Psicológica (2018), 39, 118-141.
doi: 10.2478/psicolj-2018-0006

The influence of television stories on narrative abilities in children

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This research explores the narrative abilities demonstrated by children aged between 8 and 12 in the production of television stories. The results reveal that not all television stories viewed by children foster the informal education process. One type of story, termed *narrativizing*, enables children to produce coherent stories which clearly articulate the causal, temporal and motivational relations, as well as the means-end structures, the proximal relations of the intrigue and the distal relations of the plot. Other television stories, *denarrativizing* stories, tend to induce disarrangements and incoherence at all structural levels of the stories produced by children. This in turn hampers the development of their narrative abilities, which are necessary to the correct development of narrative thought. These results indicate the need to exercise social control over this latter type of fictional television narrative, to which children are exposed throughout their development within the framework of informal education.

[*]**Acknowledgements:** This research project was supported by the University of the Basque Country Research Projects [EHU 13/65 and GIU 15/14] and by Formation and Research Units [UFI 11/04]. Also, Eider Oregui has a Predoctoral Contract granted in the Convocatory for Doctoral Formation 2015 [BES-2015-071923], contemplated in the State Subprogram Formation, of the State Program for Promotion of Talent and Employability in I+D+i, within the framework of State Plan of Scientific and Technical Research and Innovation 2013-2016, financed by the State Secretary for Investigation, Development and Innovation of the Ministry of Economy and Competitiveness of the Government of Spain and co-financed by the European Social Fund. **Corresponding authors:** Ana Aierbe. Department of Developmental and Educational Psychology. Faculty of Education, Philosophy and Anthropology. University of the Basque Country (UPV/EHU). Avenida Tolosa 70, 20018 San Sebastian, Guipuzcoa, Spain. E-mail: ana.aierbe@ehu.eus. Jesús Bermejo Berros. Department of Audiovisual Communication. University of Valladolid. lipsimedia@gmail.com.

Children are exposed to a large number of television stories from a very early age. This type of informal education (Coll, Miras, Onrubia, & Solé, 1999) helps them develop narrative abilities, which are necessary to the efficient working of narrative thought and the successful performance of numerous learning activities (Boudreau, 2008; Bruner, 1986). .

Narrative abilities are the result of two sets of dialectic processes, through which they are gradually developed during childhood. Firstly there is the process of assimilation. This is a bottom-up process which encompasses everything from the initial exposure to a story to its understanding and storage, and is based on the encoding of the audiovisual stimulus and the comprehension of its meaning through schematic cognitive structures (story schema). The narrative abilities which come into play during this kind of process require the viewer to have the assimilation schemata necessary to understand the story; in other words, the viewer must be able to construct a representation of the story's causal, temporal and motivational relationships.

The second type of process is that of accommodation. This is a top-down process in which narrative abilities are manifested in expressive tasks, such as comprehension tests or the retelling of the viewed story, and in which audiovisual language has to be translated into verbal language (Ackermann-Valladao, 1987; Bermejo, 1994; Bonus & Mares, 2015; Hoffner, Cantor & Thorson, 1988; Keats, 2009). In this case, subjects must call upon their executive functions, which perform a series of complex operations aimed at recovering, planning, organizing and distributing the previously viewed stimuli in order to retell the story. The outcome of these accommodation operations, i.e. the retold story, may be assessed in accordance with its narrative coherence and cohesion, or in other words the degree to which it correctly represents the temporal, causal and motivational relations of the original stimulus. Coherence concerns how the components of a story and the events are interrelated and organized in a meaningful way (Louwerse & Graesser, 2005; Shapiro & Hudson, 1991). To produce a coherent retelling, viewer needs activate a scheme to organize the content that permit to understand the characters, the problem, the solution, and the conclusion. This is achieved by including a formalized introduction, a background, and a setting (Hudson & Shapiro, 1991). Moreover, cohesion is a characteristic of the text that makes a list of sentences become a unitary total on a micro level (Hudson & Shapiro, 1991). Cohesion is achieved through linguistic elements that link ideas across the narrative (Struthers, Lapadat & MacMillan, 2013).

Overall, the study of narrative abilities has been interested in the reconstruction of macrostructure and textual microstructure (van Dijk &

Kintsch, 1983; Justice, Bowles, Pence & Gosse, 2010; Altman, Armon, Fichman & Walters, 2016; Gagarina, Klop, Tsimpli & Walters, 2016). However, this double cognitive analysis is not enough. A purely cognitive analysis of narrative abilities is insufficient because it leaves out the influence of the narratological aspects of the text on the viewer's ability to organize his or her storytelling. In addition, research into certain childhood disorders have helped show the complexity of the cognitive processes involved in story retelling. The difficulties and disarrangements experienced by children when planning, organizing and executively regulating the retelling task reveal both the complexity of the task itself and the requirements and structure of a good narrative (Lorch et al., 1999; Miranda, García & Soriano, 2005; O'Neill & Douglas, 1991; Purvis & Tannock, 1997; Tannock, Purvis & Schachar, 1993). Therefore, the most comprehensive study of narrative abilities should take into account three levels of stimulus processing. The first level is the deep one, the one which underlies the discourse and which aims to identify the reconstruction of both the structural coherence of the events taking place in the story, and its means-end structure. The work by Trabasso et al. has contributed to our knowledge of the former (i.e. Trabasso & Sperry, 1985a; Trabasso & van den Broek, 1985b; Trabasso, Secco & van den Broek, 1984), while research into the field of cognitive science, inspired by Artificial Intelligence, has shed light on the latter (i.e. Black & Bower, 1980; Lichtenstein & Brewer, 1980). We refer to this level below in our outline of *Semantic Networks*.

The second level of study, on which narratology and some approaches linked to narrative development have focused (Bamberg, 1997), is the intermediate one. Research has shown that in addition to the deep level, the retelling of a story also involves an intermediate level in which the subject must use their narrative abilities to reconstruct the proximal relationships between those story components that are located, as Bordwell pointed out (1985), in the mid-level between the story and the discourse. The result of these operations is the intrigue, which the subject can recount in his or her retelling of the story. The intrigue is basically the *Sequential Order,* through which the subject reconstructs the story and establishes relationships of succession between the events that take place (Bermejo, 2006).

Finally, the third level focuses on the distal relations between the story components. This is the process of reconstructing the *plot*, which enables all the different parts to be combined into a single whole. This is called the *Configurational Order* (Bermejo, 2006; Ricoeur, 1983), and focuses on the simultaneous relations that occur in the story. Its structure is related to the components of the story schema (setting, conflict, resolution and denouement).

This situation poses a twofold problem. Firstly, each of the three processing levels presented have, in the past, been partially studied not only separately, but also within the framework of different disciplines. Nevertheless, all three levels are necessary, since each involves different yet complementary processes. It would be interesting to study them together, since this would enable us to gain a better understanding of the way in which they interrelate, and would afford greater insight into their properties and working. It would also help improve our understanding of how narrative abilities are acquired throughout children's development, within the context of informal education. Secondly, the focus of analysis has been placed on the subject's cognitive structures (e.g. some studies have explored the factors involved in comprehension or recall of audiovisual stories (Gordon, Gerrig & Franklin, 2009; Lee, Roskos-Ewoldsen & Roskos-Ewoldsen, 2008). At the same time, however, the influence of the structure/form of the audiovisual text on the retelling process has hardly been taken into account. If we accept that the joint study of all three types of processes outlined above is necessary, then we must also accept that this study cannot be conducted without taking into consideration the type of audiovisual stimulus used, or in other words, the type of television story offered to children for viewing and assimilation because this contributes to the construction of their cognitive structures, in particular those cartoons to which children are exposed in a repeated and almost daily manner.

Although very little research has been done in this field to date, a previous narratological study focusing on cartoon suggested that there are two main types of story that influence assimilation processes and, consequently, subsequent narrative production processes: *narrativizing* and *denarrativizing* stories (Bermejo, 2005). This investigation identified a number of differences between these two types of cartoons (Bermejo, 2005, 2007). These differences appear in both dimensions of the classic distinction between story and discourse (Chatman, 1990). Thus, firstly, the *narrativizing* stories shares numerous characteristics and functions with the "marvelous" type of story analyzed by Vladimir Propp, as well as those characteristics attributed to classic films and television narratives with a classic structure (Butler, 1994). The story follows a canonical schema, explicitly presenting the intrigue and the different parts of the plot in the discourse. From the perspective of space and time, the story follows a chronological order. *Denarrativizing* stories, on the other hand, alters the order of the story in its discourse.

Secondly, in *narrativizing* stories, the actantial schema (Bremond, 1973; Greimás, 1973) is explicit, while in *denarrativing* stories is it implicit (Bermejo, 2007). This means that in the latter case, the spectator is obliged

to carry out supplementary inductive operations in order to determine the actantial roles fulfilled by the characters in the story.

Thirdly, both types of story have different ways of articulating the dramatic tension (Adam & Revaz, 1996; Baroni, 2007). In *narrativizing* stories, the tension is closely linked to the development of the plot, since their knowledge of the conflict impels the viewer forwards within a process of tension resolution (Bryant & Miron, 2003; Vorderer, Wulff & Friedrichsen, 1996). In *narrativizing* stories, we know that this type of tension works because the children participating in our study demonstrated in their cognitive representation that they processed the conflict and incorporated it into their retelling of the *Configurational Order* (Bermejo, 2007). In *denarrativizing* stories, on the other hand, the dramatic tension does not evolve throughout the story in keeping with the development of the plot. In this episode, dramatic tension can appear unexpectedly at any moment.

Fourthly, there are differences between the series that affect formal aspects of the discourse. Thus, in *denarrativizing* stories there is a greater number and variety of shots than in *narrativizing* stories; different types of framing techniques, fields, depths of field and off-screen shots are used, and there is a more intense use of different camera angles and tilts. This series also uses both diegetic and non-diegetic codes.

Finally, there are also differences between the two series in relation to the syntactical codes used. *Narrativizing* stories uses a simple space-time framework. From the perspective of their temporal relation to each other, the shots follow a sequential order. The events take place in well-defined spaces, and follow on from each other in keeping with a linear time line. To put it another way, the presentation of the discourse follows the development of the story itself. In *denarrativizing* stories, on the other hand, the space-time articulation is much more complex. For example, in the episode used in this study, there are three different scenes in which three different events take place at the same time. This requires the use of different cutting methods which alter the temporal order of the story in the discourse. Thus, when watching the episode, children have to process this complex network of different, yet interlinked, spaces and times. However, since they failed to correctly articulate the plot (as demonstrated in their subsequent cognitive representation), it is clear that their relationship with these spaces and times is merely sensory, rather than narrative.

As revealed in a previous research study with elementary students (Bermejo, 2007), *narrativizing* stories would contributes to the proper development of narrative schemata and narrative abilities in children,

whereas the *denarrativizing* stories would tends to generate disarrangements in the acquisition and manifestation of these abilities. If confirmed, this finding would have a direct impact on the way that educators, parents and institutions understand teaching and learning processes during childhood, through informal audiovisual education. Therefore, it is necessary to continue deepening in this field of cognition and development.

Consequently, and in light of the twofold problem outlined above, the aim of this present study is to provide further knowledge about:

1. The characteristics of children's cognitive representation in relation to most-viewed television stories, bearing in mind all three processing levels (Semantic Networks, Sequential Order and Configurational Order) involved in storytelling.

2. The different influence of the two types of story, *narrativizing* and *denarrativizing*, on children's narrative abilities manifested during the retelling, and the differences in narrative abilities of participants in relation to their age.

3. The differences between participants regarding visual contact, in accordance with the two types of story (*narrativizing* and *denarrativizing*).

Accordingly, we propose the following hypotheses:

Hypothesis 1. There are functional relationships between the three story processing levels, with a greater degree of coherence at one processing level resulting in greater coherence at the other two levels.

Hypothesis 2. The narrative abilities manifested by participants will differ in accordance with the type of story viewed and the age of children's. Participants shown the *narrativing* story will manifest greater narrative abilities than participants shown the *denarrativizing* story. In addition, participants in 3rd grade of elementary school show less narrative abilities than participants in 6th grade.

Hypothesis 3. Participants shown the *denarrativizing* story would have more visual contact than those shown the *narrativizing* story.

METHOD

The study reported here has a quasi-experimental design with a mixed methodology (quantitative and qualitative).

Participants. Participants were 112 children (55 boys and 57 girls) aged between 8 and 12. These two age groups have been selected because they are in different phases of their development in accordance with causal,

motivational and spatiotemporal structures of construction. Of the whole sample group, 43 were in 3rd grade of primary school and 69 were 6th graders. All attended two public and one private schools located in the Autonomous Region of the Basque Country (Spain).

Procedure. One episode from two different cartoon television series, Doraemon and Code Lyoko, were selected for this research (Aierbe & Oregui, 2016). These series were selected on the basis of two criteria. Firstly, they are both popular series to children, with high audience shares (http://www.kantarmedia.com); and secondly, Doraemon is an example of a *narrativizing* story and Code Lyoko of a *denarrativizing* story.

The sample of study was divided into two groups, with 59 children being shown the Doraemon episode entitled *The emotional energy canister* (https://goo.gl/7TSJhH) and the other 53 being shown the Code Lyoko episode entitled *Fight to the Finish* (https://goo.gl/8Jyo49). The sessions were videotaped in order to measure children's visual contact with the screen during viewing. After viewing the episodes, the children were asked to retell the story from start to finish *("tell me everything you remember about the episode you just saw"*) through a semi-structured interview, with an estimated duration of 25 minutes, which aim is to collect the narrative skills and the values/countervalues that they have perceived in the episodes viewed.

The following variables were selected in order to analyze the children's responses in accordance with the three levels of processing described above:

Level 1, causal coherence of the *Semantic Networks* (SN): Each episode is made up of a total of 11 Semantic Networks (SN), which together form a causal structure that explains the primary and secondary aims pursued by the characters. This structure also includes those actions that are prerequisites for achieving these aims. Thus, we have a Central Network (CN) which represents the purpose of the general action and a set of ten Subordinate Networks (SNA, SNB, SNC, SND, SNE, SNF, SNG, SNH, SNI, SNJ) that represent the secondary aims and prerequisites for achieving the ultimate aim defined by the Central Network.

Level 2, proximal sequential relations or *Sequential Order* (SO): Here we analyze how well participants reconstruct the chain of successive events which make up the intrigue. Eleven sequences were identified, running from SO1 to SO11.

Level 3, distal configurational relations or *Configurational Order* (CO): This level includes the outcome of the configurational operations that result in the retelling of the plot. Four components were identified here:

Setting (COSET), Conflict (COCON), Resolution (CORES) and Denouement (CODEN).

The children's stories were analyzed in accordance with the degree to which each of these indicators (SN, SO and CO), pertaining to the three processing levels, were present in their retelling. To analyze the results, the mean of the variables that make up each level was calculated.

Since our general aim was to explore the narrative abilities represented in these stories, we not only analyzed the variables SN, SO and CO overall, in order to determine their presence and interaction, but also processed the responses given in accordance with two supplementary concepts that enriched the overall analysis. Firstly we analyzed the responses in accordance with their degree of *Cognitive Representation* (CR). This is an index obtained from the mean of the variables at all three levels. The usefulness of this simple indicator is that it sums up the degree to which the child in question deployed his or her narrative abilities (at all three levels: SN, CO, SO) during the accommodation process, from both a quantitative and qualitative perspective.

Secondly, we included another index in the analysis, termed *Connective Density* (CD). This index was obtained from the mean of the three supplementary variables: number of *segments* retold, *causal connectors* and *temporal connectors*.

The number of *Segments* (SEGMEN) refers to the number of propositions present in the child's retold story. A proposition is understood as that which includes an agent and a goal-based predicate (Schank & Abelson, 1987). The number of segments included in the stories retold by participants ranged from 1 to 65 (M = 20.4 in Doraemon and M = 6.5 in Code Lyoko).

Causal Connectors (CC) refer to the presence in the discourse of grammatical markers (such as, because, since, etc.) which enable a causal connection to be established between two propositions. Connectors may either link two actions, rendering one subordinate to the other, or may specify in the second segment the reason why certain characters behave in a certain way.

Temporal Connectors (TC) are temporal grammatical markers (and, then, etc.) which indicate that the following segment occurs later on in the story's chronological ordering.

The *Connective Density* (CD) index is interesting because it constitutes a microstructural indicator (Altman et al., 2016), present in the textual surface, of the representational activation of elements of causal coherence between the story's aims. It is therefore an indicator which

enriches the analysis of causal coherence at level 1, where the *Semantic Networks* (SN) correspond to a deeper level of analysis, macrostructural (van Dijk & Kintsch, 1983).

Furthermore, the mistakes made in the retelling were recorded (ERROR), along with any alterations to the sequential order (AltSO).

Finally, given that the encoding and assimilation of the stimulus is a prerequisite for its correct subsequent accommodation through the retelling of the story, the visual contact made with the screen during viewing (VC) was also measured, along with the visual contact made with the screen during transition moments (VCT), or in other words, the moments during the episode in which a switch occurs between different components of the structures at each level.

The statistical processing of the data was carried out using the SPSS Statistics program. The statistical analyses conducted include Student's *t*-tests, the Mann-Whitney test and the Pearson and Spearman correlation tests.

RESULTS

The stories retold by participants varied as regards both quantity and quality. At one extreme, some children produced extremely poor stories, while at the other, the stories retold were both extensive and rich (the shortest story was just 5 words long, while the longest contained 993 words). Furthermore, the stories ranged from extremely uncoordinated and almost unintelligible to very organized and highly coherent.

The retold story. The quality of the retold story is determined not only by the number of story elements included, but also by the qualitative type of the narrative elements that make up the tale.

Firstly, according to objective 1, the analysis of the results for Sequential Order reveal significant differences for both series. Of the total sequences that make up the Sequential Order of the Code Lyoko episode, only four obtained a frequency percentage of two or over (the score equivalent to the complete retelling of the sequence). These four sequences were SO8 (M = 1.43; $S.D.$ = .747, maximum M = 2), SO6b (M = 1.09; $S.D.$ = .947), SO5 (M = .1.07; $S.D.$ = .979) and SO4 (M = 1.05; $S.D.$ = .941). Of these, the two sequences retold most often were scenes containing action-violence (SO8 is a spectacular fight sequence in which the main characters struggle against a powerful opponent), while the other two, which were retold less often, were narrative sequences with emotional components. The retelling frequency for the other sequences was very low, being either zero

(not retold at all) or close to zero. This low retelling frequency is reflected also in the mean scores for this group of sequences (between *M* = .21; *S.D.* = .588 and *M* = .47; *S.D.* = .671).

The number of sequences retold for Doraemon was much higher. The mean scores for the most frequently retold sequences were as follows (from highest to lowest): SO1 (*M* = 1.92; *S.D.* = .392), SO3 (*M* = 1.83; *S.D.* = .466), SO10a (*M* = 1.83; *S.D.* = 505), SO5 (*M* = 1.76; *S.D.* = .576), SO10a (*M* = 1.73; *S.D.* = .666), SO7a (*M* = 1.54; *S.D.* = .803), SO8 (*M* = 1.53; *S.D.* = .830), SO2 (*M* = 1.49; *S.D.* = .784), SO11b (*M* = 1.30; *S.D.* = .916) and SO7b (*M* = 1.20; *S.D.* = .978). SO1 is the introduction to the main characters; SO2 and SO3 present the conflict, when Gian keeps running down the car batteries and Suneo asks Nobita for help; SO10 is when Suneo throws balls at Gian to make him angry and provokes him into beating him up; in SO5 Doraemon introduces the canister that will solve the problem; SO7 is the sequence in which Suneo lifts up Shizuka's skirt; and SO8 is a scene of violence in which they insult Gian in order to charge the canister. Finally, SO11 is the denouement which includes the moral of the story: Nobita and Doraemon play with the car while Suneo lies prostrate from the beating that Gian gave him.

In relation to content, some of the most frequently retold scenes in Doraemon contain violence (SO3, SO10, SO8 and SO7). However, unlike with the Code Lyoko episode, other types of action linked to the reconstruction of the sequential meaning, which makes sense of the intrigue, also predominate in the retellings. Thus, when Suneo asks for help (SO3), other sequences linked to this action occur, such as Nobita's idea for a way to recharge the batteries (SO5) and the problem that arises when they try to resolve the problematic situation (SO2), because the batteries run out (SO7). Thus, the sequences most frequently retold by those participants who watched the Doraemon episode correspond to narrative aspects rather than perceptive ones, as in the case of Code Lyoko.

Secondly, for Code Lyoko, the most frequently retold Semantic Networks (SN) were: SNEb (*M* = 1.10; *S.D.* = .821) and SNB (*M* = 1.05; *S.D.* = .880). The other networks were retold only a few times. SNEb includes fight sequences in the ice sector (linked to SO8 and CORES) which do not necessarily lead to the fulfillment of the story's general goal. SNB (linked to SO5 and COSET) includes an action that fulfills an intermediate goal (the friends receive information to help them answer the call). Thus, the elements retold are mainly secondary ones that are not the most important ones from the perspective of causal structure. This indicates that the participants who watched the Code Lyoko episode were not able to demonstrate that they understood the causal structure of the story.

Moreover, this result reveals once again that, for this episode of Code Lyoko, the violent fragment of the story is more memorable than the narrative one; in other words, children recall more the spectacular scenes than the more structural narrative ones.

Unlike that observed for Code Lyoko, in the case of Doraemon more Semantic Networks (SN) were retold, and those that were retold were of a better quality. In eight out of the eleven SNs, the frequencies obtained were equivalent to complete retelling. As regards mean scores, the most frequently retold SNs were: SNG (M = 1.72; $S.D.$ = .596), SNH (M = 1.62; $S.D.$ = .753), SNA (M = 1.59; $S.D.$ = .733), SNE (M = 1.57; $S.D.$ = .728), SNJ (M = 1.35; $S.D.$ = .900), SND (M = 1.11; $S.D.$ = .948) and SNF (M = 1.06; $S.D.$ = .966). SNA (linked to SO2) outlines the general goal (Suneo wants to play with his new remote control car). SND (linked to SO7) contains an action that prevents the general goal from being achieved (the invention does not work). In SNE (linked to SO8) an action occurs that, apparently at least, resolves the problem and enables the general goal to be achieved (the invention works and the batteries are recharged). SNG (linked to SO10a) and SNH (linked to SO10b) include an action which generates a result that is inappropriate for the general goal and triggers a second action with undesirable consequences (Suneo overcharges the canister and is punished). SNJ (linked to SO11) is an action that expresses the ultimate consequences of the preceding actions (Nobita and Doraemon play with the car, but Suneo does not). Thus, the most frequently retold semantic networks correspond to the story's important causal elements. This indicates that the participants who watched the Doraemon episode were capable of reconstructing the causal structure of the story.

In short, the differences in SNs are important. The retellings of the Code Lyoko episode focused almost exclusively on the action fragments or sequences of the story (which are also the most violent ones), but neither the reason for these sequences nor their purpose, aim or consequences, or the rationale for the story were explained. In the narrations of the Doraemon episode, on the other hand, participants showed that they were able to generate a coherent story with a means-end structure that faithfully reflected that of the program viewed. In these retellings it was possible to identify the general idea of the story (what happened, how it happened, why it happened, etc.), along with the goals, means and outcomes.

Thirdly, the results for Configurational Order (CO) complement and corroborate the previous analyses. In order to compare the two series, the standardized means were included in the next analysis (maximum value 1). In Code Lyoko, the Configurational Order (CO) of the story indicates that participants mostly retold the resolution, CORES, (M = .307; $S.D.$ = 1.1923)

and/or the setting COSET (*M* = .281; *S.D.* = 1.5387); the denouement, CODEN, was retold less (*M* = .129; *S.D.* = .8202) and the conflict, COCON, was hardly retold at all (*M* = .066; *S.D.* = .2409). While the CORES (made up of the SOs 6b-7-8-9-10a) and COSET (SOs 1a-1b-2-3-4-5) components were retold by only a few participants, the other two Configurational Orders, CODEN (SOs 10b-10c-11a-11b) and COCON (SO6a) were almost completely absent from all the stories retold by the children participating in the study. In the case of Doraemon, on the other hand, all four components of CO were included in the retellings, with participants scoring highly in all: COSET (*M* = .838; *S.D.* = .3648), COCON (*M* = .775; *S.D.* = .6345), CODEN (*M* = .606; *S.D.* = 1.5859) and CORES (*M* = .529; *S.D.* = 1.2758). The components COSET (SO1) and COCON (SOs 2-3) had a strong presence in the children's stories, whereas the components CODEN (SOs 10a-10b-11a-11b) and CORES (SOs 5-6-7a-7b-8-9), despite being adequately represented, were included less often.

Other supplementary analyses also revealed differences between the two series in relation to CO. To demonstrate understanding of a story, it is not enough to merely retell different isolated parts or components of its structure. Rather, it is also necessary to evidence an overall sense of the story's structure. This means that the subject must include all the CO components (COSET+COCON+CORES+CODEN, termed total CO or CO-T) or at least the key means-end structure of the CO or the CO-ME (made up of COCON+CORES+CODEN) in their retelling. The differences observed in the results for this speak for themselves. In Code Lyoko, no 3rd grader retold the CO-T, and only 6.4% (n=2) of 6th grade students did so. As regards the means-end structure (CO-ME), only two participants from 3rd grade and two 6th graders retold it, which in percentage terms is 9% and 6.4% respectively. In Doraemon, on the other hand, 58.6% of 3rd grade participants and 93.3% of 6th graders correctly retold all the components of the CO-T in their stories. As regards the CO-ME, the results are also highly significant, with 76% of 3rd grade students and 100% of the 6th graders participating in the study retelling the means-end structure of the episode.

One final supplementary analysis again revealed the differences between the two fictional series. While previously we simply analyzed the presence or absence of the various CO components in participants' stories, here we focused on the quality of the retelling of these components. It should be borne in mind that each CO component is made up of one or various sequences (SOs). Each sequence is awarded a score of 0, 1 or 2, depending on whether it is absent from the child's narration, partially or insufficiently retold or correctly related (respectively). The results of this analysis reveal that the participants who watched the Doraemon episode

were able to retell a much higher percentage of story components than those who watched the Code Lyoko episode. The former not only retold the narrative elements of all the components, they also retold them correctly, at least in half of each of the CO components.

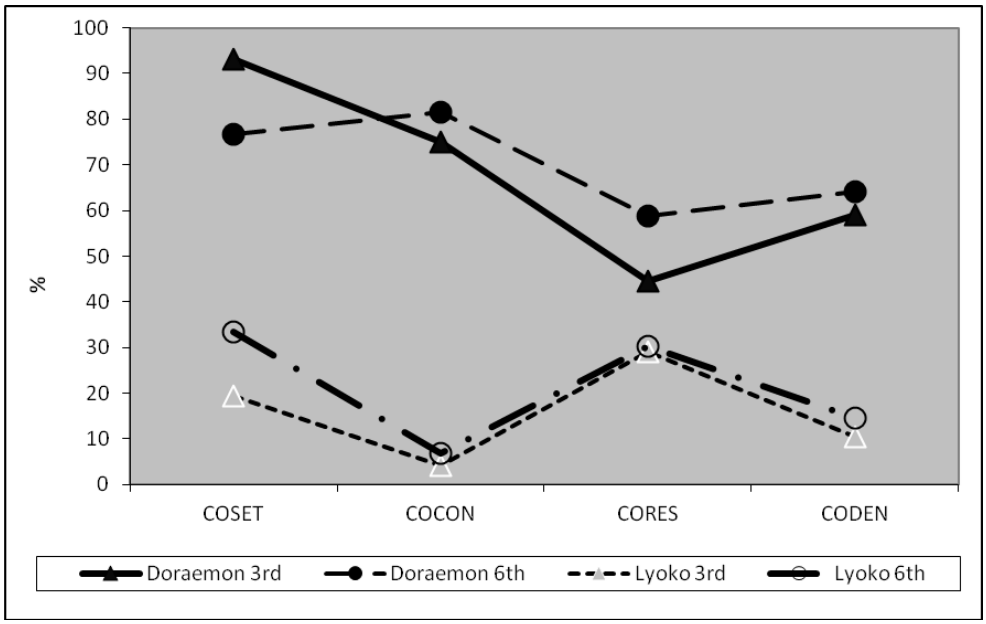

Figure 1. Degree to which the parts of the Configurational Order were retold in Doraemon and Code Lyoko, for 3rd graders and 6th graders.

Narrative abilities, structure of episode and school year. In relation to objective 2, means comparison was conducted in accordance with the episode viewed and school year.

Firstly, in the comparison between the two different story types (see Table 1), the results reveal that participants who viewed Doraemon scored higher for cognitive representation, ordered the story better both sequentially and configurationally, included more semantic networks and segments, produced a greater degree of connective density and used more temporal and causal connectors to retell the story than those who viewed the Code Lyoko episode. Moreover, participants who viewed the Code Lyoko episode altered the sequential sequence more when retelling the story than those who viewed Doraemon.

Table 1. Comparison between the study variables in accordance with the structure type of the episode viewed.

		Doraemon	Code Lyoko
	M (*S.D.*)	1.0295 (.39463)	.4644 (.31284)
Cognitive Representation	*t*	8.333	
	Sig.	.001***	
	M (*S.D.*)	.5835 (.21922)	.2429 (.16791)
Sequential Order	*t*	9.282	
	Sig.	.001***	
	M (*S.D.*)	1.9979 (.76370)	.9528 (.64684)
Configurational Order	*t*	7.768	
	Sig.	.001***	
	M (*S.D.*)	.5069 (.23465)	.1975 (.14018)
Semantic Networks	*Z*	-6.498	
	Sig.	.001***	
	M (*S.D.*)	14.9209 (8.70534)	4.7484 (3.54031)
Connective Density	*Z*	-6.800	
	Sig.	.001***	
	M (*S.D.*)	27.58 (18.733)	9.26 (6.878)
Segments retold	*Z*	-6.274	
	Sig.	.001***	
	M (*S.D.*)	14.51 (8.866)	4.60 (4.035)
Temporal Connectors	*Z*	-6.466	
	Sig.	.001***	
	M (*S.D.*)	2.68 (1.861)	.38 (.686)
Causal Connectors	*Z*	-7.456	
	Sig.	.001***	
	M (*S.D.*)	.15 (.407)	.30 (.463)
Alterations to the SO	*Z*	-2.064	
	Sig.	.05*	

In the means comparison by school year (see Table 2), the results indicate that 6th graders demonstrated better cognitive representation, ordered the story better both sequentially and configurationally and included a greater number of segments than their 3rd grade counterparts.

Table 2. Comparison between the study variables in accordance with primary school year.

		3rd grade	6th grade
Cognitive Representation	*M* (*S.D.*)	.6552 (.45809)	.8286 (.44434)
	t	-1.985	
	Sig.	.05*	
Sequential Order	*M* (*S.D.*)	.3588 (.26119)	.4620 (.25279)
	t	-2.074	
	Sig.	.05*	
Configurational Order	*M* (*S.D.*)	1.2849 (.88234)	1.6395 (.85790)
	t	-2.104	
	Sig.	.05*	
Segments retold	*M* (*S.D.*)	15.70 (15.416)	20.91 (17.771)
	Z	-1.957	
	Sig.	.05*	

Secondly, two intragroup means comparisons were conducted in accordance with school year: between all participants who viewed the Doraemon episode and between all participants who viewed the Code Lyoko episode. Differences were observed in both analyses in accordance with school year. Specifically, among those participants who watched the Doraemon episode, statistically significant differences were observed in the variables CR, SO, CO, CD, SEGMEN and ERROR (see Table 3). 6th grade students scored better for Cognitive Representation, Sequential Order, Configurational Order, Connective Density and number of segments retold, while 3rd grade students were found to make more mistakes when retelling the Doraemon episode viewed.

Table 3. Comparison between participants who viewed the Doraemon episode, in accordance with primary school year.

		3rd grade	6th grade
	M (*S.D.*)	.8515 (.43573)	1.1603 (.30658)
Cognitive Representation	*Z*	-2.732	
	Sig.	.01**	
	M (*S.D.*)	.4771 (.24460)	.6618 (.16146)
Sequential Order	*Z*	-2.924	
	Sig.	.01**	
	M (*S.D.*)	1.6300 (.83579)	2.2684 (.58236)
Configurational Order	*Z*	-2.969	
	Sig.	.01**	
	M (*S.D.*)	11.9600 (8.28616)	17.0980 (8.46960)
Connective Density	*Z*	-2.349	
	Sig.	.05*	
	M (*S.D.*)	20.92 (17.502)	32.47 (18.324)
Segments retold	*Z*	-2.855	
	Sig.	.01**	
	M (*S.D.*)	.20 (.408)	.00 (.000)
Errors	*Z*	-2.703	
	Sig.	.01**	

In relation to those participants who watched the Code Lyoko episode, statistically significant differences were found only in the retelling of Semantic Networks (Z = -2.058; $p < .05$). Specifically, 6th graders (M = .2229; *S.D.* = .14366) included more Semantic Networks than their 3rd grade counterparts (M = .1481; *S.D.* = .12219).

In sum, these results indicates that retold stories improve with age, although this difference is slight in the case of Code Lyoko and more pronounced in the case of Doraemon. Finally, in relation to all aspects analyzed at all three representational levels studied, participants who watched the Doraemon episode retold the story better than those who watched Code Lyoko.

Thirdly, a correlation was carried out between the different study variables in order to analyze the relationship which exists between them (see Table 4). The results reveal direct and statistically significant concordances between the following study variables: CR, SO, CO, SN, CD, SEGMEN, TC and CC. Thus, the higher the score for one of these variables, the higher the scores for the others, and vice versa (i.e. the lower the score for one of the variables, the lower the scores for the rest).

Although no statistically significant correlations were found, direct concordances were observed between alterations in the sequential order and the number of mistakes made; furthermore, indirect concordances were found between alterations or mistakes and the other study variables (CR, SO, CO, SN, CD, SEGMEN, TC and CC). Thus, if a participant scored poorly in one of the variables CR, SO, CO, SN, CD, SEGMEN, TC and/or CC, it was because they made more mistakes or introduced more alterations when retelling the story.

Table 4. Relationship between the study variables.

	CR	SO	CO	SN	CD	SEGMEN	TC	CC
Cognitive Representation		.988***	.996***	.943***	.909***	.907***	.807***	.723***
Sequential Order	.988***		.984***	.908***	.922***	.913***	.834***	.734***
Configurational Order	.996***	.984***		.913***	.908***	.907***	.809***	.706***
Semantic Networks	.943***	.908***	.913***		.827***	.837***	.703***	.710***
Connective Density	.909***	.922***	.908***	.827***		.982***	.932***	.703***
Segments retold	.907***	.913***	.907***	.837***	.982***		.858***	.660***
Temporal Connectors	.807***	.834***	.809***	.703***	.932***	.858***		.620***
Causal Connectors	.723***	.734***	.706***	.710***	.703***	.660***	.620***	

$p < .05$*; $p < .01$**; $p < .001$***

Furthermore, the fact that direct concordances were observed between the study variables indicates that the way in which children cope with the task of accommodating their narrative schemata causes their narrative abilities to simultaneously activate processes which affect both the reconstruction of the surface levels (SEGMEN, TC, CC), the intermediate levels which in turn affect the reconstruction of the intrigue (SO), and the deeper levels which are further removed from the textual surface, such as the plot (CO) and the semantic networks (SN).

Visual contact and assimilation of the stimulus. Finally, according to objective 3, a direct and statistically significant correlation was observed between visual contact or VC and visual contact during transition moments or VCT (r = .460; p < .001). In other words, the more visual contact is maintained with the screen throughout the episode, the more visual contact will be maintained in the transition moments of the episode, that is to say during the transition from one sequence (SO) to the next, and vice versa (i.e. the less visual contact is maintained with the screen throughout the

episode, the less visual contact will be maintained in the transition moments of the episode).

Nevertheless, when VC and VCT were analyzed in relation to the other study variables, the only statistically significant concordances found were indirect ones between VCT and CR (r = -.304; p < .001), SO (r = -.307; p < .001), CO (r = -.277; p < .001), SN (r = -.330; p < .001), CD (r = -.326; p < .001), SEGMEN (r = -.291; p < .001), TC (r = -.333; p < .001) and CC (r = -.351; p < .001). In other words, if hardly any visual contact is maintained with the screen at the transition moments of the episode, then it is likely that, when retelling the story, participants will score lower for CR, SO, CO, SN, CD, SEGMEN, TC and CC, and vice versa (i.e. participants are more likely to score higher for CR, SO, CO, SN, CD, SEGMEN, TC and CC when retelling the story if they maintain visual contact with the screen during transition moments).

Moreover, when comparing the means obtained by participants for VC and VCT, statistically significant differences were found only in accordance with the type of story viewed. Specifically, higher VT (Z = -2.528; p < .05; .9520 vs .9091) and VCT (Z = -5.160; p < .001; .9151 vs .7542) was observed for Code Lyoko than for Doraemon.

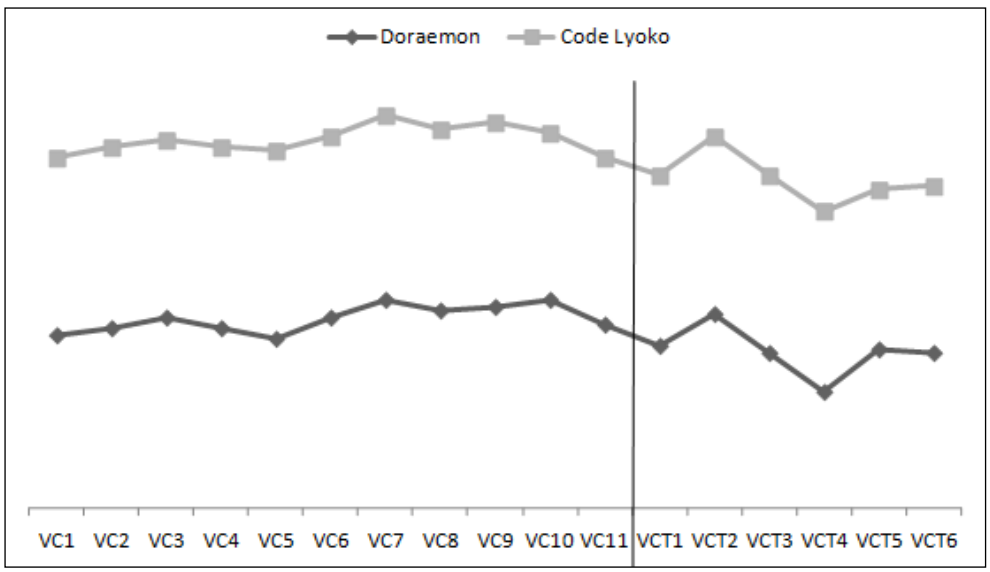

Figure 2. Visual Contact with the screen during the episode viewing.

Nevertheless, in both Doraemon and Code Lyoko fluctuations were observed in the visual contact maintained (meaning that participants did not

keep their eyes on the screen at all times), although in general a high level of visual contact was maintained throughout the episodes (see Figure 2). Thus, the differences observed between the series as regards the narrative abilities demonstrated by participants cannot be attributed to problems with stimulus assimilation, but are due rather to factors of another kind.

DISCUSSION AND CONCLUSSIONS

The results of the study show that functional relationships exist between the three story processing levels (Hypothesis 1). Narrative abilities are not organized and activated in order to accurately recount the causal, proximal or distal relationships separately, but rather are set in motion in order to process all these dimensions of the story simultaneously. This does not mean that the retelling will necessarily be correct and will reproduce the whole story; indeed, the children in our study produced a wide variety of different stories, ranging from very complete to very poor with large gaps and major shortcomings.

This multilevel activity has not been analyzed in previous studies on story production during childhood (Bonus & Mares, 2015; Castilla-Earls, Petersen, Spencer & Hammer, 2015; Fayol, 1994; Jacob, 1969; Mandler & Johnson, 1977; Mialaret & Malandain, 1962; Stein & Glenn, 1979). The complexity of this task, which involves the planning and execution of the narrative, serves to illustrate the fact that narrative abilities are complex cognitive activities which the educational field should be more aware of and pay more attention to. The results of this study enable us to demarcate the definition of narrative abilities in story production. Narrative abilities involve operations that affect the causal coherence links between events and the reconstruction of the story's proximal and distal relationships. This multilevel reconstruction of the story clearly improves with age. Nevertheless, while in relation to Doraemon this improvement is substantial, it is not so marked in relation to Code Lyoko. Surprisingly, even 6th graders reconstruct the Code Lyoko story incoherently and inadequately, and show little progress in relation to their 3rd grade counterparts. This means that, consistently with hypothesis 2, the cognitive reconstruction of the story is also affected by the type of story in question. The results reveal that the deployment of narrative abilities differs in accordance with the type of story being retold. The Doraemon episode may be considered narrativizing in the sense that it encourages the proper structuring of the causal, proximal and distal relationships during retelling. Code Lyoko, on the other hand, induces disarrangement in all the dimensions of narrative coherence. This result cannot be explained by the

lack of attention to the screen during the prior viewing. Children's show a high level of visual contact with Code Lyoko, in accordance to hypothesis 3. Consequently, the differences observed between the two groups of children as regards their narrative abilities in production cannot be attributed to the stimulus perception. Two factors may explain this phenomenon. First, as noted above, there is a set of five differences between the two types of cartoons. Code Lyoko properties are more complex and require more processing effort. Second, there is an interaction between the structure/form of Code Lyoko and the level of cognitive development of the viewer. A teenager or adult perfectly understands (and retell) a story like Code Lyoko. By contrast, at age 12, causal, motivational, and spatiotemporal mental structures are still in the process of being constructed. This would cause the mismatches found in this research. The problem is not in the series. Code Lyoko has a well articulated plot and discourse. The problem is at the age at which the child is exposed to that content. Errors and mismatches would occur when the level of development is not adequate. In short, a cartoon will be denarrativizing when the child is not able to adequately process the story because it has an insufficient cognitive development (story schema). As a consequence the child will produce a narrative without coherence and unstructured in the three levels of representation that we have analyzed here.

From the perspective of children's development and its relationship with the narrative media, these results have direct social and educational implications. Although the study focused exclusively on the 8-12 age range, participants had already been watching these audiovisual products on television for several years, since both series are popular among children in general. Indeed, when we asked participants whether or not they were familiar with these series, all responded in the affirmative, claiming either to have seen them in the past or to watch them on a regular basis. Even more interestingly, many of them said that they liked these cartoons. However, the mere fact of watching the series more often does not necessarily imply that they understand them better or are able to retell them correctly. This was particularly clear in the case of Code Lyoko, in relation to which children score lower narrative abilities.

In conclusion, the results of this study suggest that not all television stories contribute in the same way to children's informal education. Some stories are more structuring while others are more destructuring. Given that narrative abilities are gradually constructed over the course of a child's development, the solution is not to prohibit certain types of television stories, but rather to offer them fictional contents with a minimum of narrative structuring, in order to promote understanding and increase in

quality and quantity the retelling produced by children and not only those who have a more advanced cognitive level. Our results show that Code Lyoko is more demanding in this sense and requires viewers to have a more advanced cognitive level.

As regards the limitations of this study it is necessary to expand the sample with the collaboration of at least one more private school in order to control the possible effect of the school type (public/private) or other factors such as the attentional level.

Another future research area would be to test and adjust the cognitive representation (CR) and connective density (CD) index resulting from this project using other cartoon series, in order to determine its validity and scope. This would provide a relatively simply tool for testing other fictional television programs and making the appropriate decisions regarding their suitability for certain age groups. This in turn will enable a more adequate television diet, in accordance with viewers' current development levels. Viewed in this way, fictional television series can be correctly considered informal education products, since they contribute to developing narrative thought by inducing complex cognitive coherence operations.

RESUMEN

La influencia de las historias televisivas en las habilidades narrativas de niños/as. Esta investigación indaga las habilidades narrativas que niños/as entre 8 y 12 años manifiestan al evocar relatos televisivos. Los resultados muestran que no todos los relatos televisivos visualizados por los/as niños/as favorecen el proceso de educación informal. Un tipo de relato, denominado *narrativizante*, permite a los/as niños/as producir relatos coherentes que articulan adecuadamente las relaciones causales, temporales y motivacionales, así como las estructuras medios-fines, las relaciones proximales del argumento y las relaciones distales de la trama. Otros relatos televisivos, contenidos *desnarrativizantes*, inducen desajustes e incoherencias en todos los niveles estructurales de los relatos producidos por los/as niños/as. Esto, a su vez, perjudica la construcción de sus habilidades narrativas, necesarias para el correcto desarrollo del pensamiento narrativo. Los resultados plantean la necesidad de ejercer control social sobre este último tipo de productos narrativos de ficción televisiva, a los que se exponen los/as niños/as a lo largo de su desarrollo en el marco de su educación informal.

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(Manuscript received: 14 September 2017; accepted: 6 december 2017)