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Foregrounding of subordinate clauses by word order:

Psycholinguistic evidence of the function of V>Adv (V2) word order in Danish

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Abstract

In modern Danish, main clauses have the word order X > Verb > Adverb (i.e. V2) whereas subordinate clauses are generally characterized by the ”subordinate clause” word order Subject > Adverb > Verb. Spoken Danish has a high frequency of ”main clause” word order in subordinate clauses, however, and in the article we argue that this ”Main Clause Phenomena” (cf. Aelbrecht et al. 2012) functions as a foregrounding device, signaling that the more important information of the clause complex is to be found in the subordinate clause instead of in its matrix clause.

A prediction from the foregrounding hypothesis is that a subordinate clause with Verb>Adverb word order will attract more attention than a clause with Adverb>Verb word order. To test this, we conducted an experiment under the text change paradigm. 59 students each read 24 constructions twice, each containing a subordinate clause with either Verb>Adverb or Adverb>Verb word order. Half of the subordinate clauses were

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governed by a semifactive predicate (open to both word orders) and the other half by a semantically secondary sentence (in itself strongly favoring Verb>Adverb word order). Attention to the subordinate clause was tested by measuring how disinclined the participants were to notice change of a word in the subordinate clause when re-reading it.

Results showed significantly more attention to Verb>Adverb clauses than to Adverb>Verb clauses (though only under semifactive predicates), and more attention to subordinate clauses under semantically secondary than semifactive predicates. We consider this as strongly supporting the hypothesis that Verb>Adv word order functions as a foregrounding signal in subordinate clauses.

Keywords: Change blindness, Subordinate clauses, Danish, Foregrounding, Word order

1 Introduction

Main Clause Phenomena (MCP) is a cover term for a range of linguistic phenomena that are associated with main clauses, but have been found to repeatedly occur also in subordinate clauses (henceforth subclauses) (Hooper and Thompson 1973; Green 1976; Aelbrecht et al. 2012). In their seminal 1973 article, Hooper and Thompson enumerate a range of such phenomena for English, e.g. Negative Constituent Preposing (e.g. *Never in my life have I seen such a crowd*) and Left Dislocation (e.g. *This book, it has the recipe in it*). In most Germanic languages, including mainland Scandinavian, declarative main clauses are characterized by having the finite verb in the second position. The typical

ordering of constituents in mainland Scandinavian main clauses is Subject > Verb > (Sentence) Adverbial, etc., but word order flexibility allows another constituent than the subject to precede the finite verb. This is never the case for what has traditionally been called ”subclause word order” (e.g. Diderichsen 1946): Disregarding conjunctions, this word order always displays the subject in first position, then adverbials (if any are present), pushing the finite Verb to *third* position (Subject > Adverb > Verb). However, despite traditional terminology, subclauses in mainland Scandinavian do in fact regularly occur with V2 word order, which is thus an instance of MCP in these languages. It is an ongoing discussion whether this should primarily be seen as (sociolinguistic) variation or as coding of linguistic content, but as is the case for variationist studies in general, we consider it an empirical question to which degree word order in subclauses is conditioned by social or linguistic factors (see Jensen and Christensen 2013). In this article, however, we focus on the latter.

A diagnostic of word order in Danish is, then, the relative position of finite verb and sentence adverbials (compare examples 1 and 2).

Det er også en af grundene til

(1) *at vi tør* ***næsten ikke*** *flytte* (Verb > Adverb)

that we dare almost not move

(2) *at vi* ***næsten ikke*** *tør flytte* (Adverb > Verb)

that we almost not dare move

‘That is also one of the reasons that we almost dare not move’

In order to avoid the muddling of word order and syntactic level inherent in traditional terminology, we will refer to the two word orders as Verb > Adverb (”main clause word order”) and Adverb > Verb (”subclause word order”) in the remainder of this article. It should be noted that it is only possible to distinguish the two word orders when there is a sentence adverbial or a negation present. In all other instances (where the first position is occupied by the subject, which is by far most frequent), the word order cannot be determined.

Since Andersson (1975), based on Teleman (1967), discussed the semantics and syntax of Verb > Adverb word order in Swedish, several studies have examined it as a type of MCP in Mainland Scandinavian subclauses (e.g. Julien 2007; Wiklund et al. 2009; Bentzen 2010; Jensen and Christensen 2013). Two main strands of research can be identified (see also the discussion in Cristofaro 2005: 34–35). One relates the occurrence of Verb > Adverb order to assertivity, where studies can be placed on a spectrum that ranges from ascribing to it the illocutionary force of a statement (Andersson 1975: 22; Julien 2007: 107)[1] to merely attributing it with ”constative potential” (Julien 2007; Hansen and Heltoft 2011). The other strand relates Verb > Adverb order to what has been termed the ”main point of the utterance” (Simons 2007; Wiklund et al. 2009), ”discourse

[1] Andersson explicitly distinguishes between statements attributed to the speaker and those attributed to someone else (i.e. reported speech).

prominence" (Boye and Harder 2007) or "foregrounding" (Jensen and Christensen 2013), i.e. that the subclause contains information that is construed by the speaker as relatively more important than the content of the concurrent matrix clause. More precisely, this could be described as Verb > Adverb coding the subclause as "focus domain" (Hansen and Heltoft 2011: 1731) of the complex clause, i.e. it is the focus constituent, or the focus constituent is a part of it. Note that the alternative word order, Adverb > Verb, is not restricted to featuring less important or backgrounded information, which entails that there is a skewed relation between the two word orders where one is more restricted in use than the other.

To illustrate the difference between a foregrounded and a backgrounded subclause, consider the dialogues in (3–4), based on Simons (2007: 1036). The same subclause can constitute the main point of the utterance—i.e., be foregrounded—in one context (3), and in another express backgrounded information (4). Note that we do not equate backgrounded information with logico-semantic presupposition (cf. Cristofaro 2005) since some instances of logically presupposed subclauses may constitute foreground information. For this reason, our examples in (3–4) are phrased with semi-factive verbs that allow for both readings, but see Jensen and Christensen (2013) for further discussion.

(3) a. *Where has Louise been off to?*

b. *Henry discovered <u>that she was with Bill last night</u>.*

(4) a. *What is bothering Henry so about Louise?*

b. *He discovered that she was with Bill last night.*

In the absence of coded signals of foregrounding (such as Verb > Adverb word order in Danish), addressees must take other features of the context into account in order to arrive at an interpretation of what serves as foregrounded information.

Overall, production data support the foregrounding hypothesis over the assertivity hypothesis (Wiklund et al. 2009; Bentzen 2010; Jensen and Christensen 2013; Christensen et al. 2015; Christensen and Jensen 2015; but see Julien 2007). So far, however, there is no research on the *perception* of subclause word order (here disregarding studies based on introspective evidence). Given the reasonable premise that foregrounded elements attract more attention by the hearer or reader, addressees would be expected to pay more attention to subclauses with Verb > Adverb word order than to those with Adverb > Verb word order.

In this article, we report on an experiment testing this hypothesis. We have implemented an approach developed for psycholinguistic studies that belongs to the so-called text change paradigm (see below). Section 2 gives more detail on the two word orders tested in this study, i.e. Danish subordinate clauses with Verb > Adverb respectively Adverb > Verb word order. Section 3 presents the text change paradigm and Section 4 the experiment itself. In Sections 5 and 6, we summarize and discuss the results, followed by a short conclusion in Section 7.

2 Word order in Danish subordinate clauses

For the purposes of this article, we define ”main clause” word order as cases where sentence adverbials (e.g. *måske* ‘maybe’, *desværre* ‘unfortunately’) or negations (*ikke* ‘not’, *aldrig* ‘never’) are placed after the finite verb (Verb > Adverb), whereas ”subclause” word order always features them before the finite verb (Adverb > Verb). Previous studies have found that Verb > Adverb word order occurs most frequently in complement clauses (5) and *fordi* ‘because’ clauses (6), but may also be found in (other) adverbial clauses (7) and relative clauses (8), although fairly infrequently (examples in (5–8) stem from the LANCHART corpus of modern spoken Danish; Gregersen 2009; www.lanchart.hum.ku.dk).

(5) *så vidste jeg jo bare at der var* ***ikke*** *noget mellem*
then knew I of-course just that there was not something between
ham og hende
him and her
’then of course I just knew that there was nothing between him and her’

(6) *det kan jeg ikke forstå fordi jeg ville* ***hellere*** *blive sammen*
that can I not understand because I would rather stay together
med mine kollegaer
with my colleagues
’I don’t understand that because I would rather stay with my colleagues’

(7) *det var lidt anderledes når han var* ***ikke*** *hjemme*

it was slightly different when he was not home

'it was slightly different when he was not at home'

(8) *så der var ret mange vogne der var* ***lige*** *ude at køre*

so there were quite many cars that were just out to drive

lidt døgnplejekørsel hver dag jo

a-little 24-hour-care-transport every day in-fact

'so there were quite a few cars that would sneak in a little 24-hour care transport every day in fact'

In comparison with MCP in English subclauses, which involve substantial structural deviations from regular subclauses, the two Danish subclause variants differ in a less noticeable way. Compare example (5) above with the constructed variant using Adverb > Verb word order, here given as (9.a) and (9.b), where the only difference is in the relative position of finite verb and negation: No extra material is added to the clause (in distinction to tag questions in English), and the constituent initiating the clause remains the same (in distinction to Negative Constituent Preposing and Left Dislocation; see examples above):

(9.a) *så vidste jeg jo bare at der var* ***ikke*** *noget…*

that there was not something…

(9.b) *at der* ***ikke*** *var noget…*

that there not was something…

'then of course I just knew that there was nothing…'

A range of linguistic factors restrict the occurrence of Verb > Adverb word order in Danish subclauses (Hansen and Heltoft 2011: 1651–1656, 1683–1687; Jensen and Christensen 2013; Christensen and Jensen 2015; Christensen et al. 2015). In this article, we focus on complement clauses, where an important predictor is the matrix clause predicate allowing for or requiring a clausal argument. Where communicative predicates (e.g. *sige* 'say', *fortælle* 'tell') have a very high tendency for Verb > Adverb and factive predicates (e.g. *fortryde* 'regret' and *være mærkelig* 'be strange') have a very low such tendency, semifactive predicates are open to both word orders (Hooper and Thompson 1973; Jensen and Christensen 2013). Semifactive predicates typically refer to a cognitive transition, namely the acquisition of knowledge (e.g. *indse* 'realize' and *få at vide* 'learn'). Contrary to most traditional descriptions (with the notable exception of Glismann 1978), Simons (2007) demonstrates that complements of semifactive predicates in declarative matrix clauses are not necessarily backgrounded. It is a matter of context (see example 3–4 above), where an essential cue in Danish—we argue—is in the word order of the subclause. The versatility of semifactive predicates is reflected in the results of Jensen and Christensen (2013), showing that they occur almost equally often with subclauses of either word order.

For this reason, we have chosen to test the foregrounding hypothesis against sentence complexes containing a semifactive predicate in the matrix clause: Here, hearers/readers (from now on called *comprehenders* in line with psycholinguistic tradition) should not be disposed to either a foreground or a background interpretation of the subclause solely as an effect of the matrix clause predicate. In other words, we are trying to isolate the effect of word order and control for as many intervening factors of the context as possible.

In addition, we have included a set of test items where the word order opposition presumably carries little effect since the subclause is foregrounded anyhow. This is the case because the matrix clause in these items is semantically ”light”, i.e. it does not contribute to the propositional content. We refer to such matrix clauses as *semantically secondary*, and they can be subdivided into two types. One type merely presents the subclause, as in (10).

(10) *der er noget med man må ikke bære noget når i*
there is something with you can not carry anything when in
p- på sabbatt-en
d- during Sabbath-DEF
‘there is something like you cannot carry anything during the Sabbath’

The other type modifies the content of the subclause, and belongs to the type of clause that Thompson and Mulac (1991a, b) call an ”epistemic parenthetical” (e.g. *I think*). In their view, an epistemic parenthetical is not a real matrix clause and the ”subclause” likewise not actually subordinate. While that may hold in some cases, Danish data caution against generalizing this claim too far: Even the most straight-forward epistemic parenthetical (with a first-person subject and an epistemic predicate in the simple, present tense) licenses (and can be found with) subclauses with Adverb > Verb word order; i.e. the canonical subclause word order (11).

(11) *og jeg tror han* ***kun*** *var tretten*

and I think he only was thirteen

’and I think he was just thirteen years old’

Since Adverb > Verb word order never occurs in declarative main clauses, it is impossible to argue that examples like (11) constitute a main clause, *han var kun tretten*, with an added epistemic parenthetical that functions as an adverbial.

Furthermore, epistemic parenthetical clauses often occur with the complementizer *at* ‘that’ initiating the accompanying clause. It is thus warranted by empirical results from Danish to analyze the sentence complex as consisting of a matrix clause and a subclause, just as tradition would have it.

Subclauses under semantically secondary matrix clauses have been found to occur with Verb > Adverb order in 79% of the cases in production data (Jensen and Christensen 2013)[2]. Based on these findings, we expect comprehenders to interpret such subclauses as foregrounded.

To sum up, three hypotheses are tested in this study. Hypothesis 1 states that subclauses with Verb > Adverb word order (”main clause” word order) attract more attention than subclauses with Adverb > Verb word order, because Verb > Adverb functions as a foregrounder in subclauses. Hypothesis 2 states that matrix clauses that are semantically secondary divert attention to their subclauses, regardless of word order. Consequently, Hypothesis 3 states that the word order distinction under study has a smaller effect in subclauses under semantically secondary matrix clauses than in those under semifactive predicates.

3 The text change paradigm

Work on discourse processing suggests that comprehenders economize their processing resources aiming just to achieve what Ferreira et al. (2002) call *good enough representations*. What is ”good enough” depends on the situation, and information that is somehow judged more important will be processed more thoroughly (Sturt et al. 2004).

[2] Three criteria were used to code for semantically secondary status: 1. position (after the subclause), 2. raising (an adverbial belonging to the subclause is found in the matrix clause), 3. simple, present tense predicate and a 1sg subject without any further qualifications, and with nothing in the preceding or following context suggesting that the matrix clause was otherwise foregrounded. Each can occur independently of the others.

This entails that different parts of the discourse are processed to different degrees according to the comprehender's attention to them (Sanford et al. 2006).

One way to test attention is by using the text change paradigm. The advantage of this technique is that it tests comprehenders' attention to changes occurring in discourse during sentence processing and has been shown to be sensitive to different types of discourse prominence markers. The paradigm is based on testing visual attention, and it exploits the psychological phenomenon coined *change blindness* (Sturt et al. 2004). Change blindness means that we are disinclined to notice change to already processed information because we are unattentive to it. Our selective attention is by default set on the foreground (e.g. of a scenery), and we are thus less attentive to changes concerning the background. Highlighting background information will consequently reduce change blindness (Sanford et al. 2006). Sturt et al. (2004) have developed the text change paradigm in which change blindness in written discourse is tested: Participants are required to read short pieces of discourse that are presented and shortly after re-presented to them, sometimes with a specific change made to part of the discourse. Participants are then required to complete tasks regarding detection, identification and recall of the change.

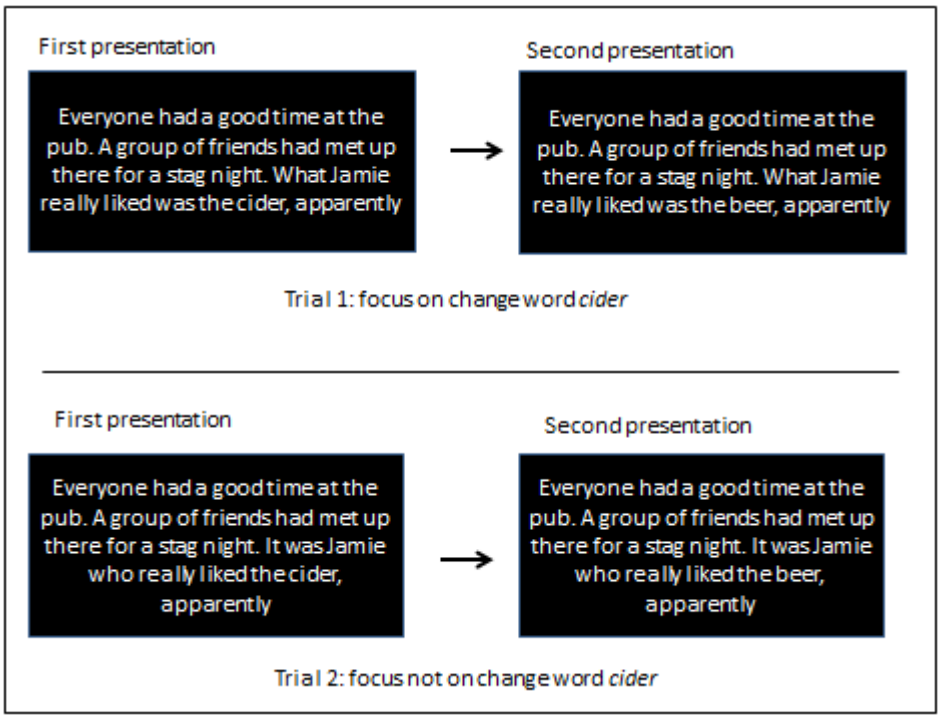

Figure 1. Illustration of the procedure of the text change paradigm used by Sturt et al. (2004). Please note that this illustration is based on Sturt et al. (2004), and that the examples on the screens are examples from that article. Their experiment tested whether participants noticed that *cider* had been replaced by *beer* in the second presentation. Participants noticed the change significantly more often when the focus was on *cider* (trial 1) than when the focus was on another constituent, in this case *Jamie* (trial 2) (Sturt et al. 2004)

The degree of correctness in the responses is influenced by a number of linguistic and cognitive factors, including the age of the comprehender (Price 2008) as well as sentential complexity (Sanford et al. 2005). Linguistic factors that highlight parts of the discourse or capture the attention of the comprehender (Sanford et al. 2006) have been found to influence change blindness in particular. Factors tested using the text change paradigm include clefting, the semantic distance between *change words* (Sturt et al. 2004), narrow focus (Sturt et al. 2004), highlighting through italicization (Sanford et al.

2006) and the discourse prominence of lexical words compared to grammatical words[3] (Christensen 2015). The studies show that these linguistic factors reduce change blindness, suggesting that discourse under the scope of attention-capturing devices is processed fuller and more deeply than discourse not under such a scope (Sanford et al. 2006). This makes the testing paradigm relevant for the above-mentioned hypotheses regarding subclause word order. If Verb > Adverb is a foregrounding cue, we expect Verb > Adverb subclauses to cause less change blindness than Adverb > Verb subclauses. Thus, this paradigm offers insight into sentence processing and attention organization mirroring that of discourse organization (by means of focus, foregrounding etc.) and can be used to evaluate whether Verb > Adverb word order cues foregrounding in sentence processing.

4 Experiment

The experiment compared the level of change blindness in constructions with different word orders in the subclause, replicating in design that of Sturt et al. (2004), Sanford et al. (2006) and Christensen (2015), but testing other factors. As detailed above, the aim was to establish whether Verb > Adverb word order reduces change blindness and whether this holds for subclauses of both semifactive and semantically secondary predicates.

[3] Grammatical words are assumed to be discursively secondary (Boye and Harder 2012) and were found to increase change blindness when chosen as change words.

4.1 Design and material

A two-by-two factorial design was employed to test word order and predicate type. Predicate type was manipulated by using items with either a semifactive or a semantically secondary matrix clause, half of each. Within these two sets, word order was manipulated so that every item had one version with Verb > Adverb order and another with Adverb > Verb word order (the change word was always the same in each item irrespective of the word order). No participant was presented with both versions of the same item.

The items were presented twice to the participants:

First presentation:

Så tænkte jeg at det ikke skulle være ***det*** *job alligevel hvis det skulle være på den måde*

'Then I thought that it would not be **that** job anyhow if those were the terms'

Second presentation:

Så tænkte jeg at det ikke skulle være ***mit*** *job alligevel hvis det skulle være på den måde*

'Then I thought that it would not be **my** job anyhow if those were the terms'

In the second presentation a word in the subclause has been replaced (*det* 'it' → *mit* 'my' in the example). The change word is always placed after the adverb of the subclause, ensuring that the cue for foregrounding, Verb > Adverb, is manifest prior to the changed word in the direction of reading (cf. Figure 2).

Two tasks concerning change blindness were tested: the ability to notice change (*change detection*) and the ability to retrieve the original word displayed in the first presentation (*original word retrieval*). The material was presented on computers using the software *PsychoPy* (Peirce 2007) to present and log responses. The experiment began with an oral instruction followed by five practice trials, followed by 60 trials constituting the experiment proper. Each trial began with a fixation cross displayed on the screen for one second followed by the stimulus (cf. Figure 2). The first presentation of each sentence was displayed on the screen in white Times New Roman letters on a black screen and lasted for 5 seconds. This was followed by a fixation cross displayed for 2,5 seconds, then by the second presentation, also on a black screen but in yellow letters. Participants were instructed to press the key *1* if they detected a change and the key *0* if they judged the two presentations to be identical. If participants reported a change, they were requested to type the word that had been changed, i.e the original word from the first presentation. The responses for the two tasks, change detection and original word retrieval, were logged separately. To check that participants read for comprehension rather than memorising, every sixth trial was followed by a comprehension question. The participants were told that the aim of the study was to test comprehension under stress of word recollection. This was done to further encourage a comprehension reading strategy.

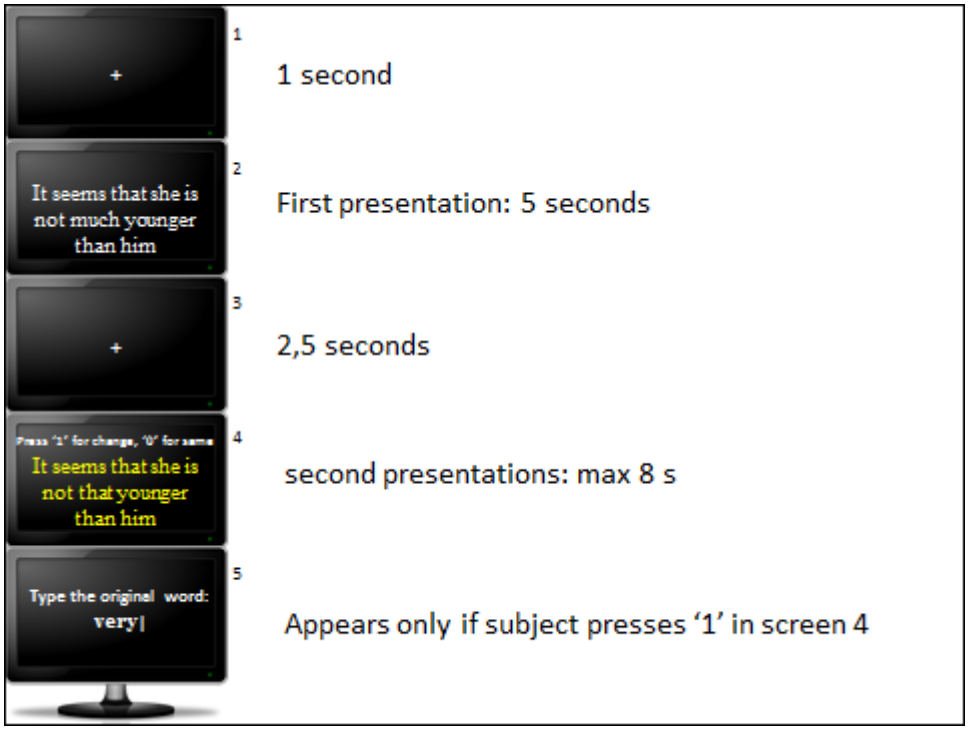

Figure 2. The procedure of a trial. Note that the texts shown in the example screen in this figure are not actual stimuli of the experiment but just serve as an illustration.

The test material consists of 24 experimental items in total (cf. Appendix for a list of all experimental items). 12 of the items contains semifactive matrix predicates and 12 contains semantically secondary matrix clauses. As mentioned, each item exists in a version with Verb > Adverb word order and a version with Adverb > Verb word order. All items were constructed based on transcriptions of original utterances found in the LANCHART corpus (cf. Figure 3).

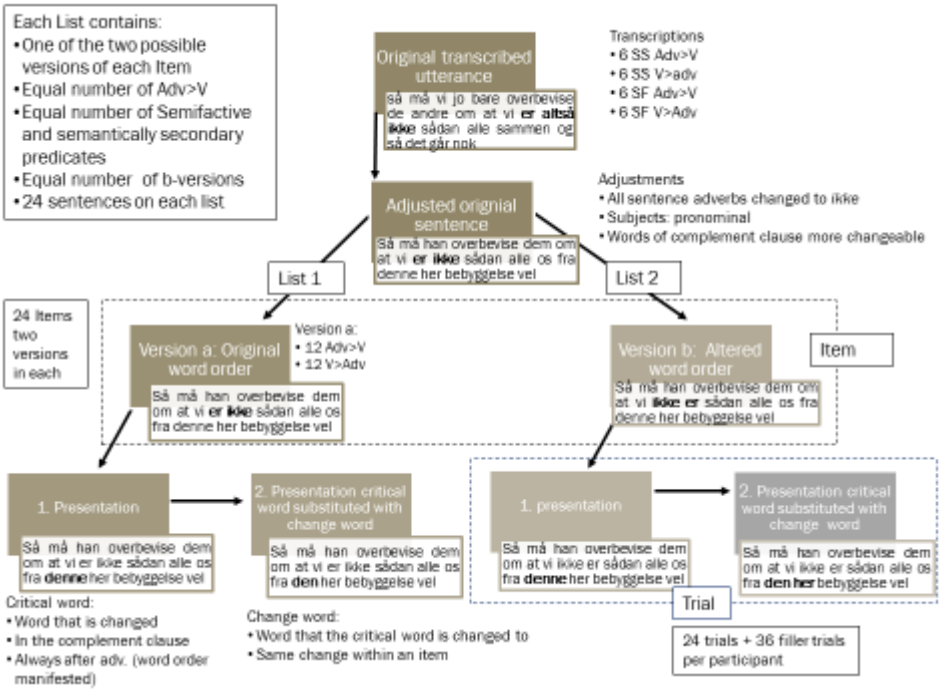

Figure 3. Flow-chart of the item construction. Participants completed either list 1 or list 2. The original transcribed utterance translates into 'then we just have to convince the others that we really aren't like that all of us and it will be alright'.

All the original utterances contained a subclause with a sentence adverbial present. To justify that the word orders used in the experiment were in fact possible in actual usage, half of the original utterances were Adverb > Verb and the other Verb > Adverb.

None of the utterances included complement clauses with non-subjects in the first position, non-finite complements, *hv-* 'wh'-clauses or *om* 'if/whether'-clauses. To control for factors previously shown to have an impact on the distribution of word order (Jensen and Christensen 2013), the items were modified by adding the complementizer *at* ('that') (when originally absent), by modifying the subject of the complement to a definite pronoun, by removing all adverbs from the matrix sentence, and by replacing sentence adverbs in the complement with the negation *ikke*. To ensure that sentences were long

enough to produce change blindness, but short enough to avoid fatigue, some of the item sentences were shortened and some had extra words added (while maintaining meaningful utterances). To avoid learning effects as well as to maintain a diverse item population, none of the sentences were of equal length and any difference in clause complexity was maintained.

The material was presented visually, i.e. in written mode, in order to avoid possible intervening phonetic variables (e.g. intonation) that we cannot control adequately for in constructing test items. Since items were constructed on the basis of speech data from the LANCHART database and therefore contain many features specific to spoken language, participants were instructed to regard the stimulus sentences as pieces of dialogue. We will return to this in the discussion.

The items were tested using a between-subjects design, which entails that no participant (test subject) encounters the same item in both versions (i.e. with both word orders). The different versions were therefore divided into two lists, balancing word order and predicate type. List 1 was presented to half of the participants and list 2 to the other half, with items presented in random order. Consequently, all participants read twelve constructions with semifactive predicates: six with a subclause of Adverb > Verb word order and six with one of Verb > Adverb word order, as well as twelve constructions with semantically secondary matrix clauses, again with six subclauses of each word order. 36 filler sentences were added to each list, containing either a change in the matrix clause or no change at all. All filler sentences were subclause constructions but none of them

contained semantically secondary or semifactive predicates. The filler sentences were also based on actual utterances from the LANCHART corpus.

4.2 Participants

59 students from the University of Copenhagen took part in the experiment. All were native speakers of Danish and all self-reported as neurotypical, under the age of 30, and having no reading, vision or hearing impairment. The students were recruited from non-language study programs (i.e. excluding Danish, German, Linguistics etc.).

4.3 Data analysis

The results of the experiment were analyzed using logistic mixed-effects regression (Baayen 2008; Tagliamonte and Baayen 2012). The two different, though related, dependent variables, change detection and original word retrieval, were analyzed separately in regression models including a range of independent variables (predictors) related to the participants and the stimuli. These included the two hypothesis-driven variables *PredicateType* (Semifactive vs. Semantically secondary) and *WordOrder* (Adverb > Verb vs. Verb > Adverb) that the experiment was designed to test. In addition, a number of variables were included to control statistically for factors that could not be held constant by the experimental design even though they might be expected to affect the dependent variables. These control variables were *Order* (i.e. the order, 0–59, in which the item in question was presented for the participant in the experiment; to control for a learning or fatigue effect), *List* (1 vs. 2, i.e. which of the two lists were presented for the participant), *Gender* of participant (Female vs. Male) and *Handedness* of participant

(Right vs. Left; controlling for the possibility that the one or the other type might have an advantage due to the technical setup). Two further variables were added in order to control for the possible effects of differences in noticeability between the original words and the change words in the item sentences (i.e. that a change is easier to detect in some item sentences than in others because the change word is either longer or less frequent than the original word): *Relative length*, operationalized as log(length word in condition 1/length replacement in condition 2), and *Relative frequency*, operationalized as log(frequency word in condition 1 / frequency replacement in condition 2).[4] We also assessed two possible interactions between the variables: PredicateType by WordOrder (i.e. whether the effect of word order, as expected, is affected by the matrix predicate) and List by Order (i.e. whether the effect of the order of presentation is different for the two lists).

It is very likely that the items vary with respect to ease of change detection and original word retrieval in a way that is not related to the variables MatrixPredicate and WordOrder (and not controlled by the variables Relative length and Relative frequency either). For instance, aspects of the specific lexical material (including differences in the relative markedness of the change words not related to relative length or frequency) and the syntactic constructions are likely to make it easier to detect change in some items

[4] Length was defined as number of letters. Frequency was defined as the frequency of the given word in KorpusDK, the reference corpus of modern written Danish comprising texts from a range of different sources from the period 1983–2002, in total 56 million words (www.ordnet.dk/korpusdk_en). Only tokens of the specific word form occurring in the item sentence were counted, and only forms with the same function as in the item clause (based on the automatic part of speech tagging of KorpusDK).

than in others. Likewise, it is probable that some participants are better at detecting change and/or retrieving original words than others, irrespective of their gender and handedness.

Such differences are impossible to avoid completely in practice, and we therefore aimed at controlling for them statistically by employing mixed models analyses. Mixed model regressions make it possible to take random variation between items and participants into account by including these variables (*Item* and *Participant*) as random effects. The model thus assigns a baseline mean (called an intercept) to each participant and item with respect to the dependent variable. Addition of by-subject (Participant) random slopes for WordOrder and PredicateType did not improve the model fit, and these were therefore not included in the final models.

Through analysis and comparison of possible models and the use of model criticism (Baayen 2008), we reached the models which most accurately predict the variation in the data given the variables included in this study.[5]

Before the analysis, we inspected the overall performance of the individual participants with respect to the dependent variables (i.e. mean ChangeDetection and OriginalWordRetrieval irrespective of predicate type and word order). Based on this, four participants were excluded from the analysis due to an exceptionally bad performance: less than 13% correct change detections, compared to the mean of 43%, and/or less than 9% correct original word retrievals, compared to the mean of 30%. One participant

[5] We used the *glmer*-function in R, version 3.4.0, Package *lme4* version 1.1-13.

was excluded due to an exceptionally good performance, 83% correct change identifications and 75% original word retrievals. Furthermore, one participant was excluded because she was a student of English who had been included in the experiment by a mistake. Leaving these six participants out, the regression analyses were based on the data of 53 participants.

5 Results

The best model for *change detection* is shown in Table 1 and the partial effects in Figure 4.[6] Order, List, Gender, Handedness and Relative frequency were not statistically significant; the only significant main effects were PredicateType and WordOrder, which also displayed a significant interaction, and relative length (RelLength).

Table 1. Best model for change detection

	Estimate	Std. error	Z value	P
Intercept	-0.6373	0.3000	-2.124	0.0337
PredicateType: semantically secondary	1.0358	0.3865	2.680	0.0074
WordOrder: Verb>Adv	0.3662	0.1837	1.993	0.0463
RelLength, i.e. log(length word in condition 1/length replacement condition 2)	-1.2095	0.4746	-2.548	0.0108
PredicateType: semantically secondary by WordOrder: Verb>Adv	-0.6414	0.2532	-2.533	0.0113
Number of obs: 1272; Participant: 53; Item: 24				

[6] The plot is made with the *plotLMER.fnc*-function in R, version 3.4.0, Package *languageR* version 1.4.1.

Random intercepts:
Participant: Variance 0.1331; Std.Dev. 0.3648
Item: Variance 0.5372; Std.Dev. 0.7330
The goodness of fit of the model is acceptable with a concordance statistic C of 0.78

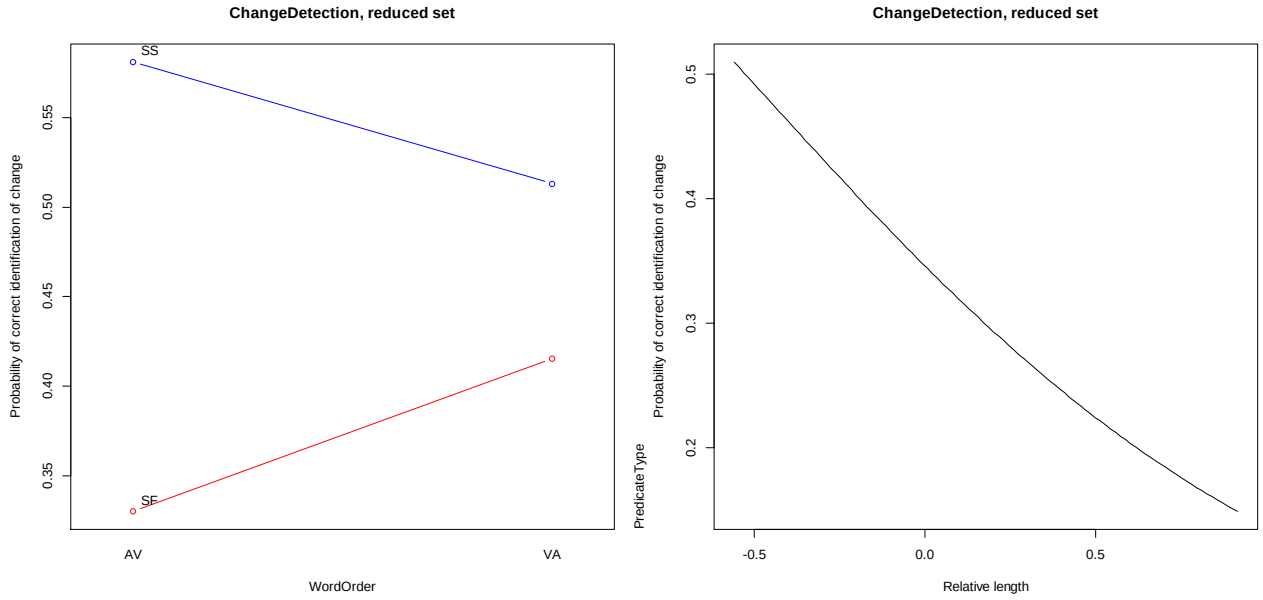

Figure 4. Partial effects, change detection.
SS: semantically secondary matrix predicate; SF: semifactive matrix predicate.

For subclauses under *semifactive* predicates, the effect of word order is that Verb > Adverb word order in the subclause increases the probability of change detection (p=0.0463). This supports the hypothesis that Verb > Adverb word order foregrounds the subclause in relation to its matrix clause.

For subclauses under *semantically secondary* predicates, there is no statistically significant difference between Adverb > Verb and Verb > Adverb word order (p=0.1139)[7].

[7] This p-value is obtained by choosing semantically secondary instead of semifactive as the default level for predicate type.

This is also in accordance with our hypothesis; Verb > Adverb word order is only expected to have a positive effect on attention under semifactive predicates, because subclauses under semantically secondary predicates are constructionally foregrounded irrespective of the word order.

Finally, the results confirm that the participants are more likely to detect a change in subclauses when the matrix predicate is semantically secondary (and the subclause hence semantically primary) than when the predicate is semifactive. As expected, the effect of matrix predicate type effect interacts with the effect of the word order of the subclause, and the difference between the two types of matrix predicates is smaller for subclauses with Verb > Adverb word order. Thus, the difference between the two predicate types is statistically significant only for Adverb > Verb word order (Adverb > Verb: p=0.0074; Verb > Adverb: p=0.3052[8]). The results support the hypothesis that the subclause under semantically secondary predicates is constructionally foregrounded.

The effect of RelLength shows that the participants are more likely to detect a change the longer the change word is in comparison with the original word.

The best model for *original word retrieval* is shown in Table 2, and the partial effects in Figure 5. As in the case of change detection, the factors Order, List, Gender, Handedness and Relative Frequency were not significant; RelLength and PredicateType were significant as main effects, while WordOrder entered the model via the interaction with PredicateType.

[8] This p-value is obtained by choosing Verb>Adv instead of Adv>Verb as the default level for WordOrder.

Table 2: Best model for original word retrieval

	Estimate	Std. error	Z value	P
Intercept	-1.6615	0.4346	-3.823	0.0001
PredicateType: semantically secondary	1.4536	0.5489	2.648	0.0081
WordOrder: Verb>Adv	0.2502	0.2281	1.097	0.2727
RelLength, i.e. log(length word in condition 1/length replacement condition 2)	-1.4224	0.6892	-2.064	0.0390
PredicateType: semantically secondary by WordOrder: Verb>Adv	-0.6846	0.2952	-2.319	0.0204
Number of obs: 1272; Participant: 53; Item: 24 Random intercepts: Participant: Variance 0.340; Std.Dev. 0.5831 Item: Variance 1.179; Std.Dev. 1.0860 The goodness of fit of the model is acceptable with a concordance statistic C of 0.85				

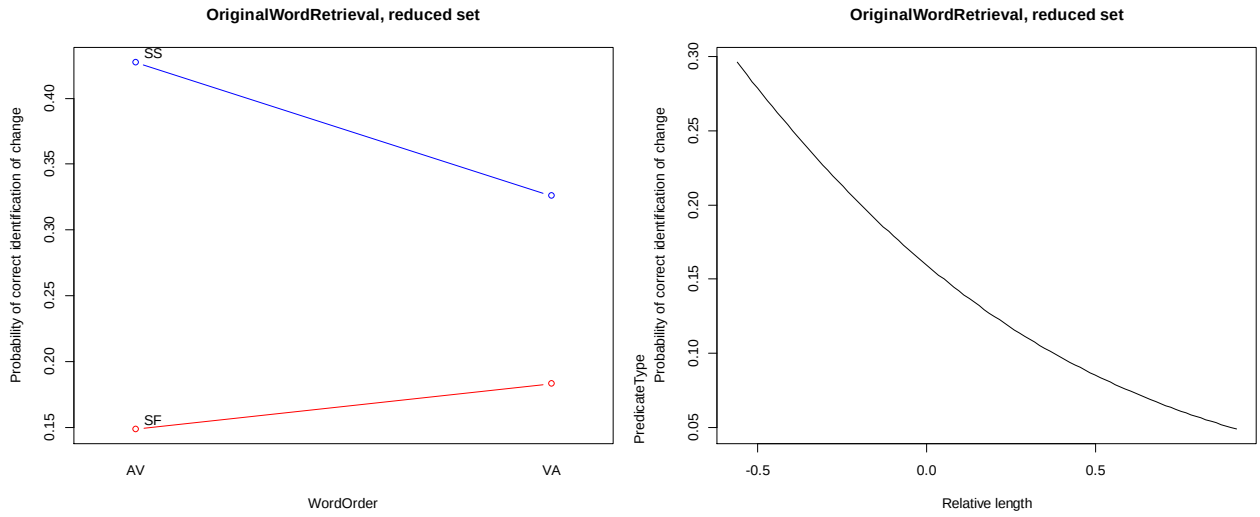

Figure 5. Partial effects, original word retrieval.

SS: semantically secondary matrix predicate; SF: semifactive matrix predicate.

The partial effects of PredicateType, WordOrder and RelLength are similar to the ones for change detection, although the proportions of correct responses are generally much lower: For change detection, the average proportion of correct responses is 44%, while it is only 30% for word retrieval.

Again, as in the case of change detection, semantically secondary matrix clauses increase the probability of correct retrieval compared to semifactive ones. The difference between semantically secondary and semifactive predicates is also here largest in the case of Adverb > Verb word order, and the effect of predicate type is only statistically significant in subclauses with Adverb > Verb word order (Adverb > Verb: p=0.0081; Verb > Adverb: p=0.2728).

With respect to the effect of word order, the tendencies are also the same as for change detection: Under semifactive predicates, Verb > Adverb word order increases the probability of correct retrieval as expected from the foregrounding hypothesis (though not statistically significant: p=0.2727), while there is a reverse effect under semantically secondary predicates (p=0.0205).

6 Discussion

Our results clearly show that Verb > Adverb (“main clause”) word order affects readers’ attention to changes made in the subclause in semifactive constructions as expected from our hypothesis. This means that the text-change design is demonstrably sensitive to word order alternations in the subclause. In accordance with other studies using this

design (cf. Sanford et al. 2006), we attribute this result to the attention-capturing properties of our dependent variable, i.e. of Verb > Adverb as compared to Adverb > Verb word order. The fact that word order functions as an attention capturer in processing corresponds to the idea of Verb > Adverb being a foregrounder. As such, it marks the content of the subclause as the important part of the sentence complex, as proposed by Jensen and Christensen (2013) based on corpus studies of observational data. We consider it a perfectly reasonable assumption that a cue that signals importance from a discourse organizing point of view, will also capture attention from a processing point of view. This leads us to conclude that the results of this study present psycholinguistic evidence for the foregrounding hypothesis.

We hasten to add that the experiment was not designed to test the competing assertivity hypothesis, and our results therefore in no way preclude that Verb > Adverb order may also be used to express assertive speech acts (or attribute subclauses with "constative potential"), nor, of course, quotes of such speech acts.

This study can further qualify the nature of the attention-capturing properties. Our results show that the tendency of Verb > Adverb word order to reduce change blindness is weaker in the task of retrieving the original word than in the task of noticing the change. This suggests that word order is used as a cue to monitor the subclause and not necessarily an aid in working memory for retrieval.

In addition, the results regarding semantically secondary matrix clauses align with other studies in showing that foregrounding by other means than word order also reduce

change blindness. Aside from demonstrating that the text change paradigm is sensitive to construction type (which resonates with the findings from Sturt et al. (2004)), this lends support to the idea that information interpreted as important by the reader is monitored more closely and processed more thoroughly than information assumed less important.

In sum, two out of the three hypotheses posed were confirmed. We were *not* able to confirm the hypothesis regarding the effect of word order in subclauses under semantically secondary matrix clauses. This hypothesis stated that word order would not affect change blindness in such subclauses because—being counterparts to semantically secondary matrix clauses—they would themselves be interpreted as semantically primary and therefore already foregrounded. Instead, we found a tendency for *Adverb > Verb* word order to reduce change blindness (i.e. a reverse effect compared to semifactive predicates), which was statistically significant in the task of original word retrieval but not in change detection. Let us briefly consider this in the light of a competing hypothesis of distributional markedness: If the expected word order in subclauses under semantically secondary matrix clauses is Verb > Adverb (because the subclause contains the primary information), informants would likely notice the opposite word order more in this context. Would this then mean that the findings for semifactive subclauses similarly reflect informants' perception of Verb > Adverb order as unusual in that context? We do not believe this to be the case: Production data clearly show that Verb > Adverb order is not at all unusual in semifactive subclauses in spoken Danish (cf. Section 2). If one were to counter that items in this study were presented in a written

format (and that Verb > Adverb in written Danish probably is infrequent also in semifactive subclauses), that is true but it should then affect results for semantically secondary subclauses equally: In written Danish, the prevalent word order in any subclause is Adverb > Verb, which means that we should not find reduced change blindness for this word order. So, unless informant somehow read subclauses under semifactive matrix clauses as examples of written language while simultaneously reading subclauses under semantically secondary matrix clauses as instances of spoken language, the markedness hypothesis does not explain the combined results of this study.

This leads us to the question of written versus spoken items in a study like this. Some informants reported that they found some test items difficult to read, apparently because they contain spoken language features that are not frequently represented in written Danish. It is obvious that it would be preferable to present items in spoken mode, since the observational studies on which our hypotheses are based concern Danish speech. However, constructing spoken test items entails a range of other complications. On a theoretical level, we simply do not know enough at present about how intonation affects foregrounding in Danish or even how it is generally related to the word order opposition under study. Related to this, but on a more practical level, it would either require very skilled speakers to record acceptable ("naturally-sounding") test items that vary only in word order, or we would have to manipulate word order by cutting and splicing sound files—which would certainly make the manipulated versions sound odd.

As a first step towards testing correlations between word order and attention, we have opted for a more readily implementable design, although we are fully aware of the limitations inherent therein. Further studies are needed to disentangle possible effects from using the written mode from those regarding spoken data.

Finally, we recruited highly skilled readers for this experiment (i.e., university students). Further studies will have to show whether reading, or indeed listening, skills affect sensitivity to attention capturing-devices such as word order.

7 Conclusion

We have presented the results of an experiment in Danish showing that readers notice changes made to subclauses with Verb > Adverb word order more often than to those displaying Adverb > Verb word order under matrix clauses with a semifactive predicate. This supports our hypothesis that Verb > Adverb word order functions as a foregrounder, not only in discourse organization but also in processing, where the foregrounding word order functions as an attention-capturing device. Additionally, our results show that "semantically secondary" matrix clauses have a similar foregrounding effect on subclauses. We do not find that the effect of word order in such constructionally foregrounded subclauses is readily interpretable. Further studies are needed to resolve this matter.

Appendix

Table of all sentences in list 1 (excluding fillers). Note that the word order is opposite in the corresponding sentences in list 2. The word that is changed is underlined. The word that the word is changed into in the second presentation is showed in the rightmost column.

	Pred.	First presentation	Change word
1	SF	*Til mødet forklarede han dem at han vidste ikke noget* At meeting-DEF explained he them that he knew not anything *om udnævnelsen <u>inden</u> han kiggede i* about nomination-DEF prior.to he looked in *telefonbogen* telephone.directory-DEF 'At the meeting he explained that he did not know anything about the nomination before he looked in the phone directory'	*før* 'before'
2	SS	*Men det har noget at gøre med at du ikke tager sådan* But that has something to do with that you not bring such *en temmelig lille fyr <u>med</u> i kirken når der er* a pretty small guy with in church-DEF when there is *begravelse vel* funeral right 'but that has to do with the fact that you do not take such a small kid with you to church during a funeral'	*ind* 'into'
3	SF	*Efterhånden har hun accepteret at jeg har ikke <u>nogen</u>* Eventually has she accepted that I have not any *forsikring til mine ældre dage hvis man kan sige detsådan* insurance for my older days if you could say it so 'By now she has accepted that I do not have any insurance for my older days so to speak'	*en* 'a'
4	SS	*Så tænkte jeg at det ikke skulle være <u>det</u> job alligevel* Then thought I that it not should be that job anyway *hvis det skulle være på den måde* if it should be in that way 'then I thought that it should not be that job anyway if that was what it	*mit* 'my'

		was like'	
5	SF	*Så må han overbevise dem om at vi ikke er* Then must he convince them about that we not are *sådan alle os fra <u>denne</u>her bebyggelse* like.that all us from this here building 'Then he will have to convince them that we are not like that all of us from this building'	*den* 'this'
6	SS	*Jeg kan godt mærke at jeg snakker ikke <u>specielt</u> meget* I can well feel that I speak not particularly much mindre jysk nu end jeg gjorde tidligere less Jutlandish now than I did previously 'I do feel that I do not speak particularly less Jutlandish now than I did before'	*særlig* 'particular'
7	SF	*Og pludselig gik det op for hende at jeg ikke* And suddenly went it up to her that I not *gik i skole og <u>sådan</u> noget men rendte rundt* went to school and and such some but ran around *og spiste is nede på Langelinie* and ate ice.cream down at Langelinie 'and suddenly she realized that I did not attend school and stuff but ran about eating ice cream at Langelinie'	*så* 'such'
8	SS	*Det kan være at det er ikke kommunens eller* It can be that it is not municipality-DEF-s or *min <u>genbos</u> eller hvem ved jeg men* my opposite.neighbor's or who know I but *min grund de har med at gøre* my property they have with to do 'It is possible that it is not the property of the municipality or of my neighbor opposite or of who knows who but my property which they are dealing with'	*nabos* 'neighbor's'
9	SF	*Han har gjort hende klart at han kan ikke klare <u>alle</u>* He has made her clear that he can not manage all *børnene og huset og ombygningen og det hele* children-DEF and house-DEF and renovation-DEF and it all *vel* right 'He has made it clear to her that he cannot manage all of the children and the house and the renovation and everything, right'	*begge* 'both'

10	SS	*Altså detkorte af detlange er at der ikke var søgt* So theshort of thelong is that there not was looked.for *kamerafolk til TV og film alligevel og nu søgte de* cameramen for tv and films anyway and now looked.for they to two 'well in short the thing is that they had not been looking for cameramen for tv and film before and now they were looking for two'	*allerede* 'already'
11	SF	*Altså på sidste lønseddel opdagede han at han var* So on last paycheck discovered he that he was *ikke steget de der omtrent halvtreds kroner i tillæg* not risen those there about fifty kroner in bonus *som han havde krav på* which he had demand on 'well on his last paycheck he discovered that he had not received that fifty kroner bonus that he was entitled to'	*cirka* 'around'
12	SS	*Og så var det sådan noget med at vi ikke kunne få afsat* And then was it such some with that we not could get sold *gården til den rigtige pris* farm-DEF for the right price 'And then it was something like we could not sell the farm for the right price'	*solgt* 'sold'
13	SF	*Det tog mange år for hende at indse at jeg ville ikke* It took many years for her to realize that I would not *vende tilbage til vores forhold nogensinde igen* return back to our relationship ever again 'It took her many years before she realized that I would not return to our relationship ever again'	*komme* 'come'
14	SS	*Jeg kunne forestille mig at personen ikke var ret meget* I could imagine me that person-DEF not was much more *yngre end den aldrende taler i lydprøve tre* younger than the older speaker in sound.sample three *fordi lyden er meget moden* because sound-DEF is very mature 'I could imagine that the person was not very much younger than the older speaker in sound sample number three because the sound is very mature'	*ældre* 'older'
15	SF	*Her den anden dag hørte han at de kan ikke afskedige*	*derindefra*

		Here the other day heard he that they can not lay.off *folk og sådan noget derudefra på grund af nogle* people and such some from.out.there on grounds of some *bestemte ting* specific things 'The other day he heard that they cannot lay off people and stuff like that from there because of some specific matters'	'from in there'
16	SS	*Og så ved jeg at de ikke er så hårde imod børn* And then know I that they not are so tough against children *men det kommer an på hvad de har stjålet* but it depends on what they have stolen 'And I know that they are not tough against children but it depends on what they have stolen'	*overfor* 'towards'
17	SF	*Og der kan hun jo forstå at vi ikke har ligget og* And there can she well understand that we not have lain and *grædt over at der ikke var nogen familie til vores* cried about that there not was any family at our *sølvbryllup vel* silver.wedding right 'and she must then understand that we have not been crying about the fact that there was not any family present at our silver wedding'	*siddet* 'sit'
18	SS	*Man skal tænke på at der er ikke varme med* You should think about that there is not heating included *i det hun betaler i husleje vel* in that she pays in rent right 'You have to consider that heating is not included in what she pays in rent right'	*han* 'he'
19	SF	*Og ret hurtigt viser det sig at hun ikke kan tåle* And pretty soon appears it REFL that she not can tolerate *hendes kat og skal tage piller og jeg ved ikke hvad* her cat and must take pills and I know not what 'And pretty soon it turns out that she is allergic to her cat and needs to take pills and what not'	*sin* 'her'
20	SS	*Men ellers vil jeg mene at jeg snakker ikke sådan særlig* But otherwise will I think that I speak not so very *anderledes end min faster der også er københavner* differently than my aunt who also is Copenhagener 'but besides from that I do feel that I do not speak very different from	*vores* 'our'

		my aunt who is also a Copenhagener'	
21	SF	*Men hun har fundet ud af at hun ikke har helt så* But she has found out of that she not has just as *nemt ved at læse og stave som Tommy* easy with to read and spell as Tommy 'But she has found out that reading and spelling does not come to her as easy as for Tommy'	*lige* 'just'
22	SS	*Nu har jeg det med at min dreng er ikke fyldt seks* Now have I it with that my boy is not turned six *år i indeværende skoleår vel så er han altså for* years in this schol.year right then is he really too lille small 'For me it is like my son is not yet six years this school year right, so he is simply too small'	*nuværende* 'this'
23	SF	*Min søster var jo kommet hjem og altså skulle* My sister was as.you.know returned home and so should *han vænne sig til at han ikke var den ældste længere og* he get.used REFL to that he not was the oldest anymore and *alt det her fis ikke* all this here crap right 'As you know my sister had returned and then he had to get used to the fact that he was not the oldest kid anymore and all that crap right'	*mere* 'any longer'
24	SS	*Nu vil jeg sige at jeg har ikke nogen intentioner* Now willI say that I have not any intentions *på nogen vis om at blande mig i det kunstneriske* in any way about to interfere REFL in the artistic 'Now I must stress that I have no intentions of interfering with the artistic matters in any ways'	*måde* 'way'

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