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What is This?

The development of narrative productivity, syntactic complexity, referential cohesion and event content in four- to eight-year-old Finnish children

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Abstract

This study focuses on the development of narrative structure and the relationship between narrative productivity and event content. A total of 172 Finnish children aged between four and eight participated. Their picture-elicited narrations were analysed for productivity, syntactic complexity, referential cohesion and event content. Each measure showed a developmental trend. Concerning consecutive age groups, significant differences were observed between four- and five-year-olds in productivity and event content and between five- and six-year-olds in referential cohesion. Multiple regression

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analysis showed that the relationship between productivity and event content was important, and especially the number of different word tokens proved to be useful in explaining the event content, whereas the number of communication units did not. This suggests that some productivity measures should be interpreted with caution.

Introduction

In everyday communication situations, narrative abilities make it possible to explain things and events as well as to tell stories and personal experiences to others. Even though the basis of narration is acquired early in a child's development in joint conversations and play situations with parents (Boudreau, 2008; Nelson, 1996), narrative development will continue into early adulthood. The development is long-term because narration comprises a variety of linguistic and cognitive knowledge about narrative genres and their structures, the listener's needs and linguistic devices (Berman, 2009; Johnston, 2008).

Narration is a multidimensional skill that has been studied extensively from different viewpoints. It has been connected, for example, to literacy development (Reese, Suggate, Long, & Schaughency, 2010; Suggate, Schaughency, & Reese, 2011) and social cognition (e.g. Fernandez, 2013). Research into children's development of narrative abilities has good normative data, at least in English, which can be used as a source of comparison in children with language impairments (Botting, 2002). However, there is a lack of data about narrative development in Finnish, which is structurally a different language from English (the most studied language) or other German or Romance languages, for example. As Hickmann (2004) points out, cross-linguistic variation is likely to occur especially in the linguistic structure of narratives because of different language typologies (see also Berman & Slobin, 1994). Moreover, communication styles may vary between cultures (e.g. Jokinen & Wilcock, 2006), which might affect communication skills in general.

Narrative structures and their relations

The diverse nature of narratives offers a rich source of data for language sample analysis, since narratives can be analysed from a linguistic or more cognitive perspective (e.g. story content). The linguistic structure of narratives consists of sentence-level productivity and complexity (Justice et al., 2006; Liles, Duffy, Merritt, & Purcell, 1995).The typical measures of productivity focus on the number of C- (communication unit) or T-units (minimal terminable unit) which are described, in general, as a main clause and its subordinate clauses (Hughes, McGillivray, & Schmidek, 1997). The total number of words (TNW) is also an often-used productivity measure that gives information about the amount of linguistic material produced. Some researchers consider the number of different words (NDW) as a measure of productivity (Justice et al.,

2006; Muñoz, Gillam, Peña, & Gulley-Faehnle, 2003). It can also be seen as a measure of lexical diversity (Heilmann, Nockerts, & Miller, 2010; Leadholm & Miller, 1992), at least if NDW is counted from a fixed amount of words. Syntactic complexity is usually measured by the mean length of C-units (MLCU) in words or in morphemes, or by analysing the clausal structures used while narrating (Bishop & Donlan, 2005; Justice et al., 2006). Additionally, cohesion is an important aspect of a well-formed narration that is not purely a measure of linguistic structure, even though it occurs through linguistic devices. Accurate use of cohesion creates the connectiveness and clarity within and between the sentences. Referential cohesion (e.g. the use of nouns and pronouns, anaphora and ellipsis) in particular has been a topic of interest in narrative studies (Schneider, Dubé, & Hayward, 2005; Van der Lely, 1997; Wigglesworth, 1990) since referential cohesion is needed to introduce characters, places and events, and to maintain the reference throughout the story. Referencing demands an understanding of context and the listener's needs; or more precisely, what provided information is mutual and what the listener can presuppose (Hickmann, 2004). In terms of story content, story grammars are often used to measure children's narrative production (e.g. Liles, et al., 1995; Price, Roberts, & Jackson, 2006; Stein & Albro, 1997). In addition, measures of main ideas (Bishop & Donlan, 2005), events (O'Neill, Pearce, & Pick, 2004) or information units (Renfrew, 1997) have been used in the evaluation of story content. The rationale for these latter analyses is to assess easily the amount of relevant information used in the story.

Even though the narrative variables measuring linguistic structure or event content are extensively used in studies with typical and atypical development, the relationship between these measures has not been studied in depth. Moreover, research has revealed somewhat contradictory results, which may be due to different languages studied as well as different methodologies used. Liles et al. (1995) studied children with language impairments and observed that narrative episodic and syntactic structures were somewhat distinct dimensions. In comparison, Kit-Sum To, Stokes, Cheung, and T'sou (2010) studied typically developing Cantonese-speaking children's narrations and detected that syntactic complexity, narrative vocabulary, referencing and the use of connectives were highly correlated. Fernandez (2013) studied six- and seven-year-old typically developing Spanish-speaking children's narrations and observed that narrative complexity, measured by the number of clauses, was a significant predictor of composite measure of narrative cohesion, coherence and evaluation (i.e. pragmatic language).

There is also research evidencing the association between story productivity and content. For example, Stein and Albro (1997) studied English-speaking children's narrations and discovered that the longest stories, measured by the number of clauses, were also structurally the best developed goal-based stories. Hakala's (2013) study also supports the relationship between content and productivity. She studied five-year-old Finnish children's narrations and, conversely, found that stories which were sparse in content contained significantly fewer words and fewer different words than stories with more story grammar elements. Moreover, Soodla and Kikas (2011) obtained a significant correlation between the story content and the total number of words produced among Estonian children. Fernandez (2013) detected a similar pattern, since the amount of produced utterances and the composite measure of narrative language were significantly

correlated. It should be noted, though, that even a strong correlation does not imply causality.

Development of narratives

When examining narrative development, the focus should be on different but interwoven narrative structures in order to get a comprehensive overview of children's narrative skills. As children become older, the linguistic structure of their narrations develops both in productivity and syntactic complexity. Narratives become longer and they also contain more different words (Justice et al., 2006; Leadholm & Miller, 1992; Schneider et al., 2005; Westerveld, Gillon, & Miller, 2004). A similar development is seen in syntax, which becomes more complex (Justice et al., 2006; Reilly, Losh, Bellugi, & Wulfeck, 2004). In the study of narrative development across different elicitation contexts, Westerveld et al. (2004) found age-related differences among five-, six- and seven-year-olds in the number of different words (NDW) and the total number of words (TNW). However, significant differences between four- and five-year-olds were not found in terms of productivity. Similar findings were reported by Muñoz et al. (2003). The development of linguistic structure seems evident during preschool and early school years, but the pace of development may start to reduce at around the age of 10 (Justice et al., 2006). However, research also suggests that the development of narrative complexity (MLU) continues even up to the early teens (Bishop, 2004; Kit-Sum To et al., 2010; Miller, 1991).

In terms of referential cohesion, it seems that as children grow up, referential ambiguities decrease and referential adequacy increases (Gutierrez-Clellen & Heinrichs-Ramos, 1993; Kit-Sum To et al., 2010; Schneider & Dubé, 1997). A four-year-old's performance at referencing can be poor because of the excessive use of pronouns (Wigglesworth, 1990) but it may become more accurate if paralinguistic means (gestures and character speech) are taken into account (O'Neill & Holmes, 2002). The understanding of a listener's needs and the communicative context by using appropriate indefinite determiners is still demanding for six-year-olds (Kail & Hickmann, 1992) and even eight-year-olds' stories lack adult competence in anaphoric relations (Hudson & Shapiro, 1991; Wigglesworth, 1990).

Event content also shows a developmental trend as measured by story grammars (Hudson & Shapiro, 1991; Schneider, Hayward, & Dubé, 2006; Stein & Albro, 1997), main ideas (Bishop, 2004) or plot structure (Berman & Slobin, 1994). Kit-Sum To et al. (2010) used semantic scores to assess story informativeness of five- to 11-year-old children's narrations and found that the semantic score was strongly associated with age. However, the mastering of story content is still demanding for four-year-olds (Lepola, Peltonen, & Korpilahti, 2009) but development takes place around this age, as has been shown by Muñoz et al. (2003) and Price et al. (2006), who reported that five-year-olds' stories contained more story grammar elements than those of four-year-olds. Schneider et al. (2006) studied the development of event content (story grammars) among children aged from four to nine. They found that the pace of development started to reduce at around the age of seven and the greatest rate of development was most clearly seen in younger age groups.

The present study

A large body of research has been carried out in the area of narration and its development, but the majority of studies have focused on children narrating in English. Since some language-specific variation is likely to happen in narratives (Hickmann, 2004), study of a less extensively investigated language such as Finnish is warranted. Narrative development has not been studied in Finnish before. As an agglutinative language, Finnish is distinctive because of its complex inflectional properties. This might be expected to have an effect on narrative productivity, since Finnish words consist of many morphemes. Finnish has 15 cases that are used to correspond to prepositions in English and, in addition, verb conjugation is rich. Thus, there can be substantially more different word tokens in Finnish samples than, for example, in English, but fewer total word tokens. In terms of referential cohesion, Finnish does not have articles and there is only one personal pronoun, *hän*, referring to both genders. But the demonstrative pronoun *se* ('it') is commonly used in spoken language to refer to people in the third person singular as well as to nominal phrases in ongoing discourse. This may have some effect on referential accuracy, since ambiguities can easily occur. Moreover, some cultural factors may affect communication in general. For example, Loukusa, Ryder, and Leinonen (2008) reported that it is quite typical for Finnish children to remain silent in a test situation if the task is found to be difficult for them. Additionally, a more implicit communication strategy seems to be typical for Finnish speakers, in comparison to, for example, English, where a more explicit style of expression is used (Jokinen & Wilcock, 2006).

Even though there is research concerning the acquisition of Finnish by means of phonology (e.g. Saaristo-Helin, Kunnari, & Savinainen-Makkonen, 2011), vocabulary (e.g. Stolt, Haataja, Lapinleimu, & Lehtonen, 2008), morphology (e.g. Nieminen, 2007) and pragmatic comprehension (Loukusa, Leinonen, & Ryder, 2007), not much is known about the connected discourse skills, i.e. storytelling, of Finnish children. Thus, the aim of this study is to explore how narrative skills develop in typically developing Finnish children, elicited by a story generation task. As previous English-language studies (e.g. Justice et al., 2006; Schneider et al., 2006; Westerveld et al., 2004) have shown, narrative skills appear to undergo substantial developments especially in the preschool and early school years. Therefore, we chose to focus on four- to eight-year-old children and to assess narratives in a story book condition that is likely to be familiar to children around this age.

The second aim of this study is to explore the relations between narrative structures, especially between productivity and event content. Previous research has detected associations between these narrative measures (e.g. Fernandez, 2013; Soodla & Kikas, 2011), but has not taken into account different productivity measures, like the commonly used number of C-units, or the number of word or different word tokens. However, the usability of productivity measures, especially in relation to the narrative content, is somewhat debatable, because the amount of words produced may not inevitably suggest the relevant content of the story. This feature has been observed among children with language impairments. Wagner, Sahlén, and Nettelbladt (1999) observed that some children may be rather verbose but produce stories with poor content. Therefore, our interest is to study further the relationship between story productivity and content among typically

developing children and to investigate whether and to what extent story productivity measures might matter in relation to story content.

Method

Participants

The data consist of narratives from 172 typically developing Finnish children, 86 boys and 86 girls, aged between four and eight years (see Table 1). The children were recruited from eight nurseries and three primary schools in the city of Oulu and from one school in the city of Tampere, Finland. Information about the children's early development was collected with a parent questionnaire. Additionally, children's language skills were assessed using the Token Test for Children, second edition (TTFC-2) (McGhee, Ehrler, & DiSimoni, 2007) and the Finnish version of the Test of Word Finding, second edition (TWF-2) (German, 2000). TTFC-2 measures understanding of verbal instructions with increasing length and linguistic complexity and was chosen to measure receptive language ability, whereas TWF-2 reflects expressive language skills as accuracy of naming is assessed. Based on the parents' reports, two children with neurological symptoms and one child whose main language spoken at home was not Finnish were excluded. In addition, four children refused to collaborate, seven four-year-old children could not pass the practice items of TTFC-2 and one child could not perform the TWF-2; these children were therefore also excluded. None of the remaining children who participated were receiving speech therapy and, according to the parental questionnaire, there had been no indications of delay or other problems in these children's language development. According to the parent questionnaire, 47.7% of the mothers and 46.5% of the fathers were upper-level employees with administrative, managerial, professional or related occupations; 27.9% of the mothers and 22.1% of the fathers were lower-level employees with administrative or clerical occupations; and 12.8% of the mothers and 18.6% of the fathers were manual workers. In addition, 8.7% of the mothers and 2.9% of the fathers were studying, retired or unemployed and 1.7% of the mothers and 5.2% of the fathers were self-employed. The information about occupation was not available for two mothers (1.2%) and for eight fathers (4.7%).

Table 1. Participant characteristics (*N* = 172).

Age group	*N*	Mean age in years	Age range in years	Boys/girls	TTFC-2: *M* (SD)	TWF-2: *M* (SD)
4-year-olds	30	4;6	4;1–4;11	16/14	*23.8* (7.8)	*107.2* (13.5)
5-year-olds	36	5;5	5;0–5;11	18/18	*30.9* (6.4)	*106.7* (13.4)
6-year-olds	39	6;6	6;0–6;10	22/17	*35.9* (4.3)	*106.4* (13.0)
7-year-olds	37	7;8	7;0–7;11	15/22	*37.7* (3.5)	89.9 (12.0)
8-year-olds	30	8;4	8;0–8;10	15/15	*38.8* (3.3)	97.2 (12.9)

TTFC-2: Token Test for Children, second edition (raw scores, maximum 46); TWF-2: Test of Word Finding, second edition (accuracy standard scores).

Procedure and transcribing

Children were tested individually and each session was videotaped for subsequent transcription. Narratives were elicited by using the Cat Story, which is a wordless picture booklet developed for the purposes of this study. The booklet consists of 12 coloured pictures. Each child was told that the story is about a kitten and was then asked to look silently through all the pictures. Next, the child was introduced to 'the naïve listener', a puppet called Herra Hakkarainen (Mr Clutterbuck), a story character well known to Finnish children. As referential cohesion may be distorted in picture narratives, at least when the context is shared with the investigator, the naïve listener procedure was used as it has been found to improve referential accuracy (Kail & Hickmann, 1992). After introducing the puppet, the instructions were given as follows: 'See, Mr Clutterbuck is going to sleep. He has his nightdress on and he wants you to tell him a goodnight story. You have to tell it carefully. Mr Clutterbuck cannot see the pictures because his eyes are closed and he does not know what happens in that story. Remember to tell him about every picture. You can start now' (procedure adapted from O'Neill et al., 2004). If children had problems getting started, they were encouraged by saying 'What happens in the story?' If a child said something (e.g. 'balloon'), the child's utterance was repeated by the examiner and he or she was praised for good performance. If the child did not respond, a specific question was asked while pointing at the picture ('What are these characters doing here?'). After that, only neutral prompts ('good, go on, and then?'), or direct repetitions of child's utterances, were used to encourage the child if necessary.

The data were transcribed orthographically using the CHAT format of the Child Language Data Exchange System (CHILDES) (MacWhinney, 2000). Narratives were segmented into C-units according to Loban's rules (see Hughes et al., 1997). The basic rule for segmenting was to treat each main clause and its subordinate clause/s as one C-unit (see Appendix 1 for the specific rules for coding). Story endings were omitted from the linguistic analysis as well as irrelevant comments, questions, mazes and unintelligible or abandoned C-units.

Narrative measures and data analysis

The measures of narration were chosen from the large body of literature reflecting productivity, syntactic complexity, referential cohesion and event content.

Measures of productivity. Three measures of productivity were chosen: the number of C-units (CU), the number of different word tokens (NDW) and the total number of word tokens (TNW). NDW was not seen as a measure of vocabulary, because the data length was not controlled for. Word tokens were used, given that the inflection of words characterizes Finnish. For example, three different Finnish word tokens can correspond to one English token 'cat' as in the following example: *kissa* 'a cat', *kissa+lta* 'from the cat', *kissa+lle* 'to the cat'.

Measures of syntactic complexity. The mean length of communication unit in words (MLCU) and clausal density (CD) were chosen as measures of syntactic complexity.

MLCU was calculated automatically using CLAN (Computerized Language Analysis) software (MacWhinney, 2000). CD was calculated by tallying all the main and subordinate clauses and dividing the total by the number of C-units. The bigger the CD value, the greater the amount of clauses, on average, in one C-unit, which reflects the syntactic complexity of the child's production.

Referential cohesion. Referential cohesion was analysed with a procedure adapted from Van der Lely (1997) and Norbury and Bishop (2003). The object for analysis was the accuracy of reference introducing and maintaining, and the use of ambiguous pronouns. The use of reference was observed from three story characters (boy, mother, seller) and from the balloon, which appears in many story events and has an essential role in the accuracy of referential use and the intelligibility of story. Each analysed reference was counted as being clear or ambiguous. The reference was coded as clear if it was explicit and understandable in the context. Personal or demonstrative pronouns were coded as being ambiguous if the referent was not clear from the previous context (*Äiti ja lapsi olivat puistossa* ja *se halusi ilmapallon*, 'The mum and child were at the park and it wanted a balloon'). The analysed aspects of referential cohesion were the use of noun phrases (*Äiti osti ilmapallon*, 'Mum bought a balloon'), personal and demonstrative pronouns (*Hän antoi sen pojalle*, 'She gave it to the boy') and deictic speech act pronouns (*Poika sanoi minä en ylety palloon*, 'The boy said I can't reach the balloon'), zero anaphora (*Poika juoksi ja ø kaatui kiveen*, 'The boy ran and ø tripped over a rock') and the possessive suffixes, which have some unique features in Finnish as they mark literal language and can be used with or without the preceding pronoun (*Hänen pallonsa jäi puuhun kiinni*, 'His balloon got stuck to the tree'). It should be noted that Finnish verbs have a subject–verb agreement system and the person is marked in the verb stem (*istu+n*, first person singular, 'I sit'). Thus, subjects are not always required (see also Appendix 1). Therefore, the reference use was occasionally analysed from the inflected verb (*En ylety palloon sanoi poika*, 'I can't reach the balloon the boy said'). Referential accuracy was calculated by tallying the clear references and dividing the number by the whole number of references used. Therefore, accuracy is the percentage of clear references used out of all references.

Event content. The purpose of scoring the event content was to get a simple and reliable measure of the amount of relevant information used in the story. To do that, the first author divided the Cat Story into 29 information units. An information unit was defined as a semantic unit, a denotation or a meaning of a clause, which is theoretically adapted from the model of text comprehension and production by Kintsch and Van Dijk (1978) reflecting the micropropositions of that model. Setting (i.e. characters and place), which is a traditional story grammar element, was also included in information units. To confirm that these predefined information units were relevant to the content of the Cat Story, a control study for adults was set up. Twenty-nine adults narrated the Cat Story and their narratives were scored according to the predefined scoring system. After analysing the adults' narratives, the scoring system was modified. Some information units were not mentioned by adults, while they also mentioned some events which were not taken into account in the scoring. Finally, information units which at least 50% of the adults mentioned were included in the final scoring system, which also consisted of 29 units (see Appendix 2).

The final scoring system reflects temporal relations because information units were only scored if they were told in the correct order. In addition, causal relations were considered. For example, a child was credited with a point only if *the rock* was mentioned in relation to *tripping*. Just saying 'there is a rock' did not justify a point. Each information unit was awarded as one point. Synonymous and dialectical expressions were accepted if they captured the main idea. To be credited with a point, the reference did not need to be stated clearly, because the referential cohesion was analysed elsewhere. For example, a child was credited with a point for the information unit *The boy tripped* for only saying *falls down*, even though the reference is ambiguous and the vocabulary is not the same but it still reflects the idea of tripping.

Reliability. Fifteen randomly selected narratives (three for each age group) were scored for inter-rater agreement by another researcher (a PhD student of logopaedics) who was not familiar with the narrative study. Inter-rater reliability was performed for the following measures: number of C-units, clausal density, event content and referential accuracy. The intra-class correlation coefficient between the two raters was .999, 1.000, .953 and .978, respectively. The reliability was not counted for TNW, NDW and MLCU because these values were automatically calculated by the CLAN software.

Results

Effect of age on the narrative variables

Descriptive statistics for the narrative variables by age are presented in Table 2. Between-age differences were examined in a series of one-way analyses of variance (ANOVA). These revealed a main effect for age group on each of the variables (CU: $F(4,167) = 4.43$, $p = .002$, $\eta_p^2 = .10$; TNW: $F(4,167) = 8.11$, $p < .001$, $\eta_p^2 = .16$; NDW: $F(4,167) = 9.96$, $p < 0.001$, $\eta_p^2 = .19$; MLCU: $F(4,167) = 8.66$, $p < 0.001$, $\eta_p^2 = .17$; CD: $F(4,167) = 4.92$, $p < 0.001$, $\eta_p^2 = .11$; References: $F(4,167) = 19.66$, $p < 0.001$, $\eta_p^2 = .32$; Event content: $F(4,167) = 25.51$, $p < 0.001$, $\eta_p^2 = .38$). Post-hoc Tukey HSD comparisons revealed that there was a significant difference ($p < .05$) between four- and five-year-olds in CU, NDW and event content and between five- and six-year-olds in referential accuracy. No differences were detected between six- and seven-year-olds or between seven- and eight-year-olds. Moreover, four-year-olds differed from older age groups in many variables and there were some significant differences between five-year-olds and the older age groups in MLCU, referential accuracy and event content. In addition, six-year-olds differed from eight-year-olds in event content. Pairwise comparisons are displayed in Table 2.

Broadly speaking the measures all show increases with age. It is of note, however, that the relatively large standard deviations indicated the heterogeneity of measurements in all variables.

Associations between narrative variables

Simple correlations. To be able to analyse the associations of narrative measures, the Pearson product-moment correlation coefficients (*r*) were calculated. Because our

Table 2. Narrative measures by age.

Age group	CU	TNW	NDW	MLCU	CD	References (%)	Event content
4 years							
M (SD)	13.70[a,b,c] (5.28)	66.40[a,b,c] (29.78)	39.93[a,b,c,d] (15.50)	4.67[a,b] (1.14)	1.14[a,b] (0.19)	45.33[a,b,c] (25.44)	12.00[a,b,c,d] (4.24)
Med (range)	14.00 (1-20)	64.50 (4-140)	37.00 (4-72)	4.76 (2.00-6.70)	1.07 (0.83-1.67)	43.67 (5.26-100)	12.50 (1-20)
5 years							
M (SD)	17.14[a] (4.94)	91.44 (30.23)	53.44[c] (17.57)	5.33[c] (1.15)	1.20 (0.19)	52.79[d,e,f] (26.09)	16.11[a,e,f] (3.48)
Md (range)	16.00 (9-33)	89.50 (25-154)	52.00 (16-98)	5.07 (2.78-8.27)	1.15 (0.93-1.82)	53.75 (8.00-100)	17.00 (8-22)
6 years							
M (SD)	16.56 (3.37)	91.46[a] (31.76)	54.67[b] (15.88)	5.43 (1.21)	1.21 (0.19)	71.03[a,d] (20.30)	17.49[b,g] (3.60)
Md (range)	16.00 (9-25)	85.00 (34-165)	52.00 (24-89)	5.43 (2.86-8.00)	1.17 (0.93-1.74)	69.70 (30.73-100)	18.00 (10-24)
7 years							
M (SD)	18.68[b] (3.37)	113.32[b] (44.94)	66.43[c] (23.99)	6.11[a] (1.18)	1.31[a] (0.21)	78.86[b,e] (18.97)	19.16[c,e] (2.70)
Md (range)	16.00 (9-25)	99.00 (72-280)	61.00 (42-176)	6.06 (4.04-9.09)	1.31 (1.00-1.91)	82.35 (26.92-100)	19.00 (13-26)
8 years							
M (SD)	17.33[c] (4.48)	109.80[c] (45.88)	65.60[d] (21.43)	6.2[b,c] (1.31)	1.31[b] (0.17)	84.69[c,f] (14.33)	19.90[d,f,g] (3.14)
Md (range)	16.00 (10-32)	99.00 (59-247)	61.50 (39-135)	6.06 (4.06-8.33)	1.32 (1.05-1.75)	89.44 (46.15-100)	20.00 (9-24)

Note. Means within columns with a same superscripts are significantly different (Tukey's HSD, $p < 0.05$).
CU = number of C-units; TNW = total number of words tokens; NDW = number of different word tokens; MLCU = mean length of C-units in words; CD = clausal density.

Table 3. Intercorrelations among narrative variables.

Variables	CU	TNW	NDW	Event content
CU	1			
TNW	.86	1		
NDW	.83	.94	1	
Event content	.57	.65	.70	1

All correlations are significant at the .001 level.

Table 4. Multiple regression models, adjusted for age and gender, explaining the event content.

Independent variables	B	SE	t	p	VIF
Model 1					
CU	.08	.07	1.07	.286	3.39
NDW	.09	.02	4.55	< .001	3.83
Model 2					
TNW	.05	.01	8.54	< .001	1.21

interest was to examine the associations between the measures of productivity (CU, TNW and NDW) and event content, only these variables were included in the following analyses. Simple correlations between the measures were strong, as shown in Table 3.

Multiple linear regression analysis. To further analyse the associations between the narrative measures, multiple regression analysis was conducted with event content as a response variable and measures of productivity as explanatory variables. To prevent multicollinearity, two different models were entered, because NDW and TNW were highly correlated. Moreover, models were adjusted for gender and age, because of the different age groups studied and because gender might have some influence, even though it is not studied further in this study. The first model (Table 4) suggests that NDW increased ($p < .001$) the event content, whereas the CU did not. This model accounted for 60.0% of the variance in the event content (adjusted $R^2 = .600$, $F(4,167) = 65.09$, $p < .001$). Next, another model was conducted, with TNW and CU as explanatory variables. However, because of the collinearity between these measures, only TNW could be entered into the model (see Table 4). This model explained 57.4% of the variance in the event content (adjusted $R^2 = .574$, $F(3,167) = 77.74$, $p < .001$) and TNW increased ($p < .001$) the event content. To evaluate the models' goodness-of-fit, Akaike's information criterion (AIC) was calculated. The model with a lower AIC value is considered to be better model (Tabachnick & Fidell, 2007). The AIC value for the first model with TNW and CU as predictor variables was 841.2 and for the second model with TNW, 851.1. Thus, the first model with NDW was clearly better than the model with TNW.

Discussion

The aim of this study was to explore the development of narrative productivity, syntactic complexity, referential cohesion and event content in Finnish children. A second goal was to explore the associations between narrative productivity and event content in order to understand the relevancy and usability of the former.

In general, this study shows that the linguistic structure of narrations reflects a subtle developmental trend. As expected, older children tended to produce longer and syntactically more complex stories than the younger ones, which is in line with previous studies (e.g. Justice et al., 2006; Westerveld et al., 2004). There were significant differences in all productivity (number of C-units, TNW and NDW) and syntactic complexity (MLCU, CD) measures between the four-year-olds and those aged seven and eight. Concerning consecutive age groups, significant differences were not detected in syntactic complexity. Instead, two measures of productivity (number of C-units and NDW) differentiated four- and five-year-olds. Our results differ from the studies by Westerveld et al. (2004) and Muñoz et al. (2003), who did not find differences between four- and five-year-olds in the measures of productivity, even though there was a tendency for the older children to produce longer stories. In terms of syntactic complexity, our results are partly in line with Westerveld et al. but differ from Muñoz et al., who obtained significant differences in MLCU between four- and five-year-olds. It should be mentioned that the analytical methods used in narrative studies vary widely, which qualifies the direct comparisons to be made between the studies. For example, Westerveld et al. used story retellings, which may have influenced the results, as the exact model of the story is given to the child.

Interestingly, examination of the descriptive data showed that a developmental trend in productivity and complexity was also seen later on, during the time of school entry, which in Finland occurs at the age of seven. Narratives are used as a source of language learning during the preschool year and the exposure to narrative language is still prominent in the first school years in Finland. Consequently, this may support the use of more sophisticated language as children encounter complex syntax and diverse vocabulary in various narrative contexts. However, only the difference in MLCU between five- and eight-year-olds achieved statistical significance and no other differences were detected between five-, six-, and seven- or eight-year-olds in productivity and complexity. Since natural variability is likely to occur in spontaneous speech samples, our relatively small sample sizes in relation to excessive within-group variation may not have been sufficient to reveal statistical significance between the age groups.

There may be some language- and task-specific aspects that should be taken into account considering the subtle trajectory seen in productivity and syntactic complexity in this study. Even though the older children's stories were longer than the younger ones' when measured by the total number of word tokens or the number of different word tokens, the number of C-units did not systematically increase after the age of five. This is a likely consequence of the way in which we segmented C-units as they were defined as 'each independent clause with its modifiers' (Hughes et al., 1997, p. 53). When a child learns to use more sophisticated language, it may result in the dropping of C-units, because the use of more complex clausal structures increases. This developing ability to use more complex syntax will increase the mean length of C-units but will reduce the

total number of C-units, which was the case in this study, as the development was somewhat better reflected in the MLCU. It can be also possible that the elicitation material used in this study may not stimulate the use of complex sentence structures sufficiently, because the events are presented in a serial order. Therefore, it was acceptable to use mostly main clauses that were coordinated by the typical narrative discourse connectives *and* and *and then.* Moreover, in Finnish, it has been found that even adult narrators especially prefer coordinating, since subordination is seen more often in literal language (Kalliokoski, 1989). Thus, dividing the samples into C-units may have resulted in rather small values in syntactic complexity measures, because the coordinating of main clauses was not actually credited at all in this study, unless the subject was elliptical or unless there was a direct quote in the C-unit. However, the use of C-units is recommended and justified, especially in transcribing the data, because the transcriptions gain high interrater reliability since the rules for segmentation are clear.

The more pragmatic aspects of narration, referential cohesion and event content, proved to capture development better than linguistic measures, since significant differences were also detected between some of the older age groups. With regard to the event content, our results support the findings of increasing informativeness with age (Bishop, 2004; Kit-Sum To et al., 2010), since there were significant differences between four-year-olds and the older age groups, and between five-year-olds and those aged seven and eight, as well as between six- and eight-year-olds. Thus, the older children could generate a story that included the chronologically ordered main events, which were relevant to the overall story schema and told with appropriate vocabulary. Concerning the consecutive age groups, an evident development trend was seen between the ages of four and five. The importance of this age transition in the mastering of story structure is also suggested in other studies (Muñoz et al., 2003; Price et al, 2006). However, fictive story generations may be most suitable for younger children, since no differences were detected between seven- and eight-year-olds in this study. A similar trend has also been noted by Schneider et al. (2006) with a story grammar analysis. In the present study, the event content was measured in a relatively simple way, through information units. It is possible that children could receive some points just by describing pictures, since this analysis does not give insight into the processes relating to narrative structure per se, such as episodes. However, information units are essential, since they create the overall plotline and are constituents of story coherence (Kintsch & Van Dijk, 1978). Moreover, in this study the oldest age groups did not yet reach a ceiling in the information unit score, which implies that the narrative skills are not fully acquired by early school years.

As can be expected, the development in referential accuracy was seen to increase in line with age, which supports the previous findings from different languages, such as Cantonese (Kit-Sum To et al., 2010), Spanish (Gutierrez-Clellen & Heinrichs-Ramos, 1993) and English (Schneider & Dubé, 1997). In the present study, four- and five-year-olds differed from the older age groups, and there was a significant difference between five- and six-year-olds. Generally, the older children could maintain clear references throughout the story – referential accuracy was over 80% for seven- and eight-year-olds. However, there were still some older children whose reference use was inaccurate and about half of the references used by the four- and five-year-olds were ambiguous. As accurate referential cohesion requires an understanding of the listener's needs, the utilization

of context and the precise use of linguistic devices, the mastering of referencing is a demanding task. It is plausible, as suggested by Hudson and Shapiro (1991) and Johnston (2008), that the precise use of cohesive devices in narration is sophisticated only after the management of story content is established. To be precise, when the story structure is mastered and not much processing is needed to maintain coherence, there is more capacity to focus on cohesion. The results of this study may support the hypothesis that the use of accurate referencing and the increase of event content seem to have parallel developmental trends. In other words, the more information there is, the more accurate the reference use becomes.

The current study shows that the widely used measures of productivity, the number of C-units, the total number of word tokens (TNW) and the number of different word tokens (NDW) showed varying associations to event content. Positive correlations were observed between all productivity measures and event content, as in previous studies (Fernandez, 2013; Soodla & Kikas, 2011). However, regression analysis showed that the number of C-units was not a significant explanatory variable. Both the NDW and TNW were significant in explaining the event content, but the model with NDW was found to be better. This finding is plausible, especially in Finnish with its rich inflectional morphology. The overall meaning of narration is conveyed through the semantics of the words used. As semantics is also expressed by morphological inflections, it is possible that NDW may capture more about semantics than TNW does. The more different word forms there are, the more meaning there is likely to be. Therefore, according to our results, it can be supposed that NDW is a narrative measure that reflects not only productivity but also semantic skills. It has been previously suggested that NDW (in word types) is a measure of general semantic diversity when calculated from the fixed amount of words in English (Leadholm & Miller, 1992). Instead, as Leadholm and Miller have discussed, TNW (calculated from standard length) may be a measure that reflects more general language proficiency. If narration is only seen as an expressive language measure, then pure productivity may have some unique value. If, however, narration is seen as a complex linguistic and cognitive task, productivity could be seen in relation to some other measure, such as informativeness of the narratives. In that case, the use of NDW instead of TNW might be recommended. With regard to the number of C-units, its use as a narrative measure should be considered, as it did not prove to be useful in explaining the event content, nor did it capture the development after the age of five.

This is the first study to be carried out concerning narrative development in Finnish children. There are some limitations, however, in generalizing these results and a relatively large within-group variability should be taken into account when interpreting the results of this study. Considerable variation in narration is also detected elsewhere (Justice et al., 2006; Kit-Sum To et al., 2010; Muñoz et al., 2003) and even in adults' narrations (Berman & Slobin, 1994). In addition, it is traditionally recommended that language sample analysis should consist of at least 50 utterances (Miller, 1996). In this study, this criterion was not fulfilled, because none of the children produced narratives as long as that; consequently, these short samples may not represent the entire linguistic potential of the participants. The scarcity of C-units is not, however, a unique finding in narrative studies (e.g. Justice et al., 2006) and Heilmann et al. (2010) have shown that

language sample measures can be reliable and stable, despite the length of the sample. Considering our productivity measures, we used word tokens, because of the importance of morphological inflections in Finnish. This may qualify the comparisons to other studies, since typically, at least in English, different word types are used. Moreover, our elicitation method, the Cat Story, is new and was developed for the purposes of this study. Therefore, direct comparisons with other studies with similar elicitation material cannot be made. In addition, validity and reliability of the Cat Story should be investigated further in the future.

To summarize, this study confirmed a developmental trend in the narrative skills of Finnish children that could be detected by a story generation task. This task seems to be particularly suitable for capturing development among younger children, since an evident trajectory was seen between four- and five-year-olds in the measures of productivity (regardless of TNW) and event content. This may be the time when narrative skills develop rapidly. Descriptive data indicated a developmental trend in all measures, regardless of the number of C-units after the age of five, but the development was particularly seen in more pragmatic narrative measures, in referential cohesion and in event content. This suggests that it is useful to assess narrative production both in linguistic and more pragmatic terms. The developmental trend seen in Finnish children seems to resemble the development reported in other languages. That is, older children's stories tended to be longer and syntactically more complex, as well as more accurate in terms of referential cohesion. Moreover, older children's stories included more relevant information. Concerning Finnish, while it would certainly be valuable to have cross-linguistic developmental studies using the same elicitation material and measures, we can agree with the remark made by Berman and Slobin (1994, p. 40) that 'across languages there is a common developmental pattern towards increasing cohesion and coherence'. Our study also underscored that the relationship between narrative productivity and event content is important. However, some productivity measures should be interpreted with caution. As a narrative is a multidimensional task, its measures should be seen in relation to the whole narrative task. From this point of view, the number of different word tokens that combine both the inflectional and lexical skills seems to be a useful measure of productivity in children's narrations, at least in languages with rich morphology.

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Appendix I

Rules for counting C-units and clauses in Finnish

Basic rule. A main clause and its subordination clauses form one C-unit (Loban, 1976 cited in Hughes et al., 1997): *Poika kaatui koska hän kompastui.* 'The boy fell down because he stumbled.'

Elliptical structures. If the subject was elliptical, coordinated main clauses were considered as one C-unit (otherwise as two C-units): *Poika kaatui ja ø alkoi itkeä.* 'The boy fell down and ø started to cry.' Some elliptical verb forms were problematic. For example, the following was analysed as two C-units and as two main clauses, although the last part of the sentence does not completely fulfil the criteria of a clause because of the elliptical part of the predicate: *Poika ei ylety palloon/ja ei äitikään (ylety).* 'The boy can't reach the balloon/and neither (can) the mother.' This latter clause was credited as a clause, because the use of elliptical structures is typical in spoken Finnish, it is pragmatically acceptable and they show advanced language competence when used in a proper way.

Clauses without subjects. In Finnish, the definition of a clause does not require a subject, so the predicate on its own can form a minimal clause. First- and second-person subject pronouns can be omitted because the person can be seen from the inflected verb. However, the subject words of the third person are usually required. Some children used clauses without third-person subjects. These clauses were considered independent

C-units and separate main clauses, because the subject was not elliptical. Rather, it was incorrectly missing: *Sitten kaatui/ja koitti ottaa palloa/ja ei saanut.* 'Then fell down/and tried to take the balloon/and didn't get it.'

Direct and indirect quotes. Direct quotes were treated as one C-unit unless they were followed by another direct quote: *Poika sanoi en saa palloa/Voitko auttaa?* 'The boy said I can't get the balloon/Can you help?' These direct quotes were more like coordinated main clauses than subordinated clauses and therefore analysed here as main clauses. If the quote was indirect, it was treated as a subordinate clause: *Poika sanoi että hän ei saa palloa.* 'The boy said that he can't get the balloon.'

Appendix 2

Event content scoring sheet

The boy is not credited as a character because it is given to the child before narrating the story.

Event
Mother Cat
Seller
Park
Boy wants/gets a balloon
Boy runs/plays with a balloon
Boy is happy
Boy trips up
Stone (in relation to tripping)
Balloon flies away
Balloon gets stuck in the tree
Boys is sad/cries OR hurts his knee
Mum comforts
Boy tries to reach the balloon
Boy can't get the balloon
Mum tries to reach the balloon
Mum stands on a bag
Mum can't get the balloon
Boy goes to seller
Boy asks for help OR says what happened
Seller helps OR comes with a boy
Seller has a ladder
Seller climbs the tree
Seller tries to reach the balloon
Balloon pops
Boy is sad/cries
Mum is sad
Seller is sad/sorry
Seller gives a new balloon
Boy is happy
___/29 Total

Note: Each mentioned item receives a score of 1.