of bikes Peter steals and sells’
 *Dit soort fietsen steelt Peter
 _____ en verkoopt ****

I conclude this subsection with some remarks on gapping. The sentences in (16) show that gapping allows nonidentical inflectional forms of the same word to be elided: The difference between *schrijven* and *schrijft* is irrelevant. This is in line with an essential assumption underlying the gapping mode of incremental updating, viz. that the updating process only involves creating and delivering substitutes for the inappropriate (contrastive) major constituents and leaves the other ones untouched.

- (16) a. *Wij schrijven artikelen en hij ~~schrijft~~ een boek*
 we write articles and he writes a book
 ‘We write articles and he writes a book’
 Wij schrijven artikelen
 en hij een boek
- b. **Wij ~~schrijven~~ artikelen en hij schrijft een boek*
 * Wij ***** artikelen
 en hij schrijft een boek
- c. ... *dat wij artikelen schrijven en hij een boek ~~schrijft~~*
 dat wij artikelen schrijven
 en hij een boek

Furthermore, notice that gapping-style borrowing also applies to “Argument cluster coordination” (cf. Steedman 2000: Ch. 7; Beaver and Sag 2004), where the to-be-updated constituents of the anterior clause are adjacent, as in (16c) and (17), rather than separated by the head verb. The incremental updating process is indifferent to the position of the head verb in the anterior conjunct. Hence, argument cluster coordination does not need a special treatment.

- (17) *We geven Susan een mobieltje en Patrick een iPod*
 ‘We give Susan a cell phone and Patrick an iPod’
 we geven Susan een mobieltje
 en Patrick een iPod

Finally, the linear order of gapping remnants need not be identical to that of their counterparts in the anterior conjunct. Examples like (18) show that both orders of the remnants *morgen en iemand uit de buurt* yield good sentences, irrespective of the order of their counterparts *ik* and *vandaag*. Versions (18a) and (18c) with the subject NP *iemand uit de buurt* in

final position within the posterior conjunct, sound even slightly better than versions (18b) and (18d) with the subject in initial position. Presumably, factors relating to information structure or constituent length, or both, are responsible for this effect. The indefiniteness of *iemand uit de buurt* may create a preference for a late position — a tendency reinforced here by “heavy NP shift” due to length.

- (18) a. *Ik let vandaag op de poes, en morgen*
 I look today after the cat and tomorrow
iemand uit de buurt
 someone from the neighborhood
 ‘I look after the cat today, and tomorrow someone from the neighborhood’
- b. *Ik let vandaag op de poes, en iemand uit de buurt morgen*
 c. *Vandaag let ik op de poes, en morgen iemand uit de buurt*
 d. *Vandaag let ik op de poes, en iemand uit de buurt morgen*

The phenomenon of remnant order reversals in gapping can be understood in terms of the sentence production model put forward in Sections 3 and 4. According to this model, the dominance relations between the nodes of a syntactic tree are computed by a different component of the grammatical encoder than the linear order of the branches of the tree. After the grammatical encoder has received as input the updated conceptual content for the outdated major constituents, the hierarchical component can compute the shape of the remnants such that they fit into the hierarchical structure of the anterior clause. The linear order component then determines the precedence relations among the branches of the modified tree in accordance with information-structural and other constraints. At this point, modified information-structural conditions may give rise to precedence relations in the posterior conjunct that differ from those in the anterior clause. As its last step, the grammatical encoder does not pass the complete tree on to the phonological encoder but only the updated constituents (remnants) in their then left-to-right order.

5.2.2. *Incremental updating in nested clauses.* The definition of superclause in Section 4.1 implies that *adverbial* subordinate clauses, whether finite or nonfinite, launch their own superclause and constitute their own incremental updating domain. This is due to the obligatory subordinating conjunction at the onset of such a clause. Hence, gapping is ruled out if one of the remnants pairs up with a constituent belonging to the main clause, and the other one to an embedded adverbial clause. Consequently, examples (19b) and (20b) are ill-formed, in contrast with variants (19a)

and (20a), where the remnants are complete major constituents of the main clause. (The brackets “[SC ...]” indicate superclause boundaries.)

- (19) a. *Jan vertrok toen zijn ex aankwam en Peter toen zijn collega aankwam*
 ‘Jan left when his ex arrived and Peter when his colleague arrived’
 Jan vertrok [SC toen zijn ex aankwam]
 en Peter [SC toen zijn collega aankwam]
- b. **Jan vertrok toen zijn ex aankwam en Peter zijn collega*
 * Jan vertrok [SC toen zijn ex aankwam]
 en Peter [SC **** zijn collega *****]
- (20) a. *Jan vertrok om zijn vrouw op te halen en Peter om zijn collega op te halen*
 Jan left in-order his wife up to pick and Peter in-order his colleague up to pick
 Jan vertrok [SC om zijn vrouw op te halen]
 en Peter [SC om zijn collega op te halen]
- b. **Jan vertrok om zijn vrouw op te halen en Peter zijn collega*
 * Jan vertrok [SC om zijn vrouw op te halen]
 en Peter [SC *** zijn collega *****]

Neijt (1979: 183) gives several examples showing that the same pattern holds for *complement* clauses introduced by a subordinating conjunction (complementizer) — see (21) and (22a). The nonfinite complement in (22b), however, without a complementizer, does not launch its own superclause, thus licensing *long-distance gapping*.

- (21) **Jan veronderstelt dat hij een novelle zal schrijven en Peter veronderstelt dat hij een toneelstuk zal schrijven*
 Jan assumes that he a novel will write and Peter assumes that he a theater-play will write
 *‘Jan assumes that he will write a novel and Peter that he will write a theater play’
 * Jan veronderstelt [SC dat hij een novelle zal schrijven]
 en Peter [SC ***** een toneelstuk *****]
- (22) a. **Kees probeerde om Bernhard te imiteren en Harry probeerde om Fred te imiteren*
 Kees tried CMPR Bernhard to imitate and Harry tried CMPR Fred to imitate
 ‘Kees tried to imitate Bernhard and Harry, Fred’
 * Kees probeerde [SC om Bernhard te imiteren]
 en Harry [SC *** Fred *****]

- b. *Kees probeerde Bernhard te imiteren en Harry ~~probeerde~~ Fred te imiteren*
 ‘Kees tried to imitate Bernhard and Harry, Fred’
 [SC Kees probeerde Bernhard te imiteren
 en Harry Fred]

The coordinations in (23) all contain the head verb *vragen* ‘ask’ governing an extraposed infinitival complement without complementizer, and in each of them the anterior conjunct qualifies as a superclause. While sentence (23a) illustrates long-distance gapping, variants (23b) and (23c) are “simple” gapping cases since their complements have been updated in their entirety (not only their head verbs but also their direct objects — a type of gapping called *subgapping*. In (23d), the verb of the complement clause has been updated but not the direct object *de tekst*. That is to say, the update does cover not the *entire* complement, and gapping fails. FCR is ruled out as well because the direct object is not located in the left periphery. Versions (23e) and (23f), both without direct object updates, can be analyzed as legal FCR structures since they do allow left-peripheral borrowing of the direct object — with the complement clause or the main clause as coordination domain in (23e) and (23f), respectively.

- (23) a. *Hij vraagt mij de tekst te controleren en jou de literatuurlijst*
 he asks me the text to check and you
 the references
 ‘He asks me to check the text and you, the references’
 Hij vraagt mij de tekst te controleren
 en jou de literatuurlijst
- b. *Hij vraagt mij de tekst te controleren en jou de literatuurlijst te actualiseren*
 he asks me the text to check and you
 the references to update
 ‘He asks me to check the text and you, to update the references’
 Hij vraagt mij de tekst te controleren
 en jou de literatuurlijst te actualiseren
- c. ... *dat hij mij vraagt de tekst te controleren en*
 ... that he me asks the text to check and
jou de literatuurlijst te actualiseren
 you the references to update
 ‘... that he asks me to check the text and you, to update the references’

- dat hij mij vraagt de tekst te controleren
 en jou de literatuurlijst te actualiseren
- d. **Hij vraagt mij de tekst te controleren en jou*
 he asks me the text to check and you
~~de tekst~~ te verspreiden
 the text to distribute
 *‘He asks me to check the text and you, to distribute ~~the text~~’
 *He vraagt mij de tekst te controleren
 en jou ***** te verspreiden
- e. *Hij vraagt mij de tekst te controleren en ~~de~~*
 he asks me the text to check and the
~~tekst~~ (te) verspreiden
 text to distribute
 ‘He asks me to check the text and to distribute it’
 Hij vraagt mij [SC de tekst te controleren
 _____ en te verspreiden]
- f. *Deze tekst vraagt hij mij te controleren en (te)*
 this text asks he me to check and to
 verspreiden
 distribute
 ‘This text, he asks me to check and (to) distribute’
 [SC Deze tekst vraagt hij mij te controleren
 _____ en te verspreiden]

The sentences in (24a)–(24f) run parallel to (23a)–(23f) except that their main clauses are headed by a modal verb instead of an extraposition verb. They reveal that *clause union* does not modify the pattern of grammaticality ratings.

- (24) a. *Ik moet de tekst controleren en jij de*
 I should the text check and you the
literatuurlijst
 references
 ‘I should check the text and you, the references’
 Ik moet de tekst controleren
 en jij de literatuurlijst
- b. *Ik moet de tekst controleren en jij de*
 I should the text check and you the
literatuurlijst actualiseren
 references update
 ‘I should check the text and you should update the references’
 Ik moet de tekst controleren
 en jij de literatuurlijst actualiseren

- c. ... *dat ik de tekst moet controleren en jij*
 ... that I should the text check and you
de literatuurlijst actualiseren
 the references update
 '... that I should check the text and you should update the references'
 dat ik de tekst moet controleren
 en jij de literatuurlijst actualiseren
- d. **Ik moet de tekst controleren en jij de tekst*
 I should the text check and you ~~the text~~
verspreiden
 distribute
 'I should check the text and you should distribute it'
 * Ik moet de tekst controleren
 en jij***** verspreiden
- e. *Ik moet de tekst controleren en de tekst*
 I should the text check and ~~the text~~
verspreiden
 distribute
 *'I should check the text and distribute ~~the text~~'
 Ik moet [SC de tekst controleren
 _____ en verspreiden]
- f. *Deze tekst moet ik controleren en verspreiden*
 this text should I check and distribute
 'This text, I should check and distribute'
 [SC Deze tekst moet ik controleren
 _____ en verspreiden]

The definition of superclause allows long-distance gapping to cut into dependent Wh-questions that do not contain a minor constituent — see (25a). Variant (25b) shows that the Wh-phrase is an obligatory member of the posterior conjunct. I assume that this restriction need not be stipulated explicitly but follows from the general prohibition against elision of contrastive expressions in gapping: Although the two referring expressions (here: Wh-phrases) are identical, non-coreferentiality is presupposed. Version (25c) shows that *of* 'whether' does not count as a Wh-phrase but as a subordinating conjunction and hence introduces its own superclause.

- (25) a. *sommigen vragen wie Bach speelt en anderen*
 some ask who Bach plays and others
~~vragen~~ wie Buxtehude ~~speelt~~
~~ask~~ who Buxtehude plays
 'Some ask who plays Bach and others who (plays) Buxtehude'

- [SC Sommigen vragen wie Bach speelt
en anderen wie Buxtehude]
- b. **Sommigen vragen wie Bach speelt en anderen vragen wie Buxtehude speelt*
- c. **Sommigen vragen of we Bach spelen en anderen*
some ask if we Bach play and others
~~*vragen of we Buxtehude spelen*~~
ask if we Buxtehude play
*‘Some ask whether we can play Bach and others Buxtehude’
* Sommigen vragen [SC of we Bach spelen]
en anderen [SC ***** Buxtehude *****]

A theoretical issue posed by the superclause as incremental updating domain arises from Wh-fronting. A Wh-phrase may escape from the complement clause it belongs to, and land at the beginning of a clause higher up in the hierarchy. Do such extracted constituents count as members of the superclause they originate from, or of the one where they have landed? Example (26a) is a case in point: The interrogative prepositional phrase *op welke dagen* ‘on which days’ can be plausibly interpreted only as a temporal modifier of *open zijn* ‘be open’ — it must have been extracted from the finite complement clause introduced by *that*. The sentence is well-formed although, of the contrastive constituent pairs, one is physically located in the main clause (the Wh-phrases) and the other one in the complement (*schoenenzaak* ‘shoe store’ and *modezaak* ‘fashion store’). Now compare (26c), which has contrastive pairs at the same linear positions but where the interrogative PP has not been extracted from the finite complement (*tegen wie* ‘to whom’ is only interpretable as an argument of *gezegd* ‘said’). The ungrammaticality of this variant is predicted on the theory that superclauses are the domain of incremental updating: The main clause and the complement are different superclauses, which rules out long-distance gapping. This, in turn, entails well-formedness of (26d), where the contrastive pairs belong to the same superclause. (Neither the pair of subject NPs *u–uw partner* nor the pair of Wh-phrases have been extracted.) In line with this reasoning, version (26b) is ungrammatical as the two contrastive pairs belong to the different superclauses. (This applies to the intended — and the only meaningful — interpretation, with *uw partner* ‘your partner’ fulfilling subject role in the main rather than the embedded clause.)⁸

- (26) a. *Op welke dagen heeft u gezegd dat de*
On which days have you said that the
schoenenzaak open moet zijn, en op welke dagen
shoe-store open should be, and on which days

heeft u gezegd dat de modezaak open moet zijn?
 have you said that the fashion-store open should
 be

‘On which days did you say that the shoe store should be open, and on which days did you say that the fashion store should be open?’

- b. **Op welke dagen heeft u gezegd dat de schoenenzaak open moet zijn, en op welke dagen heeft uw partner gezegd dat de schoenenzaak open moet zijn?*
 on which days have you said that the shoe-store open should be, and on which days has your partner said that the shoe-store open should be

‘On which days did you say that the shoe store should be open, and on which days did your partner say that the shoe store should be open?’

- c. **Tegen wie heeft u gezegd dat de schoenenzaak vaker open moet zijn, en tegen wie heeft u gezegd dat de modezaak vaker open moet zijn?*
 to whom have you said that the shoe-store more-often open should be, and to whom have you said that the fashion-store more-often open should be

‘To whom did you say that the shoe store should open more often, and to whom did you say that the fashion store should open more often?’

- d. *Tegen wie heeft u gezegd dat de schoenenzaak vaker open moet zijn, en tegen wie heeft uw partner gezegd dat de schoenenzaak vaker open moet zijn?*
 to whom have you said that the shoe-store more-often open should be, and to whom has your partner said that the shoe-store more-often open should be

‘To whom did you say that the shoe store should open more often, and to whom did your partner say that the fashion store should open more often?’

In conclusion, Wh-fronting — and, presumably, any form of A-bar movement — does not affect superclause membership of the moved phrases. This confirms the validity of the definition of superclause in terms of the hierarchical rather than the linear-order relations between clauses and their constituents.

6. Backward conjunction reduction

At first sight, BCR looks like the mirror image of FCR. On closer inspection, however, this impression is false — for several reasons. First, BCR requires an accented word or word group immediately adjacent to the elided fragment. This holds even in the absence of semantic or pragmatic reasons for accentuation, as in (27a) where the prepositions *op* and *naar* carry an obligatory contrastive accent although their meanings are not contrastive at all. In FCR variant (27b), no contrastive accent is needed on *luistert* — the word immediately adjacent to the elided string. (See also [30a] below.)

- (27) a. *Mijn kamergenoot is dol óp klassieke muziek,*
 my roommate is fond of classical music
en luistert vaak náár klassieke muziek
 and listens often to classical music
 ‘My roommate is fond of, and often listens to, classical music’
- b. *Mijn kamergenoot is dol op klassieke muziek en*
 my roommate is fond of classical music and
~~*mijn kamergenoot*~~ *luistert er vaak naar*
 my roommate listens there often to
 ‘My roommate is fond of classical music and often listens to it’

Second, FCR requires lemma rather than lexeme identity of the elided string. For instance, consider the German BCR example in (28a), with the verbs *sagen* ‘say’ and *fragen* ‘ask’ in the anterior and posterior conjuncts, respectively. Both verbs are ditransitive, but their indirect objects take different case: dative (*sagst mir*) versus accusative (*fragst mich*). The difference between the indirect object lexemes (*mir/mich*) does not rule out BCR: elision of *mir nie etwas* in the anterior conjunct has, at worst, a marginal effect on grammaticality. In synonymous FCR variant (28b), however, with fronting of the indirect objects, the lexeme difference has fatal consequences, despite the fact that *mir* is in the left-periphery of the anterior clause and borrowable.

- (28) a. *Du sagst ~~mir~~ ~~nie~~ ~~etwas~~ und ~~du~~ fragst mich*
 you tell me never anything and you ask me
nie etwas
 never anything
 ‘You never tell or ask me anything’
 b. **Mir sagst ~~du~~ ~~nie~~ ~~etwas~~ und ~~mich~~ fragst du nie etwas*
 ‘Me, you never tell or ask anything’

Third, BCR allows elision of incomplete major constituents whilst FCR does not. In the anterior conjunct of Dutch FCR example (29a), the final word of the subject NP can be elided without loss of grammaticality; its mirror image BCR counterpart (29b), however, becomes ill-formed if the first word of the subject NP is suppressed in the posterior conjunct.

- (29) a. *Nu arriveren twee ~~treinen~~ en vertrekken drie*
 Now arrive two trains and leave three
treinen
 trains
 ‘Now, two trains arrive and three trains leave’
 b. **Twee treinen arriveren ~~nu~~ en ~~twee~~ bussen vertrekken nu*
 ‘Two trains arrive ~~now~~ and two busses leave now’

Fourth, BCR does not require the elided fragment to fulfill the same grammatical function as its counterpart in the posterior conjunct, whereas FCR does. The elided string *de zoon van mijn buurman* of (30a)’s anterior conjunct plays the role of subject NP but its namesake in the posterior clause is the complement of a preposition. This difference does not degrade the sentence. In example (30b), FCR is ruled out due to the difference between the grammatical functions of *de zoon van mijn buurman*: subject in the anterior, direct object in the posterior clause. Example (30a) also illustrates that, in BCR, the elided string should be preceded immediately by a constituent that carries contrastive stress — even if this stress does not have a semantic origin: In a nonelliptical version, neither *dan* nor *van* would have been accented.

- (30) a. *Ik ben kleiner ~~dán~~ ~~de~~ ~~zoon~~ ~~van~~ ~~mijn~~ ~~buurman~~*
 I am taller than the son of my neighbor
en verlies dus gewoonlijk ~~ván~~ ~~de~~ ~~zoon~~ ~~van~~
 and lose therefore usually to the son of
mijn buurman
 my neighbor
 ‘I am smaller than, and therefore usually lose to the son of my neighbor’

- b. **De zoon van mijn buurman is groter dan ik*
 the son of my neighbor is taller than I
en de zoon van mijn buurman versla ik dus
 and the son of my neighbor beat I therefore
zelden
 seldom
 ‘My brother is taller than I and therefore I seldom beat him’

Fifth, the string that is borrowed by the anterior conjunct, need not be (right-)peripheral in the posterior conjunct. In the posterior clause of (31), the overt token of *mijn optreden* is followed by the string *weer terug te zijn*, which cannot be borrowed by the anterior conjunct because the clause *Ik vertrek twee dagen vóór mijn optreden weer terug te zijn* is ill-formed. In (32), the overt token of *het Europese gemiddelde* is not peripheral due to the clause-final particle *uit*. Remember that in FCR the borrowed string has to be (left-)peripheral in the anterior clause.

- (31) *Ik vertrek twee dagen vóór mijn optreden en*
 I leave two days before my performance and
hoop drie dagen ná mijn optreden weer terug
 hope three days after my performance again back
te zijn
 to be
 ‘I leave two days before, and hope to be back again three days
 after my performance’
- (32) *De score van Nederland begint op een niveau ver*
 the score of the-Netherlands begins at a level far
bóven het Europese gemiddelde, en komt uiteindelijk
 above the European average and ends eventually
net ónder het Europese gemiddelde uit.
 just below the European average up
 ‘The score of The Netherlands begins at a level far above, and
 eventually ends up just below the European average’

Incidentally, this observation has an important theoretical consequence. Since Postal (1974), many accounts of BCR have been based on “right node raising” or an equivalent mechanism. However, such accounts presuppose that the overt counterpart of the elided string is right-peripheral in the posterior conjunct. Hence, they are incompatible with the well-formedness of sentences such as (31) and (32).

All five BCR properties highlighted here are shared by an elliptical device that is also operative outside of coordinate structures (Hudson, 1976). Following Kathol (1999), I call this mechanism *Left Deletion*

(LD). As illustrated by (33b), from Haeseryn et al. (1997: 1562), LD may elide right-peripheral material shared by a subordinate clause and the main clause following it, or even material shared the subject and the direct object of the same clause (34).

- (33) a. *Hij is vol hoop óp een goede uitslag, maar*
 he is full-of hope for a good result, but
niet afhankelijk ván een goede uitslag
 not dependent on a good result
 ‘He is full of hope for, but not dependent on a good result’
- b. *Hoewel hij vol hoop is óp een goede uitslag, is hij niet*
afhankelijk ván een goede uitslag
 ‘Although he is full of hope for a good result, he is not
 dependent ón a good result’
- (34) a. *Een man mét kinderen, huwt graag een vrouw*
 a man with children, marries gladly a woman
zónder kinderen
 without children
 ‘A man with, likes to marry a woman withóut children’
- b. *... dat een man mét kinderen, graag een vrouw zónder kinderen*
huwt
 ‘... that a man with, likes to marry a woman withóut children’

These five points of similarity strongly suggest that BCR and LD should be treated as one and the same phenomenon. If this hypothesis is correct — which I assume — it follows that BCR is not a form of *coordinate ellipsis*: Coordinate structures only afford a suitable playing ground for Left Deletion as they often give rise to contrastive pairs. The plausibility of viewing BCR as a form of coordinate ellipsis, hence of incremental updating, is extremely low anyway: the notion of updating entails *forward ellipsis* only because, by definition, the update comes later than the original structure.

An interesting question is raised by the directionality of BCR/LD: Why does it elide backward rather than forward? I suggest two possible — both performance-related — reasons. First, consider that the elided string and its overt counterpart are always immediately preceded by a contrastively accented word or word group (e.g., *voor* ‘before’ and *na* ‘after’ in (31)). Eliding the first token of the string brings the two contrasted words or word groups closer together, thus enhancing the contrast. This perceptual effect probably benefits the listener/reader. The other reason has to do with the grammatical encoding process and may benefit the speaker. BCR helps to avoid reduplication of stretches of speech within the same sentence. One strategy to avoid reduplications is

BCR, another one is based on pronominalization. As pronouns usually follow their antecedents, the latter strategy often reaches its goal by selecting a concise pronoun. This virtually eliminates the need for a reversed BCR/LD.

How does BCR/LD fit into the model of the speaker? The fact that only right-peripheral subconstituents of the anterior conjunct/constituent can be elided, entails that BCR/LD can originate no earlier than during the grammatical encoding stage of sentence production — more precisely: after linear order of the subconstituents has been established. Prosodic properties, in fact, imply that the origin of BCR/LD must be even later, namely in the phonological encoding stage. Remember from examples such as (27) and (30) that the nonelided remnant of the anterior conjunct/constituent must end in a contrastively accented lexical item, *even if this accent is not rooted in the meaning of the utterance*. The latter condition implies that the accent cannot have been prepared during an earlier stage. The conclusion must be that BCR/LD originates in the course of computing the sentence's intonation contour by the phonological encoding component.

This “late accenting” phenomenon also provides a counterargument against an otherwise appealing theoretical possibility of relating BCR to self-repairs. In Kempen (1991), I proposed to view BCR as the coordination analog of the interrupt stage of self-repairs, that is, of the stage where the speaker withholds the remainder of a planned utterance in response to spotting an error in the realized part of the utterance. It is obvious, however, that such interrupts often occur *before the speaker has planned the repair text*. In contrast, speakers who produce a BCR or an LD structure must have carried out a considerable amount of advance planning at the moment of interrupt: They must have (1) grammatically encoded the posterior part, (2) noticed the structural similarities with the part, and (3) inserted the required sentence accents. This difference rules out a direct theoretical correspondence between the interrupt stage of self-repairs on the one hand, and BCR/LD on the other.

Before leaving the topic of BCR, I should point out a remarkable interaction between BCR and gapping. Sentence (35a) is a candidate for BCR (due to the right-peripheral *hun tentamens* being shared by the conjuncts) as well as gapping (due to the shared verb *doen*). Putting both options into effect yields (35b). Variant (35c) features gapping only. As mentioned in connection with example (18) at the end of Section 4.2.1, the order of the gapping remnants need not correspond exactly to that of their counterparts in the anterior conjunct. Hence, sentence (35d), with the order of *de twee-dejaars* and *eind juni* reversed, is predicted to be well-formed — in agreement with fact. In combination with BCR, this word order freedom is dras-

tically reduced due to the requirement that the elided string in the anterior conjunct and its overt counterpart in the posterior conjunct have to be preceded by accented constituents belonging to the same contrast pair. This condition is violated in (35e) where *eind mei* does not pair up with *de tweedejaars*. The explanation of this phenomenon awaits further investigation.

- (35) a. *De eerstejaars doen eind mei hun tentamens*
the 1st-yr-students take end May their exams
en de tweedejaars doen eind juni hun
and the 2nd-yr-students take end June their
tentamens
exams
‘The first-year students take their exams end of May and the second-year students take their exams end of June’
- b. *De eerstejaars doen eind mei ~~hun tentamens~~, en de tweedejaars ~~doen~~ eind juni hun tentamens*
- c. *De eerstejaars doen eind mei hun tentamens en de tweedejaars ~~doen~~ eind juni ~~hun tentamens~~*
- d. *De eerstejaars doen eind mei hun tentamens en eind juni ~~doen~~ de tweedejaars ~~hun tentamens~~*
- e. **De eerstejaars doen eind mei ~~hun tentamens~~, en eind juni ~~doen~~ de tweedejaars hun tentamens*

7. Asymmetrical coordinations in Dutch and German

The three groups of elliptical coordinations discussed above (gapping, FCR and BCR) are often called “symmetrical” or “even” because the elided string in one conjunct occupies the same linear position as their overt counterpart in the other conjunct. The fourth group, SGF, which does not meet this criterion, is therefore called “asymmetrical.” In the present section, I focus on SGF and other phenomena of coordinate ellipsis that exhibit asymmetry.

7.1. SGF coordination

As mentioned at the outset of the article, an important class of coordinate constructions goes by the name of SGF (“Subject gap in finite clauses with fronted verb”; Höhle 1983). The update diagram accompanying example (36a) indicates that the finite verb *verkocht* ‘sold’ of the posterior conjunct cannot borrow its subject NP *Jan* which, due to subject-verb

inversion, does not occupy a position leftward of the resumption point and therefore cannot be borrowed. Nevertheless, the sentence is fully acceptable, with *Jan* interpreted as the subject of *verkocht*. This paradox does not arise in FCR variant (36b) without inversion. The observation that SGF coordination is incompatible with incremental updating suggests that attempts to reduce this phenomenon to symmetrical (even) coordinate ellipsis (e.g., Johnson 2002) are likely to fail. This raises the question how to account for SGF differently.

- (36) a. *Gister stal Jan een fiets en verkocht hem*
 Yesterday stole Jan a bike and sold it
vanmorgen
 this-morning
 ‘Yesterday Jan stole a bike and sold it this morning’
 **Gister stal Jan een fiets*
 — en verkocht **** hem vanmorgen
- b. *Jan stal gister een fiets en verkocht hem vanmorgen*
 Jan stal gister een fiets
 — en verkocht hem vanmorgen

Various authors have noted that the conjuncts of an SGF coordination contract a special semantic relationship (Heycock and Kroch 1994; Sturm 1995; Frank 2002; Hendriks 2004; Reich 2008): The predicates that these conjuncts ascribe to the referent of the subject NP, do not refer to several independent events or situations but to aspects of a single, compound event/situation. For instance, SGF example (37a) expresses that visiting the bar and getting drunk necessarily co-occur. However, version (37b), with an overt subject NP in the second conjunct, does not entail co-occurrence: During a depressive fit, the protagonist might usually get drunk at home, for instance.

- (37) a. *Tijdens depressieve buien gaat hij naar zijn*
 during depressive fits goes he to his
stamkroeg en bedrinkt zich
 favorite-bar and gets-drunk himself
 ‘During depressive fits he goes to his favorite bar and gets drunk’
- b. *Tijdens depressieve buien gaat hij naar zijn stamkroeg en*
bedrinkt hij zich
 ‘During depressive fits he goes to his favorite bar and he gets drunk’

Another characteristic semantic property of SGF examples concerns their information structure (or “information packaging”; cf. Vallduví and Eng-

dahl 1996). Hendriks (2004) observes that in felicitous SGF coordinations the subject refers to topical (old, presupposed) information. Indeed, SGF coordination is bad if the subject NP introduces new, foregrounded information, as in (38). Grammaticality is fully restored by insertion of an overt subject (e.g., *hij* ‘it’ in front of *duurt* ‘lasts’). The two semantic properties of felicitous SGF examples can be combined into the following statement: The predicates of an SGF coordination ascribe distinct aspects of one compound event/situation as new information to the referent of the same subject. By implication, the subject referent cannot be new/foregrounded in the anterior clause.

- (38) *Vanavond draait “L’enfant sauvage” van Truffaut*
 Tonight is-showing “L’enfant sauvage” by Truffaut
*en *(hij) duurt ongeveer twee uur*
 and it lasts about two hours
 ‘Tonight “L’enfant sauvage” by Truffaut is showing and (it) lasts
 about two hours’

These observations suggest that *posterior clauses of SGF coordinations do not borrow a subject NP in the course of an incremental updating operation*. Instead, I propose that, in the communicative intention underlying an SGF coordination, the speaker assigns several predicates to the referent of the subject NP simultaneously. In sentence (36), two actions are attributed to Jan: having stolen a bike yesterday, and having sold it this morning. In the hierarchical syntactic structure of (36), the verb *verkocht* ‘sold’ does not have an NP as subject but only a “coreference tag” pointing to the person called Jan. The verb *stal* ‘stole’ does have an explicit subject NP, and it carries the same coreference tag. In the linear structure of (36), the subject position of the posterior clause is empty because no subject NP needs to be linearized in this clause.

Example (39), from Sturm (1995), indeed shows that the subject of a posterior SGF clause cannot have had an original linear position corresponding to that of its counterpart in the anterior clause. Version (39a) is an interrogative main clause whose subject *je* ‘you’ occupies a position after the finite verb due to subject-verb inversion (obligatory in interrogative main clauses). Analyzing this sentence as (39b) is blocked by the presence of the second-person suffix *-t* on the finite verb *kijkt*. A general morphosyntactic rule prohibits this suffix if subject NP *je* follows the verb. Hypothesizing an underlying structure without inversion, as (37c), is ruled out as well because the second conjunct would no longer be an interrogative clause. Actually, (39d) is the only correct interrogative variant with an overt subject NP in the posterior conjunct (see Heycock and Kroch (1994) for a similar reasoning). The only way out seems to be the

assumption that the linear structure of the posterior clause does not host a subject at all, and that in its hierarchical structure the subject role is played by a tag pointing to the referent of the subject of the anterior clause.

- (39) a. *Waarom zit je daar en kijkt zo droevig om*
 Why sit you there and look so sad around
je heen?
 you --
 ‘Why are you sitting there and looking around so sad?’
 b. **Waarom zit je daar en kijkt je zo droevig om je heen?*
 c. **Waarom zit je daar en je kijkt zo droevig om je heen?*
 d. *Waarom zit je daar en kijk je zo droevig om je heen?*

Frank (2002) provides a compelling argument in support of this assumption, i.e., that the subject of a posterior SGF clause merely consists of a pointer to the subject of the anterior clause. Consider sentence (40a) — Frank’s translation of her German SGF example (17b), reproduced here as (40b). The meaning of this sentence implies that virtually nobody who has bought a car will travel by bus anymore. It cannot be interpreted as (40c) — the translation of Frank’s example (17c), reproduced here as (40d) — where the posterior conjunct hosts its own subject, implying that virtually nobody travels by car or bus. In (40a), the set of car buyers may be large; in (40c), it is nearly empty. In other words, the reference of the overt *almost no one* in the anterior clause of (40a) is determined on the basis of *both* predicates, whereas subject reference in the anterior clause of (40c) is selected on the basis of the anterior predicate only. The well-formedness of German (40b) shows that SGF constructions behave as (40a), not as (40c). That *die wenigsten Leute* in (40b) functions both as explicit anterior subject and as implicit posterior subject, and that these subjects are coreferential, originates from the underlying communicative intention (one subject referent, multiple predicates), not from some form of non-left-peripheral borrowing during the grammatical encoding process.⁹

- (40) a. *Therefore almost no one buys a car and takes the bus*
 b. *Daher kaufen die wenigsten Leute ein Auto und*
 Therefore buy the fewest people a car and
fahren mit dem Bus
 ride with the bus
 c. *Therefore almost no one buys a car and almost no one takes the bus*
 d. *Daher kaufen die wenigsten Leute ein Auto und fahren die wenigsten Leute mit dem Bus*

Finally, what can we conclude with respect to the place of SGF in the model of the speaker? The analysis put forward in this section implies, strictly speaking, that SGF is not an elliptical phenomenon at all: At no point in time during the production process was there a Subject NP, or a conceptual fragment underlying a Subject NP, that got elided. Therefore, I propose that SGF comes into existence already at the prelinguistic stage of planning the communicative intention: attributing two predicates to one referent.

7.2. Other putatively asymmetrical coordinations in German

Recently, various purportedly asymmetrical German constructions have received a great deal of attention (Heycock and Kroch 1994; Büring and Hartmann 1998; Schwarz 1998; Kathol 1999; Johnson 2002). In fact, the SGF coordination discussed in the preceding subsection, is the *primus inter pares*. Here, I analyze the coordinations in (41) and (42) below, all due to Schwarz (1998) and extensively discussed by Johnson (2002).

Example (41a) is considered asymmetrical if analyzed as (41b): Direct object NP *Die Suppe* has been extracted from the anterior member of the coordinated nonfinite clauses (VPs) but not from the posterior member. However, Schwarz presents empirical arguments against this analysis (which was originally proposed by Heycock and Kroch) and favors a gapping analysis with the nonfinite clause *sich hinlegen* as the sole remnant. Actually, the only possible analysis on the model developed here is in terms of gapping — or rather subgapping, since the second conjunct includes an overt complement verb (see Section 5.2.2, in particular examples [23b]–[23c] and [24b]–[24c], for a definition and illustrations of subgapping). The hypothesis that gapping originates in the conceptualization stage of sentence production (or, at any rate, before linearization has taken place) leaves open the possibility that direct object fronting is realized in one conjunct only — here: in the anterior conjunct. FCR is ruled out because, due to obligatory left-peripheral borrowing, it would entail borrowing the entire left-peripheral string of constituents and force *Die Suppe* into the role of *hinlegen*'s direct object. An SGF analysis fails for the simple reason that the posterior conjunct does not contain a finite verb. (Variant [41c] is an SGF coordination.)

Schwarz (1998) also discusses variant (41d) (his example [41c]). In order to understand its ill-formedness, first consider (41f), which embodies BCR and gapping simultaneously (cf. [41g]). Gapping succeeds here because each conjunct contains one member of each contrastive

pairs (*die Suppe*–*das Bier* and *essen*–*trinken*). The ill-formedness of (41d) is due to the fact that the fronted direct object *die Suppe* is not properly paired with a contrasting constituent but with the reflexive pronoun *sich* ‘himself’, as indicated in (41e). Unlike *die Suppe*, however, *sich* is not allowed to occupy the preverbal position in a main clause. In (41h), each of the two complement clauses *die Suppe zu essen* and *sich hinzuliegen* is a continuous constituent. The adjacency of these clauses allows a nonelliptical analysis with the left-branching complement of *versuchen* as coordination domain.

- (41) a. Die Suppe wird der Hans essen und
 the soup will the Hans eat and
~~der Hans wird~~ sich hinlegen
 himself down-lie
 ‘The soup, Hans will eat and lie down’
 (Schwarz 1998: example [1])
- b. [*Die Suppe*]₁ wird der Hans [*VP t₁ essen*] und [*VP sich
 hinlegen*]
- c. Die Suppe ißt der Hans und legt sich hin
 the soup eats the Hans and lies himself down
 ‘The soup, Hans eats and he lies down’
- d. *Die Suppe soll der Hans zu essen und sich
 the soup should the Hans to eat and himself
hinzulegen versuchen
 down-to-lie try
 ‘The soup, Hans should try to eat and to lie down’
 (Schwarz 1998: example [41c])
- e. ***Die Suppe soll der Hans zu essen versuchen und sich soll der
 Hans hinzulegen versuchen**
- f. Die Suppe soll der Hans zu essen und das
 the soup should the Hans to eat and the
Bier zu trinken versuchen
 beer to drink try
 ‘The soup, Hans should try to eat and to drink the beer’
- g. **Die Suppe soll der Hans zu essen versuchen und das Bier soll
 der Hans zu trinken versuchen**
- h. *Der Hans soll die Suppe zu essen und sich hinzulegen versuchen*

The assumptions made so far also explain the grammaticality contrast between (42a) and (42b), which differ only with respect to the presence or absence of direct object fronting. Variant (42a) is ungrammatical for exactly the same reason as (41d) — compare (41e) with (42b). The grammaticality of version (42c) corresponds to that of (41h).

- (42) a. **Die Suppe lehnt der Hans zu essen und sich hinzulegen ab*
the soup turns the Hans to eat and himself
down-to-lie down
‘The soup, Hans refuses to eat and to lie down’
(Schwarz 1998: example [46a])
- b. **Die Suppe lehnt der Hans zu essen ab und sich lehnt der Hans hinzulegen ab*
- c. *Der Hans lehnt die Suppe zu essen und sich hinzulegen ab*
the Hans turns the soup to eat and himself
down-to-lie down
‘The soup, Hans refuses to eat and to lie down’
(Schwarz 1998: example [47a])

In describing the incremental updating model I have assumed that it applies to Dutch and German alike. This does not necessarily imply that Dutch examples elicit the same grammaticality judgments as their German equivalents, and vice-versa. There may be factors outside of the coordination and ellipsis domain that cause the Dutch and the German acceptability judgments to diverge. A case in point is the greater word order freedom in German than in Dutch. For instance, fronting a non-pronominal direct object NP requires sharper focus and/or stronger contrastive stress in Dutch than in German. Lack of this may be responsible for the fact that (43a), although an acceptable equivalent of (41a), does not sound as good as (43b). Another possible cause of Dutch-German discrepancies may be differential preferences for alternative elliptical mechanisms. For instance, some speakers of German do not accept FCR sentence (44a) but strongly prefer SGF alternative (44b), whereas Dutch speakers probably find the FCR version (45a) better than SGF version (45b).

- (43) a. *De soep zal Hans eten en zich terugtrekken*
the soup will Hans eat and himself retire
(in zijn slaapkamer)
(in his bedroom)
‘Hans will eat the soup and retire (to his bedroom)’
- b. *Hans zal de soep eten en zich terugtrekken (in zijn slaapkamer)*
- (44) a. ?*Wegen des Sturms bleiben wir zuhause und verschieben wir unsere Reise*
due-to the storm stay we at-home and
postpone we our trip
‘Due to the storm we stay home and postpone our trip’

- b. *Wegen des Sturms bleiben wir zuhause und verschieben unsere Reise*
- (45) a. *Vanwege de storm blijven we thuis en stellen we onze reis uit*
 b. *Vanwege de storm blijven we thuis en stellen onze reis uit*

8. Explanatory value of coordination as updating

After having shown that the incremental updating approach to FCR and gapping enables adequate analyses at least of their basic elliptical properties, I now go one step further and claim important explanatory advantages for the new approach.

8.1. *The coordinate structure constraint (CSC) with across-the-board (ATB) extraction*

Ross (1967) proposed this well-known rule pair, which I reproduce in (46) in the formulation by Sag, Wasow and Bender (2003: 444).

(46) *Coordinate Structure Constraint (CSC):*

In a coordinate structure

- (a) no conjunct can be a gap,
 (b) nor can a gap be contained in a conjunct if its filler is outside of that conjunct . . .

Across-the-board exception (ATB addendum to CSC):

. . . unless each conjunct properly contains a gap paired with the same filler.

Here, the term “gap” refers to a structural position that is empty due to its filler having moved out of the coordination domain (“extraction”). Part (a) of the CSC (“no conjunct can be a gap”) prevents empty conjuncts such as in (47). Part (b) serves to eliminate cases such as (48b), where the direct object *whose tax* fills a gap in the posterior conjunct from where it has been extracted, but not a gap in the anterior conjunct. Similarly, (48c) is ruled out due to the fact that extraction of a constituent (fronting of *who* within the relative clause) has applied in the anterior but not the posterior conjunct. Grammaticality is indeed restored if extraction is applied “across the board”, as in (48d), where the subject gaps in both conjuncts are paired with the same filler *who*.¹⁰

- (47) **What sofa will he put the chair between some table and —?*
- (48) a. *The nurse polished her trombone and the plumber computed my tax*

- b. **Whose tax did the nurse polish her trombone and the plumber compute —?*
- c. **The nurse who polished her trombone and the plumber computed my tax was a blonde*
- d. *Who polished her trombone and computed my tax?*

The coordination-as-updating approach provides an immediate account for the CSC/ATB constraint. Replacing some “old” constituent within a structure by a “new” one can only count as an update if two conditions are met:

- The new constituent should fulfill all morphosyntactic constraints that the embedding structure (i.e., the structure outside of the coordination domain) imposes on the attachment site of the old constituent.
- The new constituent should be able to duplicate all and only the attachments of the old constituent to the embedding structure.

The first condition is violated by example (48c): The posterior clause (*the plumber computed my tax*) does not qualify as a relative clause. Notice, incidentally, that the morphosyntactic constraints mentioned in the first condition have the embedding structure as *source* and the old/new constituents as *target*. For instance, if the head verb of a clause wants its subject to be an NP, then this holds for both the old and the new constituent. However, the head verb cannot impose its current value of the number feature on the new subject constituent because the subject is the source, not the target, of the subject-verb agreement constraint. Hence, verb number may take on different values before and after the update.

The second condition ensures that the new constituent fills exactly the same positions in the embedding syntactic structure as the old one. To illustrate, example (47) violates the second condition because the posterior conjunct (*what sofa*) fails to fill the position occupied by its anterior counterpart (*some table*) and, instead, occupies an “external” position, that is, a position outside of the coordination domain. The second condition also applies to *parts* of the old constituent that have moved out and occupy an external position. Example (48b) is a case in point since part of the new clause (the direct object *whose tax*) occupies an external position that was not occupied by the old clause. In (48d), the posterior clause satisfies both conditions as it represents an independent Wh-question just like the anterior one, and FCR licenses borrowing the Wh-phrase. Sentence (49a) is well-formed because the posterior clause is of the same type as the anterior one and mimics the former’s Fronting operation that moved the Direct Object (*apple bagels*) to an external

position. (The coordination domain consists of the coordinated finite complement clauses.) Variant (49b), however, is ill-formed in the reading indicated by the brackets because the posterior clause fails to apply Fronting to the Direct Object. Consequently, the posterior conjunct does not fill an external position occupied by the anterior conjunct. Incidentally, (49b) is syntactically correct if the second conjunct is analyzed as an update for the entire first conjunct, that is, as consisting of two independent main clauses that together form a coordination domain (see the brackets in (49c)). Here, the Fronting operation has not moved the Direct Object *out of* the coordination domain.

- (49) a. *Apple bagels, I can assure you [that Leslie likes —] and [Sandy hates —]*
 b. **Apple bagels, I can assure you [that Leslie likes —] and [Sandy hates lox]*
 c. *[Apple bagels, I can assure you that Leslie likes] and [Sandy hates lox]*

In conclusion, the coordination-as-updating idea appears to entail the joint effects of CSC-plus-ATB without any further stipulation — thus, in a sense, explaining its existence.

8.2. *Three-dimensional (or parallel) trees*

In the past twenty-five years, it has been suggested repeatedly that something like three-dimensional trees would be an attractive format for representing coordination and other paratactic constructions (e.g., Goodall 1987; Grootveld 1992; van Riemsdijk 1998; De Vries 2003). The consecutive members of a coordination could receive adjacent positions in the third dimension and be aligned precisely so as to bring out their structural parallelism. On the model elaborated above, this comes as no surprise. The third dimension originates from consecutive updating operation, each new update giving rise to a new conjunct (to an extra line in an update diagram). So, the attractiveness of three-dimensional trees is an immediate consequence of viewing coordination as incremental updating.

At the same time, the new perspective does not inherit an important criticism leveled at other three-dimensional representations of coordinate structures. As far as I know, they all presuppose full parallelism of matching constituents in the conjuncts. As we have seen in Section 3, this presupposition is contradicted by the gapping facts, as borne out by examples such as those in (18) and (35).

9. Discussion

The incremental updating model for coordinate ellipsis put forward in this article was inspired by certain similarities between coordination and self-repair. At the end of this exercise it appears that this source of inspiration was valuable insofar as yielding plausible accounts for two central elliptical phenomena under scrutiny: Forward conjunction reduction (FCR) and the varieties of gapping. The model may also be said to explain the well-known coordinate structure constraint with across-the-board application of movement rules (CSC/ATB). This, in turn, implies that an important type of coordination, SGF, cannot be analyzed in terms of incremental updating because it violates the CSC/ATB constraint. Instead, I argued that SGF is not an elliptical phenomenon at all. The fourth phenomenon — backward conjunction reduction (BCR) — could not be analyzed as a product of incremental updating. However, I showed that it shares key properties with an elliptical structure with a wider scope than coordination: left deletion. Hence, strictly speaking BCR does not qualify as an instance of *coordinate* ellipsis proper.

The four types of clausal coordinate ellipsis were argued to originate in four different stages of the model of the speaker: SGF in the intending stage (i.e., during the preparation of the communicative intention), gapping in the conceptualization stage, FCR during grammatical encoding, and BCR during phonological encoding.

A key property of coordination-as-updating approach is that it can be viewed as largely independent from the grammar formalism that generates noncoordinate structures. It postulates a sentence production mode that, in response to revisions or extensions of the speaker's communicative intention, attempts to save on processing load by only generating the novel parts of the modified communicative intention instead of re-processing of the complete revised/extended intention. This entails a double theoretical advantage: Coordination-as-updating can be adopted relatively easily by extant grammar formalisms of heterogeneous design; and it does not increase the computational complexity of these formalisms per se (Harbusch and Kempen 2006).

The empirical evidence adduced above in support of the proposed accounts of the four types of clausal coordinate ellipsis is entirely based on grammaticality judgments, i.e., linguistic *competence*. This raises the question whether these types are the only ones that occur in linguistic *performance*, i.e., in spoken and written language production. The TIGER treebank for written German (Brants et al. 2002) provides excellent materials to begin to answer this question. From this corpus, Harbusch and Kempen (2007) extracted all coordinations with *und* 'and' that contained

at least two clauses (about 7000 sentences in total). More than half of these clausal *und*-coordinations (about 4000) exhibited some form of coordinate ellipsis. It was not difficult to categorize each of them — partly automatically, partly by hand — under one of the four ellipsis types (or a combination: BCR joined with one of the three “forward” types). All four types occurred in considerable numbers. Importantly, in only 1 percent of these elliptical coordinations (about 40), the shape deviated from the possibilities allowed by the proposed rules. Many of them concern FCR (slashes “//” in the anterior clause mark the end of the borrowable left periphery):

- *Nonmaximal reduction.* The ellipsis is applied only to part of the elidable string. In (50), FCR licenses elision of the verb *war* ‘was’ in the posterior conjunct, but this option remains unused. (See also Note 7.)
- *Overreduction.* In particular, a non-peripheral part of a major constituent of the clause is elided. Two examples are (51) and (52) where the head nouns of the Subject of the posterior conjunct are elided, thereby violating the constraint that in FCR only entire major constituents are elidable.
- *Peripherality violations by “little words.”* In about 10 FCR cases, the third-person reflexive pronoun *sich* (‘himself, herself, themselves’) was located at the “wrong” side of the boundary between the borrowable left-periphery and the nonborrowable remainder of the first conjunct. In (53), *sich* is too late to be shared by the other conjunct. In (54), it is too early: it could be shared by the second conjunct but this does not need a reflexive pronoun. (Cases like these are not restricted to *sich*: One example involved the demonstrative pronoun *dies* ‘this’.)

The small number of deviations does not warrant ranging these sentences under a separate elliptical category, the more so because upon closer inspection the authors might have considered them erroneous and corrected them.

(50) *Der Lehrkurs bei ihm // war streng und war gründlich*

‘The course at his place was stern and was solid’

(51) ... während bei der Sparkasse X // Gebühren von 50 ~~zu berappen~~
~~sind~~ und bei der Bank Y sogar ~~Gebühren~~ von 60 Mark zu berappen
sind

‘... whereas at Savings Bank X fees of 50 ~~are to be coughed up~~
and at Bank Y even ~~fees~~ of 60 Mark have to be coughed up’

- (52) *Dabei schrumpfte // der Auftragseingang aus dem Inland um drei Prozent und der Auftragseingang aus dem Ausland um vier Prozent*
 ‘Moreover, the number of domestic orders shrank with three and the number of orders from abroad with four percent’
- (53) ... während // 78 Prozent sich für Bush und vier Prozent sich für Clinton aussprachen
 ‘... while 78 percent expressed themselves in favor of Bush and four percent themselves for Clinton’
- (54) ... daß sich weiß // davon am besten abhebt und von den Autofahrern am ehesten gesehen wird
 ‘... that [the color] white gives the better contrast (lit.: distinguishes itself best) and can be seen faster by the drivers’

Important open questions concern the possibilities of extending the scope of the incremental updating model in various directions. First and foremost, does it generalize to other languages than German and Dutch? Second, can incremental updating account for the syntactic aspects of coordination and ellipsis at the level of NPs, PPs, APs, etc.? Third, could it illuminate the treatment of constructions that are cognate with coordination, in particular comparatives (cf. Lechner 2004) and appositions (De Vries 2006; Kraak and Klooster 1968: 260)? I leave it to future research to provide the answers.

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Notes

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1. For early explorations of the idea that coordination and coordinate ellipsis can be explained in terms of an analogy with self-repair, and the implication that coordinate structure is iterative rather than recursive, see Kempen and Hoenkamp (1987), Pijls and Kempen (1986), and Kempen (1991). For a recent computer program that applies all forms of coordinate ellipsis to non-elliptical clausal coordinations in a manner based on the theory presented in the present article, see Harbusch and Kempen (2006, 2009).
 2. I will not deal with coordinations of more than two conjoint clauses, on the assumption that they can be handled by relatively straightforward extensions of the theory presented here, in combination with a solution for asyndeton. (But see Borsley 2005.)

3. Long-distance gapping (see Section 5.2.2) is an exception to this generalization: It is sometimes allowed to cut into nonfinite complement clauses.
4. The terms “conceptual encoding” (or “conceptualizing”) and “grammatical encoding” are explained in Section 3.
5. In certain types of infinitival clauses, the head verb is obligatorily preceded immediately by the equivalent of *to* (Du. *te*; Ger. *zu*). I assume here that this item forms part of the head.
6. Particles as intended here are constitutive elements of particle verbs and (in German and Dutch) of separable verbs. Sometimes they are members of semantically contrastive pairs, as in *go up* and *go down*, and thus may be remnants in gapping constructions alongside other major constituents.
7. The sentences in (12) probably become less bad if pronounced with emphasis on both tokens of *vanmorgen*. Furthermore, repetition of unstressed function words in the posterior conjunct degrades the coordination to some extent but is not fatal. In (i), repetition of the auxiliary *zal* ‘will’ is dispreferred.
 - (i) *Deze gast zal vanmiddag zijn koffers pakken en (?zal)*
 this guest will this-afternoon his suitcases pack and will
 vanavond vertrekken
 tonight leave
 ‘This guest will pack his suitcases this afternoon and (will) leave tonight’
8. See Neijt (1979: 186–187) for examples similar to those in (26).
9. The analysis of SGF constructions in terms of “multiple predication” presupposes that the initial constituent of the anterior clause cannot be borrowed. Indeed, in (36a), the modifier *gister* ‘yesterday’ in the anterior clause does not clash with *vanmorgen* ‘this morning’ in the posterior conjunct. My conjecture is that the posterior SGF conjunct cannot borrow anything at all.
10. Example (47) is identical to 2.18 in Ross (1967); those in (48) are based on 4.81 and 4.82 in Ross (1967). The examples in (49) stem from Sag et al. 2003: 443–444.

References

- Beaver, John & Ivan A. Sag. 2004. Coordinate ellipsis and apparent non-constituent coordination. In Müller, Stefan (ed.), *Proceedings of the HPSG04 Conference, Center for Computational Linguistics, Katholieke Universiteit Leuven, August 3–6, 2004*, 48–69. Stanford CA: CSLI. <http://csli-publications.stanford.edu/HPSG/5/> (accessed 23 February 2009).
- Brants, Sabine, Stefanie Dipper, Peter Eisenberg, Silvia Hansen-Schirra, Esther König, Wolfgang Lezius, Christian Rohrer, George Smith & Hans Uszkoreit. 2004. TIGER: Linguistic interpretation of a German corpus. *Research on Language and Computation* 2. 597–620.
- Büring, Daniel & Katharina Hartmann. 1998. Asymmetrische Koordination. *Linguistische Berichte* 174. 172–201.
- De Vries, Mark. 2003. Three-dimensional grammar. In *Linguistics in The Netherlands 2003*. 201–212.
- De Vries, Mark. 2006. The syntax of appositive relativization: On specifying coordination, false free relatives, and promotion. *Linguistic Inquiry* 37. 229–270.
- Dik, Simon. 1968. *Coordination: Its implications for the theory of general linguistics*. Amsterdam: North-Holland.

- Frank, Anette. 2002. A (discourse) functional analysis of asymmetric coordination. In Miriam Butt & Tracy Holloway King (eds.) *Proceedings of the LFG'02 Conference, National Technical University of Athens*, 174–196. Stanford, CA: CSLI Online Publications. <http://csli-publications.stanford.edu/LFG/7/lfg02.pdf> (accessed 23 February 2009).
- Goodall, Grant. 1987. *Parallel structures in syntax: Coordination, causatives, and restructuring*. Cambridge: Cambridge University Press.
- Grootveld, Marjan. 1992. On the representation of coordination. *Linguistics in The Netherlands 1992*. 61–73.
- Haeseryn, Walter, Kirsten Romijn, Guido Geerts, Jaap De Rooij & Maarten C. Van den Toorn. 1997. *Algemene Nederlandse Spraakkunst*. Groningen: Martinus Nijhoff.
- Harbusch, Karin & Gerard Kempen. 2002. A quantitative model of word order and movement in English, Dutch and German complement constructions. *Proceedings of the 19th International Conference on Computational Linguistics (COLING 2002)*, Taipei (Taiwan). San Francisco: Morgan Kaufmann. <http://www.aclweb.org/anthology/C/C02/C02-1034.pdf> (accessed 31 March 2009).
- Harbusch, Karin & Gerard Kempen. 2006. ELLEIPO: A module that computes coordinative ellipsis for language generators that don't. In *EACL-2006: 11th Conference of the European Chapter of the Association for Computational Linguistics* (Trento, Italy; April 2006). <http://aclweb.org/anthology/E/E06/E06-2008.pdf> (accessed 31 March 2009).
- Haspelmath, Martin (ed.). 2004. *Coordinating constructions*. Amsterdam: John Benjamins.
- Hendriks, Petra A. 2004. Coherence relations, ellipsis and contrastive topics. *Journal of Semantics* 21. 133–153.
- Heycock, Caroline & Anthony Kroch. 1994. Verb movement and coordination in a dynamic theory of licensing. *The Linguistic Review* 11. 257–283.
- Höhle, Tilman. 1983. Subjektlücken in Koordinationen. Unpublished manuscript, Tübingen University. http://www.linguistik.uni-tuebingen.de/hoehle/manuskripte/SLF-W5.1_neu.pdf (accessed 31 March 2009).
- Hudson, Richard A. 1976. Conjunction reduction, gapping, and right-node raising. *Language* 52. 535–562.
- Johannessen, Janne B. 1998. *Coordination*. Oxford: Oxford University Press.
- Johnson, Kyle. 2002. Restoring exotic coordinations to normalcy. *Linguistic Inquiry* 33. 97–156.
- Kathol, Andreas. 1999. Linearization vs. phrase structure in German coordination constructions. *Cognitive Linguistics* 10. 303–342.
- Kathol, Andreas. 2000. *Linear syntax*. Oxford: Oxford University Press.
- Kempen, Gerard. 1977. Conceptualizing and formulating in sentence production. In S. Rosenberg (ed.), *Sentence production: Developments in research and theory*, 259–274. Hillsdale, NJ: Erlbaum.
- Kempen, Gerard. 1987. A framework for incremental syntactic tree formation. *Proceedings of the Tenth International Joint Conference on Artificial Intelligence (IJCAI'87)*. <http://dli.iit.ac.in/ijcai/IJCAI-87-VOL2/PDF/011.pdf> (accessed 31 March 2009).
- Kempen, Gerard. 1991. Conjunction reduction and gapping in clause-level coordination: an inheritance-based approach. *Computational Intelligence* 7. 357–360.
- Kempen, Gerard & Eduard Hoenkamp. 1987. An incremental procedural grammar for sentence formulation. *Cognitive Science* 11. 201–258.
- Kempen, Gerard & Pieter Huijbers. 1983. The lexicalization process in sentence production and naming: indirect election of words. *Cognition* 14. 185–209.
- Kraak, Rimmert & Wim Klooster. 1968. *Syntaxis*. Culemborg: Stam-Kemperman.
- Lechner, Winfried. 2004. *Ellipsis in comparatives*. Berlin & New York: Mouton de Gruyter.
- Levelt, Willem J. M. 1983. Monitoring and self-repair in speech. *Cognition* 14. 41–104.

- Levelt, Willem J. M. 1989. *Speaking: From intention to articulation*. Cambridge, MA: MIT Press.
- Neijt, Anneke. 1980 [1979]. *Gapping: A contribution to sentence grammar*, 2nd edn. Dordrecht: Foris.
- Pijls, Fieny & Gerard Kempen. 1986. Een psycholinguïstisch model voor syntactische samen-trekking. *De Nieuwe Taalgids* 79. 217–234.
- Postal, Paul. 1974. *On raising: one rule of English grammar and its theoretical implications*. Cambridge, MA: MIT Press.
- Reich, Ingo. 2008. From discourse to “odd coordinations”: On asymmetric coordination and subject gaps in German. In Cathrine Fabricius-Hansen & Wiebke Ramm (eds.), *‘Subordination’ versus ‘coordination’ in sentence and text: A cross-linguistic perspective*, 281–303. Amsterdam: Benjamins.
- Ross, John R. 1986 [1967]. *Infinite syntax!* (Language and Being). Norwood, NJ: Ablex. [Constraints on variables in syntax. Cambridge, MA: MIT dissertation.]
- Sag, Ivan A., Thomas Wasow & Emily M. Bender. 2003. *Syntactic theory: A formal introduction*. Stanford, CA: CSLI.
- Schwabe, Kerstin & Ning Zhang (eds.). 2000. *Ellipsis in conjunction*. Tübingen: Niemeyer.
- Schwarz, Bernhard. 1998. On odd coordinations in German. *Journal of Comparative Germanic Linguistics* 2. 191–219.
- Seuren, Pieter A. M. 1996. *Semantic syntax*. Oxford: Blackwell.
- Slobin, Dan I. 1996. From “thought and language” to “thinking for speaking.” In John J. Gumperz & Stephen C. Levinson (eds.), *Rethinking linguistic relativity*, 70–96. Cambridge: Cambridge University Press.
- Steedman, Mark. 2000. *The syntactic process*. Cambridge, MA: MIT Press.
- Sturm, Arie. 1995. SGF-coördinatie bij nader inzien: verklaring van de eigenschappen en on-gehoorde mogelijkheden. *De Nieuwe Taalgids* 88. 333–353.
- te Velde, John. 2006. *Deriving coordinate symmetries: A phase-based approach integrating Select, Merge, Copy and Match*. Amsterdam: John Benjamins.
- Vallduvi, Enric & Elisabet Engdahl (1996). The linguistic realization of information packag-ing. *Linguistics* 34. 459–519.
- Van Oirsouw, Robert R. 1987. *The syntax of coordination*. London: Croom Helm.
- van Riemsdijk, Henk. 1998. Trees and Scions — Science and trees. In *Chomsky 70th Birthday Celebration Fest-Web-Page*. <http://cognet.mit.edu/Books/celebration/essays/riemsdyk.html> (accessed 23 February 2009).
- Van Wijk, Carel & Gerard Kempen. 1987. A dual system for producing self-repairs in spon-taneous speech: evidence from experimentally elicited corrections. *Cognitive Psychology* 19. 403–440.