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Learning embedded verb placement in Norwegian: Evidence for early overgeneralization

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ABSTRACT

This article investigates how children acquire word order generalizations from ambiguous and infrequent input. We focus on verb placement in Norwegian relative and complement clauses. In two elicitation experiments we explore where children (age 3–7) place verbs in three embedded clauses types: one requiring a purely syntactic generalization and two requiring a semantic-pragmatic generalization. We find that children overgeneralize the main clause word order to embedded clauses. However, this happens with different probabilities across all three clause types. We take this to mean that children overgeneralize and that they entertain both coarse and fine-grained hypotheses simultaneously. We also suggest that children make use of frequency information, both in making initial hypotheses and when retracting from overgeneralization.

1. Introduction

Norwegian children must learn that Norwegian is an underlyingly SVO language that exhibits verb second (V2) word order in main clauses. V2 word order can be seen in (1a), where the verb *les* precedes the negation *ikkje* (henceforth V-Neg order). The opposite Neg-V order is never allowed (1b).[1]

(1) a. Vi *les* **ikkje** islandske soger kvar kveld
we read not Icelandic sagas every night
'We don't read Icelandic sagas every night.'

b. *Vi **ikkje** *les* islandske soger kvar kveld
we not read Icelandic sagas every night
'We don't read Icelandic sagas every night.'

Learning the appropriate position of the verb in main clauses, however, is not enough to attain adult-like command of verb position in all Norwegian clauses. Norwegian children must also learn that word order patterns differ in embedded clauses. Embedded clause word order follows two generalizations: First, in contrast to main clauses, Neg-V is the canonical order in embedded clauses in the adult grammar. This can be seen in relative clauses (2a) and embedded complement clauses (2b).

[1]For clarity, negation will be shown in bold in the examples throughout the text and the finite verb in italics.

(2) a. Dette　er　lærar-en　　　[som **ikkje** *les*　　islandske soger kvar　kveld]

　　　this　　is　teacher-DEF[who　not　　reads Icelandic sagas every　night]

　　　'This is the teacher who doesn't read Icelandic sagas every night.'

　b. Lærar-en　　　veit　　[at vi **ikkje** *les*　islandske soger kvar　kveld]

　　　teacher-DEF　knows [that we not　　read Icelandic sagas every　night]

　　　'The teacher knows that we don't read Icelandic sagas every night.'

The second generalization is that V-Neg order is optionally allowed in a restricted set of embedded clauses—most often complement clauses. For example, a clause embedded under the predicate *seie* 'say' allows both canonical Neg-V and V-Neg order, as shown in (3). Optional V-Neg is never allowed in relative clauses (4) or clauses embedded under factive matrix predicates like *angre på* 'regret' in (5) (Faarlund, Lie & Vannebo 1997; Franco 2010).
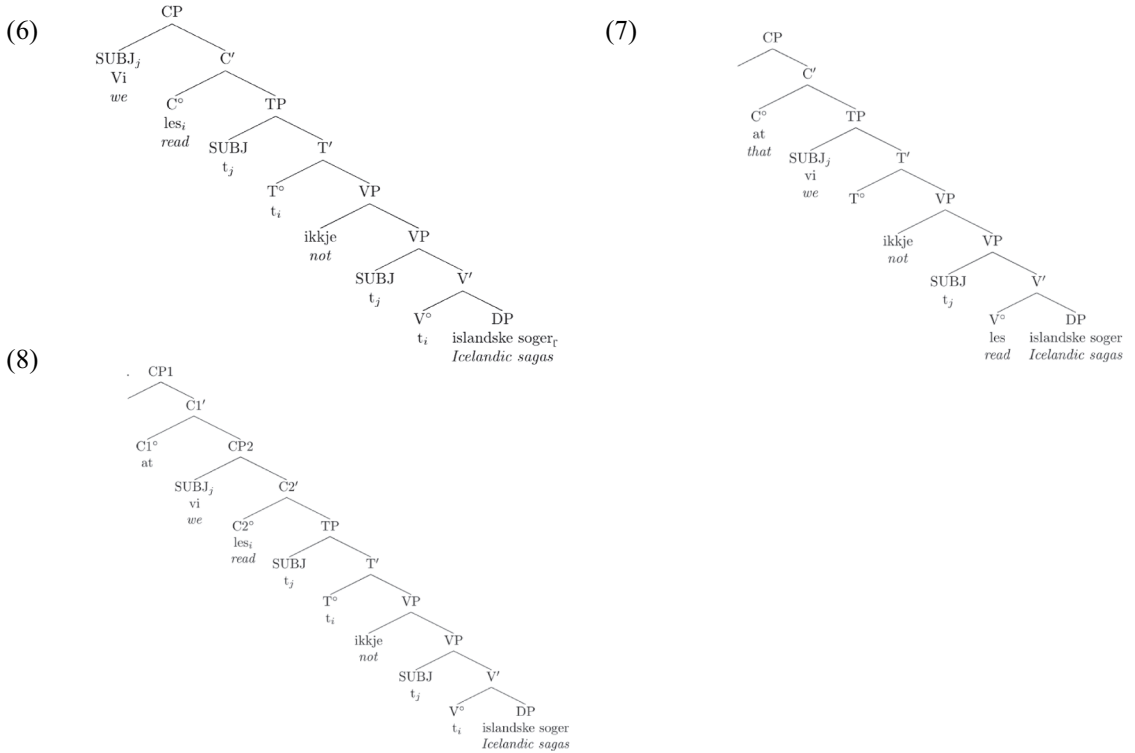
(3) a. Lærar-en　　　sa　　[at　vi **ikkje** *skulle* lese islandske soger]

　　　teacher-DEF　said [that we not　　　should read Icelandic　sagas]

　　　'The teacher said that we should not read Icelandic sagas.'

　b. Lærar-en　　　sa　　[at　vi *skulle* **ikkje** lese　islandske soger]

　　　teacher-DEF　said [that we should not　read　Icelandic sagas]

　　　'The teacher said that we should not read Icelandic sagas.'

(4) *Dette　er　lærar-en　　　[som *les*　　**ikkje** islandske soger kvar　kveld]

　　　this　　is　teacher-DEF [who reads not　　Icelandic sagas every　night]

　　　'This is the teacher who doesn't read Icelandic sagas every night.'

(5) *Lærar-en　　　angra　　på [at　vi *las*　**ikkje** islandske soger kvar　kveld]

　　　teacher-DEF　regretted　on [that we read not　　Icelandic sagas every　night]

　　　'The teacher regrets that we didn't read Icelandic sagas every night.'

The exact conditions that govern the availability of optional V-Neg order have proven difficult to formulate precisely, but they are generally agreed to be semantic/pragmatic in nature. In essence, embedded V-Neg is argued to be licensed either under an "assertive" matrix predicate or in an embedded clause that carries the main assertion or "main point of utterance" of the sentence (Heycock 2006; Bentzen et al. 2007; Wiklund et al. 2009; Franco 2010; Julien 2010). For the purposes of this article, we do not take a stand on the appropriate analysis of the phenomenon.

Mastery of the two aforementioned generalizations requires children to establish three distinct syntactic analyses of verb placement and their conditions of use: (i) an analysis for V2 main clauses, (ii) an analysis for canonical non-V2 embedded clauses, and (iii) an analysis for semantically/pragmatically conditioned embedded V-Neg. For concreteness, a sketch of these analyses is given in the following.

The V2, or V-Neg, word order in main clauses is typically argued to involve movement of the finite verb to C (see, e.g., Holmberg 2015), as illustrated in (6). As can be seen, we assume the standard analysis of negation in Scandinavian as placed directly above VP (e.g., Holmberg & Platzack 1995). The Neg-V order in embedded clauses is generally assumed not to involve movement of the finite verb to C: The verb stays in VP (see, e.g., Holmberg & Platzack 1995; Lohndal, Westergaard & Vangsnes 2020), as illustrated in (7). Embedded V-Neg order is derived via movement of the finite verb to C, as in matrix clauses, as shown in (8). The complementizer is assumed, in such clauses, to occupy a higher

head (C1 in the following diagram) in the C-domain. Adopting the V-to-C analysis of embedded V-Neg word order on par with matrix V2 represents a view of embedded V-Neg as a kind of embedded root phenomenon (Heycock 2006; Holmberg & Platzack 1995; Julien 2007, 2015).

(6)
```
                    CP
          ┌─────────┴─────────┐
       SUBJ_j              C'
        Vi        ┌─────────┴─────────┐
        we       C°                 TP
               les_i        ┌────────┴────────┐
               read       SUBJ             T'
                          t_j      ┌────────┴────────┐
                                 T°               VP
                                 t_i      ┌────────┴────────┐
                                       ikkje            VP
                                        not      ┌───────┴───────┐
                                              SUBJ            V'
                                               t_j     ┌───────┴───────┐
                                                      V°             DP
                                                      t_i    islandske soger_f
                                                             Icelandic sagas
```

(7)
```
                CP
           ┌────┴────┐
                   C'
          ┌─────────┴─────────┐
         C°                 TP
         at        ┌─────────┴─────────┐
        that     SUBJ_j             T'
                  vi        ┌────────┴────────┐
                  we      T°               VP
                                  ┌────────┴────────┐
                                ikkje            VP
                                 not      ┌───────┴───────┐
                                       SUBJ            V'
                                        t_j     ┌───────┴───────┐
                                               V°             DP
                                               les    islandske soger
                                               read   Icelandic sagas
```

(8)
```
                   .  CP1
                ┌─────┴─────┐
                         C1'
             ┌───────────┴───────────┐
            C1°                    CP2
            at            ┌─────────┴─────────┐
                       SUBJ_j             C2'
                        vi        ┌─────────┴─────────┐
                        we      C2°                 TP
                               les_i       ┌────────┴────────┐
                               read      SUBJ             T'
                                         t_j      ┌────────┴────────┐
                                                 T°               VP
                                                 t_i      ┌────────┴────────┐
                                                       ikkje            VP
                                                        not      ┌───────┴───────┐
                                                              SUBJ            V'
                                                               t_j     ┌───────┴───────┐
                                                                      V°             DP
                                                                      t_i    islandske soger
                                                                             Icelandic sagas
```

We suspect that acquiring the analyses in (7) and (8) and the generalizations governing the adult distribution of Neg-V and V-Neg word order in embedded clauses may prove challenging for Norwegian children in two ways: First, children may be delayed in learning that canonical main and embedded clause word orders are different, and they may therefore overgeneralize the V2 main clause analysis to all embedded clauses early in acquisition. Second, children may struggle to identify the appropriate conditions that govern V-Neg optionality in embedded clauses and thereby overgeneralize the optionality of embedded V-Neg. Therefore, we ask whether children produce *verb-placement errors* in embedded clauses, producing V-Neg word order in clauses where it is not licensed in the adult grammar.

Acquiring the generalizations in question could be challenging for three reasons. First, input to the embedded verb's true position is ambiguous in most utterances that children hear. When a negation or a clause adverb is not present, as in (9), the exact placement of the embedded verb is not clear because the verb is the second element of the clause.

(9) a. Lærar-en   veit   [at vi *les* islandske soger kvar   kveld]
       teacher-DEF knows [that we read Icelandic sagas every night]
       'The teacher knows that we read Icelandic sagas every night.'

    b. Dette er lærar-en   [som *les*   islandske soger kvar   kveld]
       this   is teacher-DEF [who reads   Icelandic sagas every night]
       'This is the teacher who reads Icelandic sagas every night.'

Given that the word orders in embedded clauses in (9) are superficially identical to main clause word order, it is possible that children may consider the hypothesis that the main clause analysis of verb placement can be extended to embedded clauses.

Second, unambiguous evidence that embedded clauses have a different canonical order than main clauses is relatively scarce. Extensive research suggests that input frequency plays an important role in successfully acquiring syntactic constructions (Lightfoot 1999, 2006; Diessel & Tomasello 2000; Huttenlocher et al. 2002; Yang 2002; Kidd, Lieven & Tomasello 2006; Demuth 2007; Roeper 2007; Westergaard & Bentzen 2007; Lieven 2010). Though learners receive frequent unambiguous evidence that the verb is in a V2 position in main clauses, through nonsubject initial declarative clauses as well as questions (50.4% of all child-directed utterances in a corpus extraction of 668 total utterances in Westergaard & Bentzen 2007), evidence that the verb is not in the V2 position in embedded clauses is comparatively rare. Embedded clauses containing negation constitute evidence for a non-V2 word order (alongside embedded clauses containing other adverbs) and are found to make up less than 1% of total utterances in adult speech corpora (Ringstad 2019) and in a corpus of child-directed speech (Westergaard & Bentzen 2007).

Finally, children may consider hypotheses about verb placement that do not align with the adult generalizations because the input they receive presents them with potentially conflicting cues to embedded clause verb position. The possibility of pragmatically licensed V-Neg in selected embedded clauses entails that children observe both V-Neg and Neg-V word order. According to Ringstad (2019), roughly 33% of negated embedded clauses in adult speech exhibit V-Neg across embedded clause types (not only including contexts that allow V-Neg). The frequent alternation could lead children to erroneously overgeneralize the alternation to embedded clauses where it is never allowed. Overgeneralization of semantically restricted syntactic alternations during language acquisition has been shown to occur with other constructions, such as the dative alternation. Certain ditranstive verbs, like *give*, are compatible with both a double-object frame (10a) or a prepositional dative frame (10b), while others, such as *donate*, are only compatible with one of the two frames (10c,d).

(10) a. The girl gave the museum money.

   b. The girl gave money to the museum.

   c. *The girl donated the museum money.

   d. The girl donated money to the museum.

Semantic conditions govern which verbs permit alternation and which do not (Baker 1979; Pinker 1989), but children face a version of the classic subset problem when learning these conditions: Do children entertain the superset hypothesis that the dative alternation is possible with *all* ditransitive verbs? And if so, how do they retract to the subset hypothesis that the alternation is only available with a selected set of verbs? Research has shown that children do, in fact, overextend the scope of the dative alternation to verbs that do not permit the alternation in the adult grammar (Mazurkewich & White 1984; Pinker, 1984, 1989; Bowerman 1988; Gropen et al. 1989; Ambridge et al. 2009; Ambridge et al. 2013). Norwegian children learning the conditions on embedded V-Neg face a version of the superset-subset problem embodied in Baker's paradox: Children observe that some embedded clauses permit Neg-V/V-Neg alternation, and they must learn the pragmatic conditions that limit the scope of that alternation. Given the abstract similarity to the case of the dative alternation, we might therefore expect that children will make overgeneralization errors and extend V-Neg to embedded clauses where it is not allowed in the adult grammar.

2. Past work on embedded word order

A few studies have investigated the acquisition of embedded word order generalizations in Norwegian (e.g., Westergaard & Bentzen 2007; Westergaard 2009a), but the acquisition of word order in main and embedded clauses has been studied more extensively in German (Clahsen & Smolka 1985; Clahsen &

Penke 1992; Jordens 1988; Brandt, Diessel & Tomasello 2008; Sanfelici, Schulz & Trabandt 2017). German, like Norwegian, is a V2 language, where the finite verb is in second position in main clauses (11a). In embedded clauses, German is generally clause final (Haider 1985), (11b)–(11c), with the possibility of V2 order in certain clauses, such as some complement clauses (Vikner 1995), a special type of relative clause (Gärtner 2001), and clauses embedded under the complementizer *weil* 'because' (Haegeman 2013).

(11) a. Wir *lesen* jeden Abend isländische Sagas

      we   read   every night   Icelandic   sagas

      'We read Icelandic sagas every night'

  b. Der Lehrer weiß, [dass wir jeden Abend isländische Sagas *lesen*]

      the teacher knows [that we every night   Icelandic   sagas read]

      'The teacher knows that we read Icelandic sagas every night'

  c. Dies ist der Lehrer, der nicht jeden Abend isländische Sagas *liest*

      this is the teacher who not   every night   Icelandic   sagas read

      'This is the teacher who doesn't read Icelandic sagas every night.'

Even though German children, as Norwegian, are faced with the option of V2 in embedded environments, they receive frequent direct evidence for differences in main and embedded clause verb placement as most embedded clauses consisting of more than a simple subject-verb sequence provide direct evidence that embedded clauses are verb final. Indeed, German children quickly learn that canonical verb placement differs in main and embedded clauses: Children are found to place the verb correctly in final position as soon as they start producing embedded clauses (Clahsen & Smolka 1985; Sanfelici, Schulz & Trabandt 2017). Some case studies have found that children frequently use V2 in their first embedded clauses (Brandt, Diessel & Tomasello 2008; Brandt, Lieven & Tomasello 2010), but their use of embedded V2 appears to occur only in clauses where it is allowed in the adult language (though see data from Swiss-German children in Schönenberger 2001).

Existing studies suggest that Scandinavian children may struggle with acquiring embedded clause word order generalizations in their native languages in a way that German children might not. However, the extent of the problem remains undetermined. Håkansson & Dooley Collberg (1994) studied a corpus of child productions (age 2;00–3;06) in Swedish and conducted a small imitation experiment (participants *n* = 13, age 2;08–6;06). The researchers report that nine of the children sometimes produce V-Neg in embedded clauses, instead of the canonical Neg-V. Unexpectedly, they also found that children were more likely to produce V-Neg order if the verb was an auxiliary and not a main verb. Westergaard & Bentzen (2007) also found occasional instances of V-Neg (9/13 embedded clauses with negation) in a Norwegian child speech corpus (age 1;09–3;03). In a corpus investigation of four Swedish children's productions (age 1;06–4;00), Waldmann (2014) also found that the children produced V-Neg more frequently than adults overall.

The results of the aforementioned studies establish that children occasionally produce V-Neg. The studies do not, however, allow us to conclude that the observed cases of V-Neg were non-adult-like errors, as they do not specify the types of embedded clauses (e.g., assertive, factive, etc.) where V-Neg was found (the exception being Westergaard & Bentzen 2007, who report finding a few relative clauses with V-Neg). Thus, most of the results are equally compatible with children either making verb placement errors or having mastered the optional alternation.

Establishing whether children commit errors requires specifically investigating productions in clauses where V-Neg is unacceptable in the adult grammar. To our knowledge, only two experimental studies have done so in any Scandinavian language. Both studies tested whether children produce V-Neg in embedded questions, where the word order is always ungrammatical in the target language. In a small elicitation experiment with two Norwegian children, Westergaard & Bentzen (2007) found that one participant (age = 5;09,18) produced ungrammatical V-Neg word order in seven of eight

embedded *wh*-questions (whereas the other participant, age = 8;00,20, never used the V-Neg order in these clauses). The results suggest that Norwegian children may go through a stage in which they consider a non-adult-like analysis of verb placement in embedded clauses and that misanalysis may persist rather late. Though the results are suggestive, strong conclusions should not be drawn based on data from a single participant.

A larger study was carried out by Heycock et al. (2013) in which embedded questions were elicited in Faroese, a Scandinavian language with word order patterns that are similar to Norwegian. Heycock and colleagues found that Faroese children occasionally produced embedded questions with the non-target V-Neg word order and that they produced the V-Neg order more often with auxiliaries than main verbs (similar to the Swedish children in Håkansson & Dooley Collberg 1994). The fact that Faroese learners struggled to consistently produce the correct word order lends credence to the idea that the acquisition of embedded verb placement is challenging. However, the extent to which we can draw a generalization from Faroese to Norwegian is not certain, given grammatical differences between the languages: Even though modern Faroese resembles Norwegian in that it prefers Neg-V in embedded clauses, Faroese embedded verb placement is more variable than in Norwegian. The increased variability reflects an ongoing grammatical shift in the language from earlier stages where embedded V-Neg word order was the norm (Heycock 2010; Heycock et al. 2013). Thus, Faroese children may face more inconsistent or uncertain input than children do in Norwegian.

To sum up, past studies provide suggestive, but by no means conclusive, evidence that Scandinavian children erroneously use V-Neg in environments where it is not permitted by the adult grammar. Moreover, what little experimental evidence there is on incorrect use of embedded V-Neg comes from embedded questions. Little is known about children's behavior in other types of embedded clauses.

3. Our study

Prior studies suggest that Norwegian children can struggle to settle on word order generalizations in embedded clauses. However, no systematic studies investigating this topic have been carried out in the language. To fill this gap, we elicited production of three types of embedded clauses containing negation: relative clauses, factive complement clauses, and complement clauses where Neg-V/V-Neg alternation is possible because they constitute the main point of utterance or convey "new" information. Our primary empirical question is whether Norwegian children ever erroneously produce V-Neg in relative and embedded factive clauses, where it is not licensed in the target language. A subsidiary empirical question is whether V-Neg is more frequently produced with auxiliary verbs than with main verbs, as Håkansson & Dooley-Collberg (1994) and Heycock et al. (2013) have observed.

We assume that children's errors reveal information about (i) the intermediate hypotheses that they consider over the course of acquisition, and (ii) how children transition from one hypothesis to another. Recall that the end-state generalizations governing the distribution of Neg-V and V-Neg make reference to both coarse syntactic distinctions (main vs. embedded clauses) and subtler semantic-pragmatic notions (e.g., whether the clause is the main point of utterance, or it conveys "new" information). Two questions that arise are (i) when children entertain hypotheses sensitive to these different types of information, and (ii) whether certain hypotheses are considered before others. Some learning models predict that children follow an acquisition strategy whereby they consider coarse syntactic generalizations first (e.g., Lightfoot 1999, 2006; Biberauer & Roberts 2012). Other learning models, such as Westergaard's (2009a) Micro-cue model, posit that children's hypotheses can combine both coarse and fine linguistic details from an early stage. Of course, fine-grained hypotheses can only make use of linguistic details that children are sensitive to. There is some evidence suggesting that the pragmatic concepts required to make distinctions between mental state verbs introducing different levels of factivity or assertivity are acquired from a young age (Shatz, Wellman & Silber 1983; Dudley et al. 2015, Hacquard & Lidz 2018). Thus, it seems at least possible that children are aware from an early age of the distinctions relevant for the finer-grained hypotheses that they should ultimately entertain.

Different patterns of V-Neg use correspond to different underlying hypotheses, which may or may not be under consideration at different points of development. Previous work suggests that children overgeneralize main-clause patterns when learning embedded generalizations in English (subject auxiliary inversion errors, e.g., Stromswold 1990; Ambridge et al. 2006; Pozzan 2011; Pozzan & Valian 2017), suggesting that children may have difficulty separating hypotheses for embedded and main clauses at least up to age 5. If children apply their main-clause analysis equally to all embedded clauses, we expect comparable rates of V-Neg in complement and relative clauses. Higher error rates in complement clauses over relative clauses would indicate that hypotheses are conditioned on clause type. If children prioritize coarse hypotheses before finer-grained ones (Lightfoot 1999, 2006; Biberauer & Roberts 2012), we would expect younger children to show equal error across clause types and older children to distinguish between the two. If syntactic distinctions precede pragmatically conditioned hypotheses, children should minimize embedded V-Neg in relative clauses while treating V-Neg as optional across all complement clauses regardless of their informational status (i.e., newness/ main point of utterance). As noted, such overgeneralization has been observed in the acquisition of semantically constrained cases of syntactic alternation (Mazurkewich & White 1984; Pinker 1984; Bowerman 1988; Gropen et al. 1989; Ambridge et al. 2009, 2013). Alternatively, knowledge that the availability of embedded V-Neg varies between possibly alternating and factive complement clauses could emerge simultaneously with sensitivity to all other distinctions. This outcome would support the kind of early sensitivity predicted by models such as the micro-cue framework (Westergaard 2009a).

The aforementioned outcomes correspond to different intermediate hypotheses that children might consider along the way to establishing adult-like generalizations. If the acquisition process involves transitioning through a series of alternative hypotheses, one can ask how transition occurs: Do children consider each intermediate hypothesis serially, or is transition through the hypothesis space a process where multiple hypotheses are considered in parallel, probabilistically comparing several hypotheses? Though earlier studies of acquisition often idealize acquisition as a process in which single hypotheses are considered in discrete stages (Weinberg 1990; Håkansson & Dooley-Collberg 1994), more recent work has suggested that children probabilistically evaluate multiple hypotheses in tandem (Roeper 1999; Yang 2002, 2016; Amaral & Roeper 2014; Gould 2017).

Patterns of V-Neg production can bear on this issue. Probabilistic acquisition models predict that children's overall productions should reflect a mixture of the various outcomes made possible by the hypotheses under current consideration. Thus, by inspecting which clauses V-Neg occurs in, as well as the relative proportion of V-Neg production across clause types, we can determine which hypotheses children are entertaining. For example, if we find that children use V-Neg incorrectly in different proportions across the different clause types, we would have evidence that children are simultaneously evaluating coarse and fine-grained hypotheses about the different licensing conditions for word order in a probabilistic fashion. Further, if probabilistic evaluation models are correct, we expect (i) that the qualitative pattern of embedded V-Neg should track the relative differences in the adult grammar, and (ii) that the probability of errors should be negatively correlated with the amount of unambiguous input for the correct analysis in the data.

3.1. *Experiments*

We tested where children position auxiliary and main verbs in relative clauses (RCs) and complement clauses using two separate, but related, elicited production experiments. The same participants were tested in both experiments to enable measurement of within-participant differences in successful acquisition of the word order generalizations across different structural environments.

3.1.1. *Participants*
Forty-eight typically developing Norwegian-speaking children were recruited. Participants aged 5 and younger (*N* = 33, 3;00–4;11) were recruited through local day cares and nursery schools in Trondheim. Participants older than 5 (*N* = 15, ages 6;00–7;03) were recruited through local primary schools. We

chose to test children over the age of 3, as younger participants might have difficulty producing relative clauses (e.g., Diessel 2004).

Individuals participated in both experiments on separate days, with the order of testing counterbalanced. In both experiments, child participants were tested in a quiet room at their day care or school by an investigator speaking the local dialect. All sessions were audio recorded, and participant responses were scored by listening to the recording.

Thirty-seven children were available to participate in both experiments. Three participants failed to produce any relative clauses responses in the RC experiment and were therefore excluded from further analysis. Thus, data from 34 children were used in the final analysis.

Eighteen adult control participants were also recruited from the student body and administrative staff at the Norwegian University of Science and Technology through social media and flyers. All spoke the local dialect of the area (Trøndelag), to maximize similarity to the linguistic profile of the child participants.

3.1.2. *Relative clause elicitation experiment*

We developed an experimental task to elicit relative clauses, based on the "Which child would you rather be?" design of Novogrodsky & Friedmann (2006), in which the experimenter presents a participant with a story about two children, accompanied by two pictures on a computer, showing the items relevant for the story. In each story, the two characters are associated with a distinct identifier. In the example story (12), the two boys are associated with different desserts (cake and ice cream). A relation between each character and its identifier is specified (e.g., *didn't want to eat X*). After each story, the experimenter asked the participant a question using a kangaroo hand puppet. Questions required the participant to identify one of the characters and express a personal judgment (*Which boy do you find more odd?*) or preference (*Which boy would you rather be?*). Participants were instructed to respond verbally (as opposed to pointing) because the kangaroo could not see the screen. The task was designed such that reference to a particular character required a relative clause (e.g., *the boy who didn't want to eat his ice cream*).

(12) **Experimenter:** I have heard about two boys who were a bit odd. They didn't want

to eat their dessert. One boy did not want to eat his cake, and one boy did not want

to eat his ice cream. Those two boys must be quite odd, right? Which boy do you find

more odd?'

Target answer:

Han	(gutt-en)	som	**ikkje**	*ville*	ete	isen/kaka	si
He	(boy-DEF)	who	not	wanted	eat	icecream/cake	REFL.POSS

`The boy who doesn't want to eat his ice cream/cake'

Sixteen experimental items similar in form to (12) were constructed such that the target RC responses would contain a negation regardless of the individual chosen. All experimental items can be found at the project's OSF page: https://osf.io/g6ayv/. Six items were designed to elicit only a main verb; 10 items were designed to elicit an auxiliary in addition.[2] Since both subject and object relative clauses disallow V-Neg in adult language, and children exhibit later mastery of object relatives (e.g., Costa, Lobo & Silva 2011), all items were designed to elicit subject relatives. Experimental items were randomly intermixed among six filler items in eight different lists. There was no time limit for responding, and (a maximum of two) reminders were given if the participant was unable to recall the content of the clause. The experiment took approximately 30 minutes.

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[2]The items were intended to be balanced (eight eliciting a main verb, eight eliciting an auxiliary), but due to an error, an unbalanced number of items were used in the experiment.

3.1.3. *Complement clause elicitation experiment*

To elicit complement clauses with negation, we used a shy puppet design (Crain & Thornton 1998), where participants were introduced to a turtle hand puppet (managed by an assistant), who would only talk to children. Participants were informed that they would hear about Karsten and Petra, two popular characters from Norwegian children's books. The stories were accompanied by pictures. Participants were told that the turtle was eager to hear the stories but could be forgetful, so he might ask questions afterwards. Children were encouraged to help the turtle by answering his questions. Adult controls were asked the eliciting question directly by the investigator.

[3]Each story contained a few sentences that established the narrative context. Stories ended with a character seeing, saying, or being sad or happy about something. After that, the turtle asked the participant what the character said, saw, or was happy/sad about. In the experimental items the correct response always required negation. The stories and design were inspired by those used in Westergaard & Bentzen (2007) and Westergaard et al. (2014). An example item is in (13):

(13) **Experimenter:** In Karsten's family, everyone knows eating sweets is only allowed
     on Saturdays. But one Monday, Karsten's mum has a suspicion that he has taken
     some sweets nevertheless. She asks him if this is the case, and he replies: No, I don't
     eat sweets on Mondays![3]

     Hand puppet: What did Karsten say?

     Target answer:

     (Karsten seier) at   han **ikkje** *et*   godteri på mandager
     (Karsten says) that he   not   eats sweets on Mondays
     `Karsten says that he does not eat sweets on Mondays'

Sixteen test items of the form in (13) were created. To test the effect of embedding verb class on embedded clause word order, test stories were grouped into two conditions. In the ALTERNATION POSSIBLE condition, the stories for the turtle's question used either the assertive *seie* 'to say' or semifactive *sjå* 'to see', both of which allow a V-Neg/Neg-V alternation in their complement clauses. In the FACTIVE condition, the eliciting question contained embedding predicates *glad for at* 'be happy (for) that' or *lei seg for at* 'be sad (for) that,' which only allow Neg-V order. We avoided using typical factive predicates such as *angre på* 'regret', which might prove difficult for the children to understand. In addition, half of the items were designed to elicit only a main verb in the embedded clauses; the other half was designed to elicit an auxiliary in addition.

All embedding verbs were confirmed to be frequent and familiar to Norwegian children according to the lexical database "Norwegian Words" (Lind et al. 2015). Each verb's ability to license the Neg-V/V-Neg alternation was checked in a corpus search of adult speech—The Big Brother corpus (Tekstlab 2009), ScanDiaSyn (Johannessen et al. 2009), and NoTa (Tekstlab 2004). Test items were interspersed alongside six filler trials in which participants were required to report the content of an affirmative embedded clause. Test and filler items were distributed among nine lists with separately randomized order.

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[3]In both experiments, the context sentence providing the content for the question consisted of a main clause with V-Neg order. A reviewer asked whether seeing V-Neg in the context sentence (or hearing V2 so frequently in the stories) could prime participants to carry over V-Neg/V2 order to embedded clauses. This is possible, in principle, but we note that any possible priming would have been the same across conditions, as the word order was held constant. The high frequency of V2 sentences is not a feature of our stimuli alone, as all matrix clauses are V2 in Norwegian. The fact that children in our experiments use V2 to differing degrees across contexts (and adults almost never) indicates, at the very least, that any effect of V2 priming is likely small.

3.2. *Analysis*

Participant responses were coded as (a) V-Neg, (b) Neg-V, or (c) others. This last category encompassed failures to respond, responses without an embedded clause, and responses with a different word order altogether. We also coded whether the first embedded verb in participant responses was an auxiliary or a main verb to follow up on observations in Håkansson & Dooley-Collberg (1994) and Heycock et al. (2013) that V-Neg was more likely with auxiliary verbs.

Response data were analyzed using logistic mixed effects models implemented using the glmer function in the package lme4 (Bates et al. 2015) in R (RStudio Team 2016). Models included centered fixed effects of verb type (main vs. auxiliary verb) and embedding predicate type (factive vs. alternation possible) when appropriate. Age was scaled (centered and divided by the *SD*) and then used as a continuous predictor. Random intercepts were included for participant and item.

4. Results

Figure 1 shows the mean proportion of V-Neg production across all clause types and participants. For ease of plotting, we have grouped children into two groups: *younger children* (age ≤ 5) and *older children* (age > 6). These groups were not used in analysis, where age was treated as a continuous predictor. Younger children produced more V-Neg than both adults and older children, following a step-wise pattern, with a decreasing proportion of V-Neg across the three different clause types. Older children exhibit a pattern broadly similar to adults: Both older children and adults never use Neg-V order in RCs, and they show a negligible rate of V-Neg under factive verbs and the highest proportion of V-Neg under alternating verbs.

Before investigating relations between performances across experiments, we analyzed the results from each experiment separately.

4.1. *Relative clauses*

Adults produced RCs on 185 of 240 trials. All RCs contained the Neg-V order. The children produced 288 RCs with either Neg-V or V-Neg word order (out of 529 trials). The relatively high proportion of
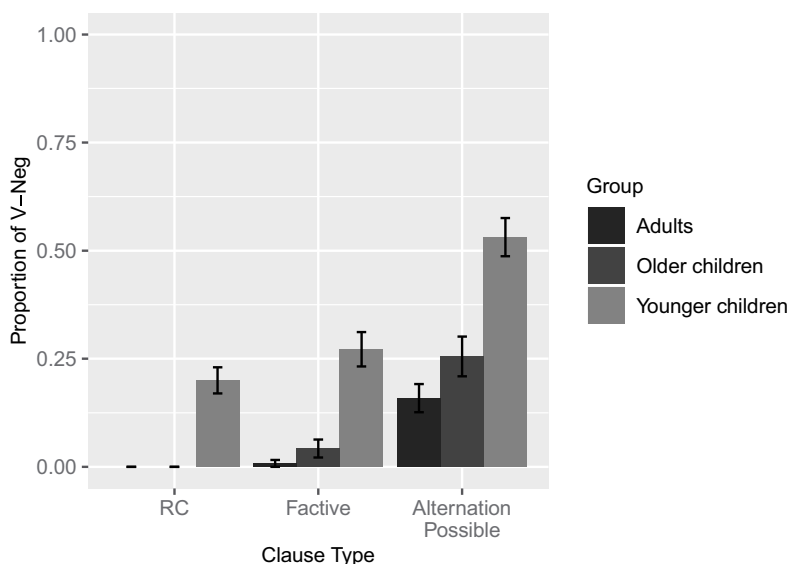

Figure 1. Proportion of V-Neg produced in all clause types grouped roughly by participant age.

nontarget responses likely reflects the difficulty of RCs for young children and is consistent with success rates in prior studies that elicited RC production in young children (Håkansson & Hansson 2000). Children under 5 produced 175 total RCs (out of 320 trials), of which 35 had V-Neg order (20%). Children over 6 years of age produced 113 total RCs (out of 208 trials). The older group did not produce any RCs with V-Neg order.

We investigated whether children's production of V-Neg in RCs varied by age and verb type. Figure 2 plots the proportion of V-Neg responses produced by each of the 33 children who produced usable responses. Table 1 provides a summary of the statistical model. As can be seen, there were no significant effects of age, verb type, or their interaction. Despite the absence of a significant effect of age, Figure 2 makes clear that children under 5 were the only participants who produced V-Neg. The failure to achieve significance likely reflects low power: The number of children who produced V-Neg in RCs was small, and the number of observations per participant was often low.

4.2. Complement clauses

A total of 249 adult responses (of 288 total trials) were eligible for analysis. The proportion of V-Neg in adult responses is summarized in Table 2, broken up by embedding predicate and verb type. Adults overwhelmingly produced Neg-V across complement clauses but produced V-Neg more often in clauses where alternation was possible than in factive clauses. Specifically, adults produced V-Neg only under the assertive verb *seie* 'to say' but not under semifactive *sjå* 'to see', though V-Neg is also reported possible under *sjå*. Though the number of trials with V-Neg was small, pairwise comparison
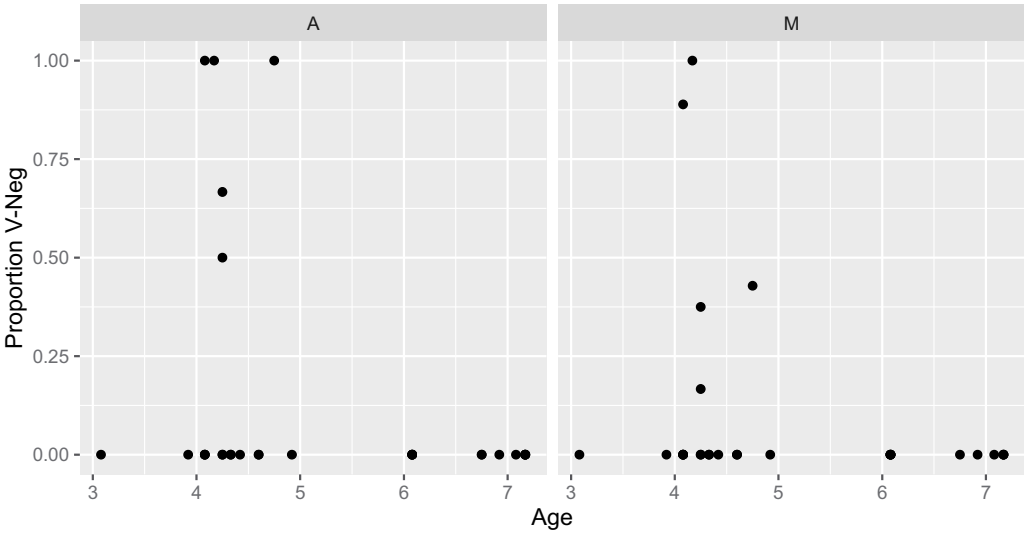

Figure 2. Proportion of children's V-Neg responses in relative clauses, sorted by verb type (Auxiliary [A] and Main Verb [M]). Each dot represents an individual participant.

Table 1. Summary of statistical analysis of children's responses in the RC elicitation experiment.

WordOrder ~ Age × VerbType + (1+VerbType|Participant) + (1|Item)			
	Estimate (*SD*)	*z* value	*p* value
Age	1.44 (2.85)	0.506	.613
Verb type	−0.546 (5.81)	−0.094	.925
Age × verb type	2.39 (4.65)	0.513	.608

Table 2. Proportion (and number) of total trials on which adults gave V-Neg responses (A) under individual embedding predicates and (B) with main and auxiliary verbs.

	Seie 'to say'	Sjå 'to see'	Glad for 'is glad'	Lei for 'is sad'
V-Neg	31.7% (20/63)	0% (0/63)	0% (0/59)	1.5% (1/65)

(A)

	Factive	Alternation Possible
Main verb	1.4% (1/70)	12.3% (8/65)
Auxiliary verb	0% (0/54)	20% (12/60)

(B)

revealed that adults used V-Neg more often with auxiliary verbs than with main verbs when alternation was grammatically possible ($z = 3.739$, $p < .001$).

A total of 465 child responses (of 544 total trials) were eligible for analysis. On average, children produced V-Neg under factive verbs on 16.2% of eligible trials and under alternating verbs on 39.0% of eligible trials. Table 3A shows how often V-Neg was produced under each embedding predicate and Table 3B how often V-Neg was produced with auxiliaries and main verbs.

A summary of the statistical analysis of responses is in Table 4. The model included embedding predicate, participant age, and embedded verb type as main effects and their interactions.

The model revealed three significant main effects: V-Neg was produced significantly less often under factive verbs ($p < .001$). V-Neg was more common when the embedded finite verb was an auxiliary than when it was a main verb ($p < .01$). V-Neg production decreased with age ($p < .01$). Age did not interact significantly with embedding predicate, reflecting that older children produced fewer instances of V-Neg, irrespective of embedding environment. These effects were qualified by a marginally significant Embedding Predicate × Verb Type interaction ($p < .10$). We did not resolve this interaction because it did not achieve the threshold for significance.

Table 3. Proportion (and number) of total trials on which children gave V-Neg responses (A) under individual embedding predicates and (B) with main and auxiliary verbs.

	Seie 'to say'	Sjå 'to see'	Glad for 'is glad'	Lei for 'is sad'
V-Neg	44.2% (50/113)	39.0% (41/105)	18.1% (20/111)	16.7% (18/108)

(A)

	Factive	Alternation possible
Main verb	11.4% (15/131)	36.3% (38/102)
Auxiliary verb	26.1% (23/88)	46.5% (53/114)

(B)

Table 4. Summary of statistical analysis of children's responses in the complement clause experiment.

WordOrder ~ Age × VerbType × EmbedPred + (1|Participant) + (1|Item)			
	Estimate (SD)	z value	p value
Age	1.22 (0.46)	2.666	.0077 **
Verb type	1.55 (0.40)	3.094	.0020 **
Embed. pred.	−2.19 (0.53)	−4.119	<.0001 ***
Age × verb type	0.13 (0.48)	−0.268	.7884
Age × embed pred	−0.69 (0.49)	−1.401	.1610
Verb × embed pred	−1.91 (0.99)	−1.941	.0522 +
Age × verb × pred	0.51 (0.98)	−0.521	.602

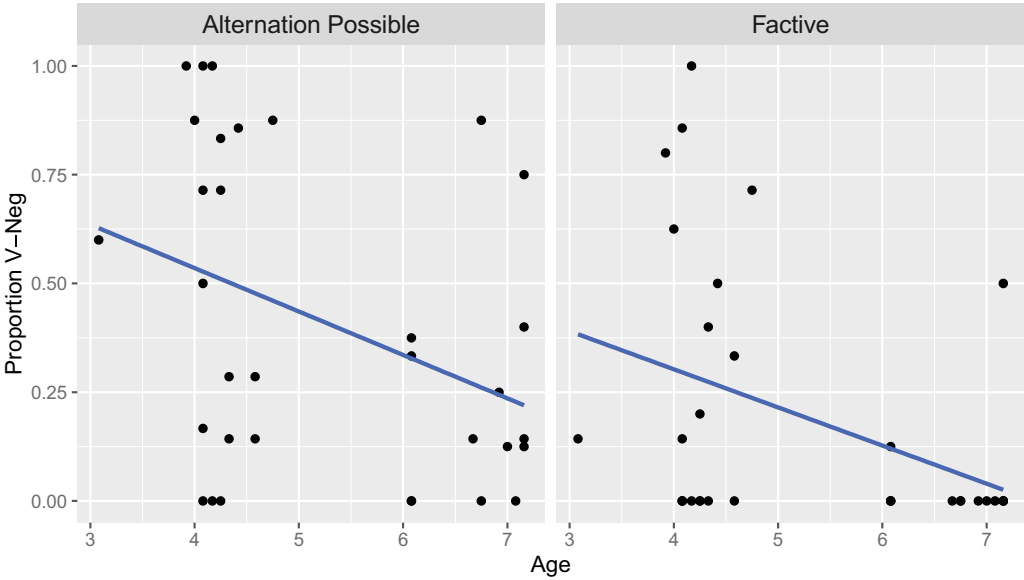+$p < .10$, **$p < .01$, and ***$p < .001$.

Figure 3. Proportion V-Neg responses by condition per child participant.

We probed individual children's productions further to understand the source of the differences across children and age groups, even though the Embedding Predicate × Age interaction did not achieve statistical significance. Figure 3 plots how often individual children produced V-Neg under each verb type as a function of age.

Figure 3 makes apparent that V-Neg rates varied substantially by child. Twenty participants had production patterns that were consistent with the target generalizations: Seven participants produced Neg-V exclusively across the conditions (age range: 4;00–7;03). Thirteen participants produced V-Neg at least once under an alternating verb but never under a factive verb. Thirteen participants behaved in a manner that was not target-like, producing V-Neg in factive clauses. Eleven of the participants with non-target-like production were aged 4;00–4;11; the remaining were aged 6;01 and 7;02. Ten of the participants who made V-Neg errors produced fewer instances of V-Neg in factive clauses than in clauses allowing alternation. Table 5 provides an overview of participant response patterns.

As can be seen in Table 5, errors were more common among younger participants than older participants. Looking closer at the individual participant data revealed that seven of the 13 children produced V-Neg in at least half of their responses (average = 0.71; range = 0.50–1.00), while the rest produced V-Neg more variably (average = 0.224; range = 0.14–0.40). The majority of children that produced mixed V-Neg patterns fell into the younger group.

4.3. *Individual results*

Finally, we wished to check the relationship between verb-placement errors inside RCs and complement clauses to determine whether children's production of V-Neg inside factive complement clauses

Table 5. Counts of individual child participants by response pattern in the complement clause elicitation experiment.

	Adult-like responses		Non-adult-like responses (V-Neg in factive clauses)	
	100% V-Neg	V-Neg only in alternating clauses	Alternating > factive V-Neg	Factive > alternating V-Neg
Age ≤ 5	3	4	9	3
Age > 6	4	8	1	1

reflected uncertainty about word order across embedded clauses generally or uncertainty about complement clauses specifically. If a participant produced V-Neg in factive clauses, but not in RCs, we could attribute those errors to lingering uncertainty about the conditions governing the alternation specifically.

Five participants produced V-Neg inside RCs. All of these five also produced V-Neg inside factive complement clauses (all aged 4;00–4;11). Four participants who produced V-Neg in RCs had high and comparable rates of V-Neg across all embedded clause types (range = 3–11 instances per condition). The remaining participant produced V-Neg in RC only once, but on more than half of all complement trials. The remaining eight participants who produced V-Neg in factive clauses made no verb-placement errors in RCs, consistent with the conclusion that they had mastered the generalization regarding verb position in RCs before the complement clause generalization.

5. Discussion

Our study investigated how Norwegian children acquire two generalizations governing verb placement in embedded clauses. The first generalization is that unlike main clauses, ordinary embedded clauses do not have V-Neg word order: The finite verb follows negation and adverbs by default (Neg-V). The second generalization is that V-Neg word order is optionally allowed in complement clauses that express new information or the main point of utterance, but V-Neg is not allowed in factive complement clauses. We reasoned that learning these two generalizations might be difficult for children because the relevant input is sparse and often ambiguous. We hypothesized that children would consider alternative, intermediate hypotheses along the way to learning the target generalizations, which would lead them to make errors in embedded verb placement.

We measured how often children produced V-Neg order in three different types of embedded clauses: (i) relative clauses (RCs), where V-Neg is never acceptable; (ii) in the complement of factive verbs, where V-Neg is also disallowed; and (iii) in complement clauses that allow alternation in the adult grammar. We tested the production of children aged 3;01–7;02 to see when and how errors changed with age. Our results show that some children make errors in embedded verb placement, using V-Neg in clauses where it is not licensed in the adult grammar. However, error rates are characterized by substantial interindividual variation across children.

Average error rates differed by clause type. A small group of children below the age of 5 produced V-Neg in RCs. The same children produced high rates of V-Neg in factive and complement clauses that allow alternation.

Across the age range, most participants consistently produced the correct Neg-V word order in RCs. Verb-placement errors in complement clauses persisted after verb placement was fixed in RCs. Statistical analysis revealed that even though participants made errors by producing V-Neg in factive clauses, they used V-Neg less often in factive than in clauses that permit alternation. Overall use of V-Neg decreased with age, but there was not a significant interaction between age and clause type.

Closer inspection of productions in complement clauses revealed three response patterns: (i) some participants never produced V-Neg, (ii) some only produced V-Neg in complement clauses that allow alternation, and (iii) some produced V-Neg in both types of complement clauses. The first two groups behaved in accordance with the two target generalizations. Children with target-like performance were found across the age range tested, suggesting that mastery was not only determined by age (other possible factors will be discussed in the following). However, the general decrease of V-Neg use with age likely reflects that age is a relevant factor in the maturity of this phenomenon.

When statistical analysis was restricted to the subset of non-target-like participants, the effects of clause type persisted: Children who erroneously produced V-Neg in factive clauses did so less often than they produced V-Neg in clauses where alternation is grammatical. Age was not a significant predictor of V-Neg production among participants who made errors, but the majority of children who used V-Neg under a factive verb were found among the younger children. Finally, producing V-Neg in

factive clauses did not depend on making errors in RCs. There were a number of participants who never produced V-Neg in RCs but who still made V-Neg errors in factive clauses.

Finally, replicating the findings of Håkansson & Dooley-Collberg (1994), we found that children were more likely to use V-Neg with auxiliary verbs than with main verbs complement clauses but not relative clauses. This pattern aligned with the behavior of adult controls, who used V-Neg with auxiliaries more often than main verbs in complement clauses that permitted alternation.

5.1. *Input, frequency, and age of acquisition*

For some children acquiring Norwegian, it seems verb-placement errors, such as V-Neg order in RCs, can persist longer than in languages like German, where successful acquisition of embedded verb-final order is found to have occurred by around age 3 (Clahsen & Smolka 1985; Sanfelici, Schulz & Trabandt 2017). As discussed, this difference likely reflects differences in the frequency of unambiguous evidence for the right analysis of embedded verb placement in Norwegian and German; embedded clauses containing an object in addition to subject and verb provides unambiguous evidence for verb-final word order in German, while the position of the Norwegian embedded verb can only be deduced by its position relative to negation or an adverb. The fact that some children produce V-Neg errors in complement clauses up to the age of 7 indicates that mastery of the second generalization can occur rather late. We suspect that this delay persists not only due to the low input frequency of unambiguous evidence but also because the input contains potentially conflicting cues to embedded verb position: Observing acceptable cases of the V-Neg/Neg-V alternation may delay consolidation of the correct hypothesis, if children are unable to recognize that the alternation is restricted to a subset of clauses.

Although some children remain uncertain about the correct generalizations until relatively late, it does appear that others master the relevant generalizations earlier, as evidenced by the group of children—younger and older—who produced V-Neg in a target-like manner. We speculate that the ability of some younger children to successfully acquire the generalization earlier may be linked to individual differences in the probability of V-Neg in their input or even in variability of embedding verbs in caregiver speech. For example, child-directed speech is found to vary in complexity by demographic factors such as educational level—caregivers with higher education use more multiclause sentences (see, e.g., Huttenlocher et al. 2007). Thus, there is a possibility that children are exposed to different levels of relevant evidence.

5.2. *Hypotheses considered*

Children's use of V-Neg in unlicensed environments could arise for multiple reasons, reflecting distinct intermediate hypotheses about the grammar of verb movement that arise at different times (or are considered simultaneously). Understanding which hypotheses lie behind children's errors, and if children consider different hypotheses at different times, can help us understand how hypotheses are generated over the course of acquisition and the types of linguistic distinctions that children make in their hypothesis generation. We reasoned that the distribution of errors can provide information about which hypotheses children are considering. We first consider possible acquisition trajectories where children only consider the three adult structures (6–8) discussed in the introduction before considering a proposal due to Westergaard & Bentzen (2007).

Children could produce embedded V-Neg because they overgeneralize the correct matrix V2 analysis to all embedded clauses. Such a hypothesis might be entertained before children posit a separate V-in-situ analysis in response to embedded Neg-V. Unlicensed V-Neg in embedded clauses could also occur after children have learned the Neg-V analysis, if they consider an overinclusive hypothesis that extends Neg-V/V-Neg alternation to all embedded clauses. Such an outcome would be possible if children have to learn the pragmatic licensing conditions for embedded V-Neg independently from the syntactic analysis. The fact that a few (*N* = 6) younger children produced V-Neg in RCs alongside complement clauses is consistent with children overgeneralizing either the main clause

analysis of verb placement to embedded clauses or the possibility of alternation across all embedded clauses. We note that a portion of the children in question produced embedded V-Neg on almost all trials. Such behavior is easily explained if V-Neg production at this stage reflects overgeneralization of the main clause analysis of obligatory V2 order. We recognize, however, that such a trend provides only suggestive evidence in favor of the main clause analysis.

Westergaard & Bentzen (2007) provide a different explanation for the overuse of embedded V-Neg, which involves consideration of an intermediate hypothesis not corresponding to any of the structures in (6)–(8). They argue that economy principles first lead children to assume an incorrect intermediate analysis in which there is only V-to-T movement in both main and embedded clauses. The analysis is wrong because it does not move the verb far enough in main clauses, which require V-to-C movement, and because it moves the verb too far in embedded clauses, where the verb is required to remain in a position below negation. Eventually, children must reject the V-to-T analysis. Children may reanalyze their initial V-to-T analysis after encountering enough evidence of Neg-V order in embedded clauses, which is incompatible with V-to-T movement (Westergaard & Bentzen 2007). At this point, they may shift to the correct V-in-situ analysis for embedded clauses. Shifting from the V-to-T analysis to a V-to-C analysis in main clauses may occur when children observe enough examples of V2 word order in clauses where nonsubjects are fronted and V precedes the subject, such as (14).

(14) Islandske soger *les*   vi aldri
     icelandic   sagas   read we never

'We never read Icelandic sagas'

Children would need to infer from sentences like (14) that V-to-C movement is generalized: A single analysis underlies subject-initial clauses and non-subject-initial clauses. Reanalyzing matrix clauses as involving V-to-C would still ensure V-Neg word order.

Whether overuse of embedded V-Neg is due to overgeneralization of a correct main clause analysis to embedded clauses or use of a nontarget analysis in both clause types, both options still involve children erroneously conflating verb-movement patterns in main and embedded clauses. Unfortunately, our data cannot reveal whether all children at an early stage consider a single hypothesis for verb movement and whether this hypothesis would be V-to-T movement or V-to-C movement.

A further possibility, pointed out by a reviewer, is that children initially hypothesize that only Neg-V is possible in embedded clauses and that overgeneralization of V-Neg only emerges at a later, intermediate, developmental stage where children try out the possibility of embedded V-Neg in different environments. We agree that this is a possibility. Our results suggest that if there is a stage where children rigidly use Neg-V, it should come prior to age 4, when we begin to see overgeneralization of V-Neg in our experiments. Again, our data set does not include enough children below the age of 4 to plot such a developmental trajectory. Investigating even younger children's word orders in embedded clauses would be an interesting topic for further research, even though eliciting embedded clauses from children younger than 3 years may provide some methodological challenges.

After the age of 5, children no longer use V-Neg in RCs, but many persist in producing V-Neg in complement clauses. This suggests that children are not only distinguishing between matrix and embedded clauses but that they are pursuing separate hypotheses for different embedded clause types.

Many children still incorrectly produce V-Neg in factive complement clauses after they have determined that V-Neg is not possible in RCs. This might seem to be evidence that children are insensitive to the distinction between complement clause types. However, we found that V-Neg in factive clauses was still, on average, significantly less likely than in clauses where alternation was possible. Such differences suggest that many of the children who overgeneralized the V-Neg alternation were nevertheless attuned to the possibility that word order patterns could differ between different complement clause types. This kind of fine-grained sorting by clause type is compatible with learning

models such as Westergaard's (2009a) micro-cue model, which predicts that children acquire word order variation in a context-based fashion, e.g., clause type by clause type.

Children appear not to learn the scope of the alternation in an item-based manner, first considering hypotheses about which individual verbs allow the alternation in their scope and which do not, as suggested by an item-based account (e.g., Tomasello 2009 for the early learning of [English] word order). A verb-driven learner would not overgeneralize the possibility of V-Neg to complement clauses where it was not observed in the input, which it appears that children do. Thus, children's hypotheses about the conditions governing the alternation are more abstract and apparently anticonservative (contra Berwick 1985; Biberauer & Roberts 2009).

In sum, our findings suggest that in learning generalizations about embedded verb placement, Norwegian children initially struggle to separate embedded from matrix clause word order. However, when they learn to distinguish embedded clause order from matrix clause order, they are able to categorize different embedded clause types and pursue distinct hypotheses for verb placement patterns in each.

Before moving on, we note that one of our other findings could bear on the granularity of children's hypotheses in a way that we have not considered thus far. Similar to Håkansson & Dooley Collberg (1994) and Heycock et al. (2013), we found that embedded V-Neg was more often observed with auxiliaries than with main verbs. Importantly, adults also used V-Neg more with auxiliaries than main verbs in our experiment. At present, we do not know why the difference in verb type exists. Preliminary evidence suggests that the difference does not transparently track simple baseline frequencies. Ringstad (2019) investigated corpora of Norwegian adult-to-adult and child-directed speech and found that auxiliaries and main verbs are roughly equiprobable in clauses that allow and disallow alternation. In fact, Ringstad (2019) found no evidence that V-Neg was significantly more common with auxiliaries than main verbs in any corpora checked.[4]

Regardless of the underlying cause of the difference, children's elevated use of auxiliaries with V-Neg seems to reflect consideration of a non-target-like hypothesis in that they also use V-Neg more often with auxiliaries in factive complement clauses. Children appear aware that an auxiliary-main verb distinction exists, but they have not yet connected it with the semantic/ pragmatic conditions regulating embedded V-Neg. We point out that the hypothesis that there is a difference in verb type seems specific to complement clauses. Young children who produce V-Neg in RCs do not distinguish between verb types inside RCs. The distinction is visible in children who have mastered verb position in RC. How children even learn a basic distinction that auxiliaries move more than main verbs is currently unclear if, as Ringstad (2019) suggests, the frequency distributions of the their input do not bear out such a difference. We leave investigating this to further research.

5.3. *Single or multiple hypotheses*

We suggested that the higher proportion of V-Neg under verbs that allow the alternation than in factive complement clauses could be interpreted as evidence that children consider hypotheses that distinguish between factive clauses and clauses where V-Neg is allowed. If this is so, one question that arises is why children persist in making V-Neg errors even when they exhibit sensitivity to the relevant distinctions governing verb placement. If children can tell the difference between clause types, why don't they simply converge on the target generalizations immediately? One possibility is that errors persist because young children evaluate multiple hypotheses about the "true generalization" simultaneously, probabilistically weighting and updating their confidence in individual hypotheses over time (Roeper 1999; Yang 2002, 2016; Amaral & Roeper 2014; Gould 2017). More concretely, the pattern of

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[4]The fact that the distinction is apparently not found in a broader sample of everyday language suggests that some uncontrolled aspect of our experimental items may have led to the difference. It is unlikely related to the distribution of auxiliaries and main verbs in our test sentences, as these were counterbalanced.

effects that we observed is expected if children simultaneously consider the overinclusive hypothesis that alternation is free in complement clauses and the true restrictive hypothesis that alternation is only allowed in assertive complements.

Another possibility for explaining V-Neg errors in factive clauses would be to assume that children settle on the accurate generalization for licensing Neg-V/V-Neg alternation quite early, but they have difficulty identifying which complements meet the semantic/pragmatic conditions on alternation. Children could simply lack the relevant lexical knowledge for the individual predicates that we used, they could initially *misanalyze* certain embedding predicates as introducing new information/main point of utterance, or they could simply be prone to overassume that embedded clauses contribute new information/main point of utterance. Different authors have argued that children may assume semantics for certain embedding predicates that do not align with adult meanings (e.g., Diessel & Tomasello 2001) or that children may prefer to interpret some complement clauses as assertive when they should not (Lewis, Hacquard & Lidz 2017; Hacquard & Lidz 2018). We leave determining which is the correct explanation to future research.

5.4. *Retraction from overgeneralization*

Children appear to overgeneralize the V-Neg order to clause types where it is never found in the adult language but eventually converge on the target analysis. The question arises of how they retract from overgeneralization. Our problem can be likened to the problem of determining the appropriate lexical semantic conditions that govern the dative alternation in English (i.e., Baker's Paradox, Baker 1979; Pinker 1984): Past studies show that English learners go through a period in which they overgeneralize the dative alternation, extending it to verbs that do not allow alternation in the adult grammar (Pinker 1984; Bowerman 1988; Gropen et al. 1989; Ambridge et al. 2013).

In order to retract from overgeneralization in our case, children must learn that use of the V-Neg analysis is semantically or pragmatically conditioned: V-Neg is only allowed when the embedded clause is assertive or the main point of utterance. If we assume that children—at some point—are sensitive to features such as assertivity/main point of utterance, they can annotate different clauses in their input for these features. Learners might make use of these features in different ways to drive new generalization. One possibility is that they use *indirect negative evidence* (e.g., Rohde & Plaut 1999; Ambridge et al. 2009; Foraker et al. 2009; Ambridge et al. 2013; Ramscar, Dye & McCauley 2013; Blything, Ambridge & Lieven 2014): Statistically sensitive learners notice that V-Neg is only observed in main point of utterance/new information clauses and is conspicuously absent in factive clauses and eventually reject the overinclusive hypothesis that alternation is free. We have described retraction as applying to complement clause classes but acknowledge that it is also possible that the process would proceed on a verb-by-verb basis, presumably driven by verb frequency (as supposed by entrenchment accounts such as Ambridge et al. 2008). We also acknowledge that retraction is, in principle, driven entirely by (indirect) positive evidence (Pearl & Mis 2016), though the exact features and structures that would drive this learning must be identified.

Alternatively, if children know the correct generalization but make errors because they are unsure about the semantics of individual embedding predicates or the pragmatics of particular clauses in the experiment, "retraction" from a permissive to a more restrictive generalization is unnecessary: Errors would disappear as children learn which predicates are actually assertive and which are not or as they become better at identifying assertive/main point of utterance clauses.

6. Conclusion

The main aim of this article was to learn more about how Norwegian children acquire two generalizations regarding verb placement in embedded clauses. The first generalization is that in Norwegian the verb follows negation (Neg-V) in ordinary embedded clauses (unlike matrix clauses, where the word order is V-Neg). The second generalization is that exceptional V-Neg order is possible in

complement clauses selected by an assertive predicate. We speculated that infrequent unambiguous evidence of the correct embedded word order might make it challenging for language learners to reach the correct generalizations, in addition to the presence of occasional embedded V-Neg clauses in the input.

We tested whether children distinguish (i) between relative clauses, where only Neg-V is possible, and main clauses, where Neg-V/V-Neg alternation is licensed; and (ii) whether children could recognize the correct semantic-pragmatic constraints regulating the possibility of Neg-V/V-Neg alternation in complement clauses.

We found that children have difficulty learning the two generalizations for embedded verb placement, as evidenced by their overuse of V-Neg word order in embedded clauses where the order is not allowed in the adult grammar. Although the basic syntactic generalization of embedded clause word order being different than main clause word order appears to be mastered by age 5, we found that many struggle to acquire the second generalization, erroneously using V-Neg in factive clauses up to age 7. We take our findings to mean that children settle on correct syntactic generalizations for word order first, before making the more fine-grained generalizations based on pragmatic distinctions. More generally, our findings confirm that (i) infrequent and inconsistent input delays successful acquisition, and that (ii) children commit errors of overgeneralization from which they must subsequently retreat.

Acknowledgments

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