

UDK 811.163.42'276.3-053.5

811.163.42'367

Izvorni znanstveni rad

Rukopis primljen 8. XI. 2021.

Prihvaćen za tisak 25. III. 2022.

doi.org/10.31724/rihjj.48.1.15

Sara Košutar

Matea Kramarić

Gordana Hržica

Edukacijsko-rehabilitacijski fakultet Sveučilišta u Zagrebu

Odsjek za logopediju

Borongajska cesta 83f, HR-10000 Zagreb

orcid.org/0000-0002-8882-9600

sara.kosutar@erf.unizg.hr

orcid.org/0000-0002-3161-7893

matea.kramaric@erf.unizg.hr

orcid.org/0000-0001-6067-9148

gordana.hrzica@erf.unizg.hr

AGE-RELATED DIFFERENCES IN THE EXPRESSION OF CAUSAL RELATIONSHIPS DURING NARRATIVE PRODUCTION OF CROATIAN CHILDREN

A successful narration relies on the ability of an individual to express a coherent sequence of temporally and causally related events organised around a specific theme, and this skill typically develops in early preschool age. Narrative coherence can be assessed by sequences or elements of story grammar. According to the causal network model, story grammar is viewed as an interconnected network of causal relationships, including enabling, physical, motivational, and psychological relationships. The importance of causal coherence has been recognised in many studies dealing with narrative discourse from the developmental perspective. However, previous studies have reported inconsistent results with respect to the use of different types of causal relationships in the narratives of children of different ages. In the present study, we aimed to examine the differences between preschool and school children in their ability to express causal relationships, both overall and specific, in the narratives that they produce. Participants were monolingual Croatian-speaking children with typical language development, who were stratified into two groups: preschool ($n = 41$, mean age = 6;3 years) and school children ($n = 50$, mean age = 8;4 years). Narratives were collected using the *Multilingual Assessment Instrument for Narratives* (MAIN), which was adapted to Croatian. The results show significant differences between the two groups of

children in the overall proportion of causal relationships expressed, as well as specifically in the proportion of motivational relationships. There were no significant differences between the groups in production of enabling, physical, or psychological relationships. School children expressed more causal relationships overall than preschool children, as well as specifically more motivational relationships. As far as we know, this study is the first to investigate causality in the narratives of monolingual Croatian-speaking children using the causal network model. Our results only partially confirm the findings of previous studies, suggesting the need for further research to better understand the development of causal coherence in children's narrative discourse.

1. Introduction

Narrative discourse is a rich source of information about the child's linguistic, cognitive, and sociocultural abilities at different stages of development (see Botting 2002; Justice et al. 2006). Storytelling relies on the ability of a child to present a coherent sequence of temporally and causally related events organised around a specific theme (Karmiloff and Karmiloff-Smith 2001; Aksu-Koç and Aktan-Erciyes 2018). Since structuring discourse requires advanced language skills, complete mastery of this aspect of narrative discourse occurs during later language development (around 10 years).

Research of narrative structure is usually conducted at a microstructural or macrostructural level (Gagarina et al. 2012; Gagarina et al. 2019). At the microstructural level, the focus is on assessing the use of vocabulary, complexity of syntactic structures, use of connectives, choice of reference, and degree of fluency. At the macrostructural level, narratives are evaluated based on coherence, which refers to a global representation of the meaning of the story and connections made with different story elements (e.g., setting, goal, attempt, and outcome). At the level of narrative structure, causal relationships have a special status.

Causality is fundamental in human thought and perception (Graesser, Singer and Trabasso 1994; Goldman, Graesser and Van den Broek 1999; Sanders and Sweetser 2009): causality helps the narrator to construct a coherent story and the receiver to comprehend it. Several studies have shown that for children and adults, causally related events are more important than those that are not, they are more easily recalled and verified, and they are more rapidly processed (Trabasso, Secco and Van den Broek 1984; Trabasso and Sperry 1985; Trabasso and

Van den Broek 1985; Myers, Shinjo and Duffy 1987; Wolman 1991; Van den Broek 1996; Lorch et al. 1999; Van den Broek et al. 2000; Sanders and Noordman 2000; Louwarse 2001; Wenner 2004). A child's ability to understand causal relationships can also predict their literacy skills (Van den Broek et al. 2000). Therefore, children must develop the ability to comprehend and express causal relationships in order to build a strongly coherent narrative.

1.1. Narrative coherence

The two most influential approaches used in the study of narrative coherence are high-point analyses (Labov and Waletzky 1967) and story grammar (SG) models (Mandler and Johnson 1977; Stein and Glenn 1979). Research on personal narratives usually focus on high-point analyses, while fictional narratives are analysed using SG models, where several story components can be distinguished (Peterson and McCabe 1983; Aksu-Koç and Aktan-Erciyes 2018). The first component is the *setting*, which is used to introduce the time, place, and characters of the story. The setting is followed by one or more *episodes*, where each episode consists of an *initiating event*, for example, a problem that the main character must solve. The initiating event triggers the character's internal response or reaction to the problem, which is associated with the *goal* (i.e., solving the problem). The *attempt* represents the actions taken by the main character to solve the problem. This leads to an *outcome*, which may or may not be successful, thereby inducing a reaction or emotional response in the character.

The SG model has been successfully adopted under the Multilingual Assessment Instrument for Narratives (MAIN) in the Language Impairment Testing in Multilingual Settings (LITMUS) programme (Gagarina et al. 2012; Gagarina et al. 2019). MAIN involves a multidimensional macrostructural assessment that distinguishes between story structure (setting and three episodes, including all elements contained therein) and story complexity (combinations of episode components such as goal, attempt, and outcome). Assessing story structure examines the quantity of SG, while assessing story complexity examines the quality of story structure. *Goal-attempt-outcome* sequences are very important for narrative comprehension and production since narrative coherence depends on encoding actions as intentional attempts once the character's goals have been

identified (Fichmann et al. 2017). Complete episodes with clear goal-attempt-outcome sequences contain the greatest structural complexity (Stein and Glenn 1979; Trabasso and Nickels 1992; Westby 2005, 2015; Gagarina, Bohnacker and Lindgren 2015).

Since goal-attempt-outcome sequences are based on causal relationships, they are essential to the production of highly coherent narratives (Trabasso, Van den Broek and Suh 1989; Trabasso and Nickels 1992). However, neither the traditional SG models nor MAIN have considered coherence relations and their association with story structure. Including both aspects of coherence in a single model may provide a different view of how story complexity is expressed through causality in the course of narrative development.

1.2. Causal network model

Recognition of the importance of both aspects of narrative coherence – goal-attempt-outcome sequences and coherence relations – led to a unified discourse analytic model, in which the goal-attempt-outcome sequence is viewed as an interconnected network of causal relationships (Trabasso and Sperry 1985; Trabasso and Van den Broek 1985; Trabasso, Van den Broek and Suh 1989; Trabasso and Nickels 1992; Trabasso and Wiley 2005). According to this model, there are four types of causal relationships that can be established between higher-level elements: *enabling*, *motivational*, *psychological*, and *physical*. The type of causal relationship depends on criteria of *necessity* and *sufficiency*.

The necessity criterion requires the application of a counterfactual test. If A (antecedent) did not happen under the circumstances of the story, then B (consequent) would not happen. If the counterfactual is true under the circumstances of the story, then A is the cause of B. The necessity criterion is a prerequisite for identifying pairs of clauses that are directly connected by causality. Here the transitivity of clause pairs allows directly connected pairs to be combined into causal chains and networks.

The sufficiency criterion, for its part, requires the identification of the relationships between clauses that are connected by the necessity criterion. In the case of a pair of clauses where the occurrence of A is necessary for the occurrence of

B, one must determine whether A contains goal information: if it does, then the relation is *motivational*, because A is necessary and sufficient for B to occur. If A is necessary and sufficient for B, but does not contain goal information, then the question becomes whether B contains an internal state caused by A: if B contains an internal state, then the relation is considered *psychological*. If B does not involve an internal state, then one must determine whether A is sufficient under the circumstances for B: if A is necessary and sufficient for B, then the relation is considered *physical*. If A is necessary but not sufficient for B, then the relation is considered to be *enabling*.

Causal relationships can vary in their complexity. Enabling relationships are the least complex because the antecedent A is necessary but not sufficient for the consequent B. Physical relationships have intermediate complexity since the antecedent A is both necessary and sufficient for the consequent B, while motivational and psychological relationships are highly complex. Motivational relationships require goals to motivate attempts and outcomes, while psychological relationships involve attempts and an initiating event to motivate internal responses.

The causal network model has been successfully applied in several studies dealing with fictional narratives. A model based on causal relationships provided an explanation for the variance observed in story comprehension and recall by school children (Trabasso, Secco and Van den Broek 1984), while a comparison of the causal network and the story grammar model showed that the former was a more reliable predictor of story recall by adults (Trabasso and Sperry 1985). In addition, causal network model was able to effectively indicate age-related differences in the use of causal relationships during the narrative production by preschool and school children (Trabasso and Nickels 1992). A review of studies on children with autism spectrum disorders confirmed that the causal network system can assess narrative coherence (Diehl, Bennetto and Young 2006). Nevertheless, although this model has been used to assess narratives produced by mono- and bilingual children in typical and atypical populations, the various studies have not always given consistent results (see Kupersmitt et al. 2014; Fichmann et al. 2017; Kupersmitt and Armon-Lotem 2019).

1.3. Development of causal coherence

The importance of causal coherence has also been recognised in studies that address the development of narrative competence. An individual's ability to understand and express causal connections while structuring a narrative can increase from early preschool to school age [see Gutierrez-Clellen and Iglesias 1992 (Spanish); Berman and Slobin 1994 (English, German, Hebrew, Spanish); Sah 2015 (Chinese)]. This ability to make causal connections develops in the context of one's general ability to maintain the global organisation of the story (Peterson and McCabe 1983; Bohnacker 2016; Lindgren 2018). Studies have shown that children's narratives at an early age (< 4 years) are primarily descriptive and short: they do not mention the setting (time, place, and characters), or establish temporal or causal links. Around the age of four years, children begin to produce narratives based on simple, causally linked routine events that are known as reactive sequences (Stein and Albro 1997). However, these narratives do not contain complex causal sequences. From the age of five years, a child's narrative contains explicitly stated goals (Trabasso and Nickels 1992; Trabasso et al. 1992), moving from descriptive and reactive sequences to complex episodic organisation with causal connections. As children grow older, they are able to explicitly express all relevant macrostructural elements (time and place, initiating event, emotional status of characters, and motivations), as well as complete goal-attempt-outcome sequences. By the age of nine or 10 years, children's narratives typically resemble those of adults.

Studies using the causal network model to examine the development of causal relationships have focused on comparing the narratives of mono- or bilingual children who show typical language development or who have developmental language disorders (Kupersmitt et al. 2014; Kupersmitt and Armon-Lotem 2019). Kupersmitt et al. (2014) investigated the development of causal relationships in the narratives of 6- and 8-year-old monolingual children speaking Hebrew and bilingual children speaking it as a second language. They found that monolingual children expressed psychological relationships more frequently than other types of relationships, with > 80% of the narratives produced by both 6- and 8-year-olds containing at least one psychological relationship. While physical relationships were unexpectedly rare in both age groups, the frequency of enabling and motivational relationships fell somewhere in between that of psychological

and physical relationships. The same study went on to show that motivational and enabling relationships showed age-related differences, while psychological and physical relationships remained stable across age. Similar developmental path was observed in the narratives of bilingual children speaking Hebrew as a second language.

Kupersmitt and Armon-Lotem (2019) examined causal relationships in the narratives of 5- and 7-year-old monolingual children speaking Hebrew and bilingual children speaking it as a second language. They found that about one-third of the children were able to express causal relationships. In contrast to Kupersmitt et al. (2014), enabling and motivational relationships were challenging for all children and rarely occurred in their narratives. Consistent with Kupersmitt et al. (2014), physical relationships were rare and psychological relationships were frequent. However, these findings are inconsistent with the results of previous studies reporting that enabling relationships are relatively common in the narratives of preschool children. An assessment of the production of causal relationships in the narratives of 3-, 4-, 5-, and 9-year-old English-speaking children and adults showed that all age groups produced more enabling relationships than other types of relationships (Trabasso and Nickels 1992). Although enabling relationships were prevalent in the narratives of 4-year-olds, their frequency began to decline after age four. The frequency of motivational relationships increased with age, with 4-year-olds expressing them least often. Physical relationships showed no age-related differences and were rarely observed in the narratives of all age groups. Psychological relationships were frequently observed in the narratives of 3- and 9-year-olds, but their frequency did not increase with age. Overall, there was no significant difference between the 9-year-olds and the adults in the frequency of any of the four types of relationships.

Several studies have reported that causality develops early in children's narratives. For example, Kuvač (2004) found that Croatian children as young as four years old were able to use causal connectives to associate events in a narrative. Košutar and Hržica (2021) examined the frequency and semantics of connective *and* in narratives of Croatian children. They found that the frequency of using *and* to express causal relationships increased from age four to eight years, after which it decreased, thereby following an inverted U-curve. These studies suggest that causality in narratives develops gradually, but they did not address the

question of age-related differences in the expression of causal relationships. As far as we know, there are no other studies examining the development of causal narrative coherence in Croatian.

Studies that analysed causal relationships in the development of narrative structures by comparing mono- and bilingual children with typical language development or developmental language disorders indicate that in monolingual children, there is no single pathway for the development of the four types of causal relationships (Kupersmitt et al. 2014; Kupersmitt and Armon-Lotem 2019). However, these studies used different elicitation material and the resulting stories differed in the types of causal relationships that needed to be expressed in order to achieve narrative coherence. Thus, how and when different types of causal relationships develop remains unclear.

2. Aim and hypotheses

In the present study, we aimed to investigate the differences between narratives produced by monolingual Croatian-speaking preschool and school children in terms of the total quantity of causal relationships, as well as the quantity of each of the four types of causal relationships. Based on previous studies, we proposed the following hypotheses:

H1: There will be differences between the two groups of children in terms of the total proportion of causal relationships in narrative production, with older children expressing more causal relationships.

H2: There will be differences between the two groups of children in terms of the proportions of enabling and motivational relationships in narrative production, with older children expressing more such relationships.

H3: There will be no differences between the two groups of children in terms of the proportions of physical or psychological relationships.

3. Methods

3.1. Participants

We recruited a total of 91 monolingual Croatian-speaking children with typical language development from kindergartens and one elementary school in Zagreb. To confirm that the children had no language difficulties, all underwent two standardised language tests: the Croatian version of the *Peabody Picture Vocabulary Test* (PPVT-III-HR; Dunn et al. 2010) and the Croatian version of the *Test for the Reception of Grammar* (TROG-2: HR; Bishop et al. 2013). Children whose scores were two standard deviations (*SDs*) below the average for their age group were excluded from the sample.

Children were divided into a preschool group (mean age $M = 6;3$, $SD = 0;6$) and a school group (mean age $M = 8;4$, $SD = 0;4$). Each group was balanced in terms of gender (see Table 1) and parental education. In both groups, about 40% of mothers had completed secondary education and 60% had completed tertiary education, while nearly equal proportions of fathers had completed secondary or tertiary education. The data analysed in this study were collected during the course of two projects: Multilevel approach to spoken discourse in language development (UIP-2017-05-6603) and Language Dominance of Bilingual Speakers Perceived as Balanced (PISCRTJQ4Y). The projects were approved by the Croatian Ministry of Science and Education (Class: 602-02/18-03/00424, Reg. No. 533-05-18-0004; Class: 602-01/14-01/00642, Reg. No. 533-25-14-0002) and by the participating institutions. All participants provided verbal consent to take part in the study and their parents signed a written consent form.

Table 1: Demographic characteristics of participants ($N = 91$)

age group	chronological age (years; months)				gender	
	<i>n</i>	<i>M</i>	<i>SD</i>	range	male	female
preschool	41	6;3	0;6	5;1-6;11	19	22
school	50	8;4	0;4	7;10-9;0	28	22

Note: n = number of participants; M = mean; SD = standard deviation

3.2. Materials and procedure

Oral narrative samples were elicited using the LITMUS Multilingual Assessment Instrument for Narratives (MAIN; Gagarina et al. 2012; Gagarina et al. 2019), which was adapted to Croatian (Hržica and Kuvač Kraljević 2012, 2020). To adhere to the original procedures outlined in MAIN, the children were given one of two stories used for the storytelling task: half of the participants were given the *Baby Goats* story and the other half, the *Baby Birds* story. Both stories consist of six coloured pictures and are matched in terms of the numbers of main characters and goal-attempt-outcome sequences. Several studies have reported no significant differences in the macrostructure between *Baby Goats* and *Baby Birds* stories when narrated by children (e.g. Bohnacker 2016; Lindgren 2018), although some studies have found significant differences (e.g. Gagarina et al. 2019; Lindgren 2019). In the present study, we found no significant differences in the macrostructure between the two stories when narrated by children: in the pre-school group $t(39) = 0.78, p = .439$ and in the school group $t(48) = 0.93, p = .356$.

Children were tested individually in a quiet room, where only the participant and the interviewer were present. The study procedure differed from that described in the MAIN manual (Gagarina et al. 2012; Gagarina et al. 2019) because the picture prompts were displayed on a 15.6-inch computer screen, rather than on paper. Nevertheless, we adhered to the procedures recommended for online testing available on the MAIN website (e.g. Hamdani et al. 2021). First, the participant had to select a story by clicking on one of the four differently coloured squares. In reality, the act of selection was staged: the interviewer had already preselected the story. Next, a series of six pictures appeared on the screen, three in the top half and three in the bottom half. The child had to press a key on the keyboard to scroll through the picture sequence. With each keystroke, a pair of pictures was displayed. To control for the effects of shared knowledge and joint attention, only the child could view the picture prompts while telling the story.

3.3. Data analysis

The recorded narratives were transcribed and divided into clauses. Each clause was assigned a SG category based on the MAIN scoring sheet: initiating event,

goal, attempt, outcome, or reaction. Next, causal relationships were coded according to the scheme provided by Fichman et al. (2017), who applied the causal network model developed by Trabasso and associates (e.g. Trabasso and Sperry 1985; Trabasso and Wiley 2005) to the MAIN story structure. In this approach, causal relationships are defined as connections between the SG elements. Enabling relationships connect SG elements between episodes (e.g., an attempt in episode one to a goal in episode two), while motivational and physical relationships connect elements within each episode (motivational relationships connect goals to attempts, and physical relationships connect attempts to outcomes). Finally, psychological relationships connect internal responses to attempts, outcomes, or goals. Since the number of SG elements in MAIN is fixed, the children could express up to a finite number of causal relationships in their narratives: six enabling, three motivational, three physical, and three psychological (15 in total).

Participants received one point for each causal relationship used in their narrative. We then calculated the total number of causal relationships expressed by each child, as well as the number of individual types of causal relationships expressed in their narrative. Next, we calculated the proportion of causal relationships expressed by dividing the number of causal relationships used by a participant by the total number of possible causal relationships: these proportions were calculated for the total number of causal relationships, as well as for each type of causal relationship. Mann-Whitney U and χ^2 tests were performed to test the difference between the two groups of children in the total proportion of causal relationships, as well as in the proportions of enabling, motivational, physical, and psychological relationships. Median values were calculated as a measure of central tendency, and interquartile range and range (minimum to maximum) were calculated as measures of dispersion. These descriptive statistics and non-parametric tests were chosen since all distributions showed significant skew. All analyses were performed in SPSS 23.0.

4. Results

Table 2 lists median values and ranges of proportions of causal relationships expressed in participants' narratives. The results of the Mann-Whitney U test showed a significant difference between preschool and school children in the

total proportion of causal relationships ($U = 693.00, p = .008, r = .27$), as well as in the proportion of motivational relationships ($U = 643.00, p = .001, r = .33$). School children expressed more motivational relationships and causal relationships overall than preschool children. However, contrary to our expectations, we found no significant differences in the proportion of enabling relationships expressed ($U = 809.00, p = .081, r = .18$).

Physical and psychological relationships were sparsely represented in the narratives of both groups of children (median scores were zero). Since none of the participants expressed more than one psychological relationship, we calculated the proportion of children in each group who used this type of causality in their narratives. Only 11 (27%) preschool children and 17 (34%) school children expressed a psychological relationship (see Figure 1). We used a χ^2 test to analyse the difference between the two groups and found no significant difference ($\chi^2(1, N = 91) = 0.54, p = .461, V = .08$) in the proportions of preschool and school children who expressed a psychological relationship in their narratives. Also, consistent with our hypothesis, we found no significant differences between the two groups in the proportion of physical relationships expressed in their narratives ($U = 813.50, p = .053, r = .20$).

Table 2: Proportions of causal relationships expressed in narratives of preschool ($n = 41$) and school children ($n = 50$)

type of causal relationship	preschool			school		
	<i>Mdn</i>	<i>IQR</i>	range	<i>Mdn</i>	<i>IQR</i>	range
enabling	.34	.50	.00-.83	.42	.67	.00-1.00
motivational	.34	.67	.00-1.00	.67	.67	.00-1.00
physical	.00	.34	.00-.67	.00	.34	.00-1.00
psychological	.00	.34	.00-.34	.00	.34	.00-.34
total	.27	.34	.00-.60	.34	.40	.07-.80

Note: *Mdn* = median; *IQR* = interquartile range

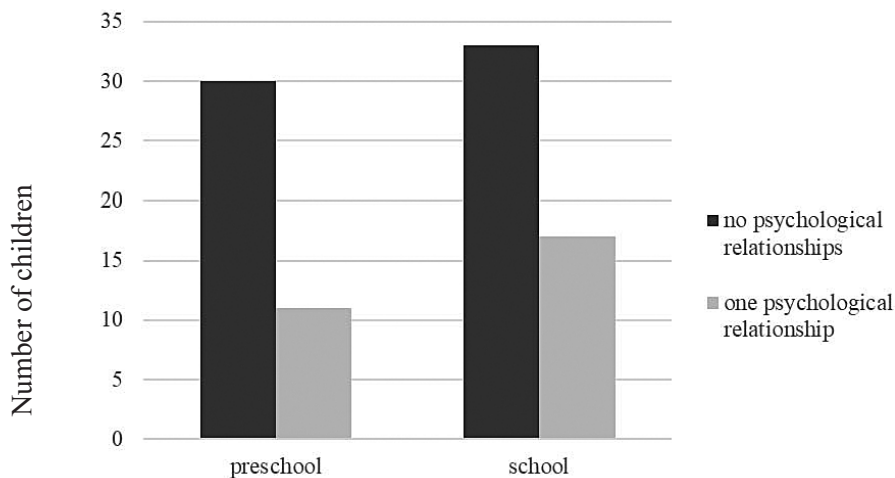


Figure 1: Numbers of preschool and school children who did or did not express psychological relationships in their narratives

5. Discussion

In this study, we analysed causal relationships in the narratives of monolingual Croatian-speaking preschool and school children. We used the causal network model proposed by Trabasso and associates (Trabasso and Sperry 1985; Trabasso and Van den Broek 1985; Trabasso, Van den Broek and Suh 1989; Trabasso and Nickels 1992; Trabasso and Wiley 2005) to examine age-related differences in expressing causal relationships, with the aim of gaining a better understanding of when children develop the ability to express different types of causal relationships. This study focused on the number of causal relationships, overall and by specific type, expressed in children's narratives. The causal relationships that we observed connected SG elements (Stein and Glenn 1979) both within and between episodes of the story.

First, we examined differences between two groups of children (preschool and school children) in the total proportion of causal relationships in their narratives. School children generally expressed more casual relationships than pre-

school children. These results are consistent with previous studies showing that the ability to express causal relationships increases with age, from preschool to school [Gutierrez-Clellen and Iglesias 1992 (Spanish); Berman and Slobin 1994 (English, German, Hebrew, Spanish); Sah 2015 (Chinese)]. Given that these results have been obtained with different story elicitation materials in different languages, the age-related increase in the number of causal relationships expressed by children appears to be robust. These findings are quite important since studies using other scales, such as counting elements of story grammar (SG), have failed to consistently demonstrate developmental differences.

The most widely used method of assessing the macrostructure of narratives is based on the SG elements produced by the participant. However, previous studies that have measured narrative ability in terms of the number of SG elements have reported mixed results. For example, Lindgren (2019) reported differences in the number of macrostructural elements expressed in the narratives of children between the ages of four and five years, but not in children between the ages of five and seven years. Similarly, Blom and Boerma (2016) showed that group of typically developing children showed similar results in SG in two time points (children were five or six at wave 1 and six or seven at wave 2). Studies comparing mono- and bilingual children with typical language development or with developmental language disorders have also shown a similar trend: thus, SG analysis on its own may not be subtle enough to distinguish the narratives of the two groups of children (Fichman et al. 2017; Kupersmitt and Armon-Lotem 2019). The present study showed that the total proportion of causal relationships may be superior to SG scores for detecting differences between younger and older individuals, or between typically developing children and children with language disorders (Kupersmitt et al. 2014; Kupersmitt and Armon-Lotem 2019). Compared to previous studies using the causal relationships analysis of MAIN stories, our approach is novel since we focused on the differences in the total proportion of causal relationships expressed by two groups of monolingual, typically developing children, while previous studies focused on mono- and bilingual children with or without developmental language disorders.

Although several studies have examined causal relationships in the course of narrative development, few have focused on specific types of causal relationships. Based on the causal network model, goal-attempt-outcome sequences are

linked by four types of causal relationships: motivational, enabling, physical, and psychological. We examined age-related differences in the proportions of the four types of causal relationships, and found that school children frequently expressed motivational relationships ($Mdn = .67$, $IQR = .67$) and enabling relationships ($Mdn = .42$, $IQR = .67$), but rarely physical or psychological relationships (both $Mdn = .00$, $IQR = .34$). Pre-schoolers showed similar tendencies: motivational ($Mdn = .34$, $IQR = .67$) and enabling relationships ($Mdn = .34$, $IQR = .50$) were frequently expressed, while physical and psychological relationships were rarely expressed (both $Mdn = .00$, $IQR = .34$).

We predicted that school children would express more motivational and enabling relationships than preschool children, but we found that this was true only for motivational relationships. According to Trabasso and Nickels (1992), motivational relationships are considered to be difficult for preschool children: they emerge gradually by age five and their frequency does not approach the value for adults until the age of nine. Both motivational and enabling relationships involve goals: in motivational relationships, goals are obligatory, whereas in enabling relationships, they are optional (enabling relations can occur between two attempts, or between an attempt and a goal). Since goals are complex elements in the structure of a story, pre-schoolers are more likely to encode fewer goals and therefore overlook certain motivational relationships, resulting in an age-related difference in the expression of such causality. Such a difference was reported by Kupersmitt et al. (2014) between children aged six or eight years, as well as by Trabasso and Nickels (1992) when they compared pre-schoolers (3-5 years old) to 9-year-olds. In contrast, Kupersmitt and Armon-Lotem (2019) found that motivational relationships were similarly rare in narratives produced by children five or seven years old.

In the present study, physical and psychological causal relationships were similarly infrequent in the narratives of both groups of children. The children were able to express only one of three possible psychological relationships in their narratives. Our findings are consistent with previous research showing no significant age dependence in the narrative expression of physical relationships (Kupersmitt and Armon-Lotem 2019) or psychological relationships (Kupersmitt et al. 2014).

It is important to note that the present study applied the causal network model to narratives elicited using MAIN. The macrostructure of MAIN stories is generally considered to hold across languages (Trabasso and Nickels 1992; Berman 2001; Paradis et al. 2001), yet further study should verify and extend our results for other languages. Our study focused on quantitative measures, but the best linguistic methods for analysing causal relationships are unclear. Further qualitative and quantitative research could provide insights into this question and its potential age dependence. Previous studies have used different elicitation materials to derive narratives, such as the wordless picture book “*Frog, Where Are You?*” (Mayer 1969). Differences in the elicitation material may lead to variability in the length and structural features of the narrative. Previous studies have shown that longer texts are more likely to include causal relationships, particularly psychological relationships, but not necessarily more complex types of causality, such as enabling relationships (Kupersmitt and Armon-Lotem 2019). Therefore, future studies should focus on comparing similar stories between different groups of participants in order to gain deeper insights into causality in narrative discourse.

6. Conclusion

This study showed that age can influence the proportion of causal relationships expressed in a child’s narrative, particularly the frequency of motivational relationships. Motivational relationships are expressed when the participant states, within the same episode, the goal and the attempt to achieve that goal. Expressing such a relationship indicates a deeper understanding of why a particular action was taken. Since few studies have addressed different types of causal relationships, further research is required to better understand the development of causal coherence in children’s narrative discourse.

Our data indicate that language development in children does not end in preschool, and that certain aspects can develop with age, such as the expression of causal relationships. This finding is especially relevant for language assessments, in which narrative assessments can be quite useful because of their high ecological validity, but only when the results are analysed with appropriate measures.

Acknowledgments

This work was supported by the Croatian Science Foundation under the project entitled *Multilevel approach to spoken discourse in language development* (UIP-2017-05-6603), by European Commission Seventh Framework Programme under the project *Language Dominance of Bilingual Speakers Perceived as Balanced* (LADOBI, PISCRTJQ4Y, Piscopia Marie Curie Action (COFUND)), by the Arts and Humanities Research Council under the project entitled *Feast and Famine Project: Confronting Overabundance and Defectivity in Language* (AH/T002859/1) and by the project *NexusLinguarum – European network for Web-centred linguistic data science* (COST Action CA18209). Sara Košutar was supported by the project *Young Researchers' Career Development project – Training of New Doctoral Students*. Any opinions, findings, conclusions, or recommendations presented in this manuscript are those of the author(s) and do not necessarily reflect the views of the Croatian Science Foundation.

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Dobne razlike u izražavanju uzročnih odnosa u pričama hrvatske djece

Sažetak

Uspješno pripovijedanje temelji se na sposobnosti oblikovanja koherentnoga slijeda vremenski i uzročno povezanih događaja organiziranih oko određene teme. Te se sposobnosti počinju razvijati u ranoj predškolskoj dobi. Koherentnost priče može se procijeniti nizovima elemenata gramatike priče. Prema modelu uzročne mreže gramatika priče promatra se kao međusobno povezana mreža uzročnih odnosa kao što su omogućavajući, fizički, motivacijski i psihološki odnosi. Važnost uzročne koherencije prepoznata je u mnogim istraživanjima koja se bave pripovjednim diskursom iz perspektive jezičnoga usvajanja. Međutim, prijašnja istraživanja pokazuju oprečne rezultate glede uporabe vrsta uzročnih odnosa u pričama djece različite dobi. Cilj ovoga istraživanja bio je ispitati razlike između predškolske i školske djece u ukupnoj proizvodnji uzročnih odnosa i proizvodnji različitih vrsta uzročnih odnosa. U istraživanju su sudjelovala hrvatska jednojezična djeca prosječne dobi 6;3 ($n = 41$) i 8;4 ($n = 50$). Priče su prikupljene *Višejezičnim instrumentom za ispitivanje pripovijedanja (MAIN)* koji je preveden i prilagođen na hrvatski jezik. Rezultati su pokazali statistički značajnu razliku između dviju skupina djece u ukupnom udjelu uzročnih odnosa i u udjelu motivacijskoga odnosa, no nije proanađena značajna razlika u udjelima omogućavajućega, fizičkoga i psihičkog odnosa. Djece školske dobi proizvela su više motivacijskih odnosa i općenito više uzročnih odnosa u usporedbi s djecom predškolske dobi. Ovo je prvo istraživanje u kojem je ispitana uzročnost u pričama hrvatske jednojezične djece rabeći model uzročne mreže. Dobiveni rezultati samo su djelomično potvrdili spoznaje prethodnih istraživanja, što upućuje na to da su potrebna daljnja istraživanja da bi se bolje razumio razvoj uzročne koherencije u dječjem pripovjednom diskursu.

Keywords: narrative ability, children, age differences, causal network model, causal relationships, Croatian

Cljučne riječi: pripovjedna sposobnost, djeca, dobne razlike, model uzročne mreže, uzročni odnosi, hrvatski jezik

