

Microgenesis of Typical Storytelling

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Abstract

We studied the development of narrative ability yearly in a cross-sectional design from 4 to 10 years. All children were given the same props and underwent the same procedures. Children's narratives were transcribed verbatim, and then coded for number of: words, propositions, episodes and indexes of narrative cohesion and structure. Verbal IQ was controlled as appropriate. Words showed no significant effect for age. Number of propositions and episodes followed nonlinear trajectories of development, and spline regression analyses identified maxima at 8 and 7 years, respectively. However, indexes of cohesion and structure followed linear trajectories of development.

Introduction

Learning to narrate (and comprehend the narratives of others) shows critical links to early literacy and academic achievement and is even fundamental to children's success in social relationships. For these several reasons, we wished to further understand the normative development of children's narrative abilities. We approached the problem by studying large samples of children yearly over several ages (from the beginning of storytelling at age 4 to the beginning of more mature storytelling at age 10) and submitting their stories to two levels of analysis (linguistic in terms of words, for example, and structural, in terms of cohesion, for example).

A constellation of skills and abilities paves the way to children's storytelling. Storytelling depends on the coordination of many different abilities, including pretending, understanding emotions and social reciprocity, comprehending cultural scripts and social roles, and capabilities to plan and remember the story. Further antecedents or concomitants of storytelling include cognitive skills, such as knowledge and memory of the structure of events, narrative genre, executive planning, theory of mind, and concept development [1–3]. All these skills must work in concert to tell an organized story. As such, children's abilities to understand intentionality and glean information about goals and goal plans, put events in temporal order with cause-and-effect relations, establish a hierarchical goal structure consistent with the event structure in the story, and process, encode, and monitor an event map all contribute to children's narrative performance. Furthermore, good stories often have appropriate settings, characters who react to a central problem through a sequence of goal-directed behaviours, and plausible conclusions [4], and they pose a problem that is responded to and nullified or overcome [5].

Over the years, researchers have studied many of these diverse aspects of children's narratives, including contents and themes [6], social and cultural processes [7,8], cognition and affect [9], and imagination and creativity [2,10,11]. In an early analysis of children's stories, Sutton-Smith [12] argued that narrative competence requires increasing structured performance. Studies suggested that children's development of story schema (generalized knowledge about an event sequence) forms a fundamental basis for telling narratives [5]. Thus, children's narratives are composed of a series of predictable

components, which form from previously established structural components and increase in complexity with age. Presumably then, the structural complexity of storytelling increases following specific developmental trends, and storytelling skills develop over time and are connected to chronological age and language development [13,14].

Microgenesis of Storytelling

Children's storytelling follows several general trends. Children under 3 years tell primitive stories, ones usually constructed only of concatenations of words without continuous action sequences or causal connections between events. Storytelling typically emerges between 3 and 4 years of age. Early stories typically lack core structural components, such as clear conflict and resolution [15]. For these reasons, we began our microgenetic study of the development of storytelling with 4-year-olds. Generally, between 4 and 10 years of age children rapidly develop story grammar knowledge and competence. Through childhood (and even adolescence), children acquire abilities to flexibly deploy linguistic devices to mark character reference and perspective and to maintain references throughout the story telling process. Referential adequacy, measured as clear and unambiguous reference to characters throughout the story, improves from 3 to 5 to 8 years of age. To clearly maintain reference to characters throughout a story, or switch reference between characters, children need to develop the ability to flexibly use nominal and pronominal forms. Additionally, Case and Okamoto [16] suggested that young children actively develop a new form of "psycho-logic" between the ages of 4 and 7 years as they integrate rudimentary theory-of-mind abilities with narrative abilities. This emergence of "psycho-logic" is identified a key mechanism enabling children to link story events with character motivations and narrate stories that are goal-based or plan-based in nature.

Looking at specific developmental changes, between 3 and 4 years, children begin to tell stories about events and actions that often seem like juxtapositions of events and characters without a central conflict or problem. A common feature of 3- to 4-year-old children's stories is a lack of causal connections between events. When character states or outcomes are identified, 3- to 4-year-olds tend not link them to the main plot line.

Between 4 and 5 years, children begin to organize simple narrative structures around a conflict. These narratives are becoming well formed with a goal or purpose, indicating children's grasp for the concept of causal relations (antecedents and consequences). Children at this age also begin to use the verbs "know," "think," and "feel" [5].

By 5 years, children tell narratives that sometimes have sustained plans of actions, indicating an increased ability to structure and organize higher level goals. Their narrations also include more story components compared to 4-year-olds.

At around 6 years, a schema for story setting emerges, which includes temporal and spatial orientation and character identification [17]. Between 6 and 7 years, children begin to tell stories with sequences of episodes to explain characters' coordinated actions. For instance, Lynch and colleagues (2008) found that 6-year-olds recall a greater number of story events that had more causal connections to other parts of the story compared to 4-year-olds.

Bamberg and Damrad-Frye [18] examined pre-schoolers' narratives for evaluative devices and found that, even though 5- and 9-year-old children include more references to characters' emotions compared to adults when constructing a narrative using the Frog, Where are You picture book, theirs were local, evaluative perspectives rather than integrations across the larger episodes. Between 7 and 8 years, children begin to initiate events and consequences in their stories [5]. Higher-order cognitive skills are likely key foundations for children's abstraction and use of complex narrative structures.

Later still in development, children acquire the competence to tell stories with a complex structure, focusing on diverse dyads' problem-solutions that interconnect various events and conflicts, in which one or more dyads are opened, interconnected, and closed. According to Stenning [6], older children tell stories with more intentional story structure, in which the characters' actions are related to mental states, desires, and feelings. More mature narrative cohesion includes successful integration of both sentence-level and narrative-level structures but this stage is typically not attained until late childhood.

However, individual differences in mastery of complex syntactic structures, such as coordinative conjunctions, locatives, relative clauses, embeddings, and passives, as well as sensitivity to causal structure (i.e. being more likely to recall events that have more causal connections than other events), are present in both children and adults [17], and likely affect narratives.

Past Approaches to Children's Narrative Development

Many studies have focused on the content of narratives, but few studies have systematically investigated linguistic and structural underpinnings of storytelling. Historically, the predominant methods of assessing narrative skill have relied on quite short, simple stories. For example, narrative skill tests evaluate just the number of sentences and number of episodes for The Frog Book series [19], or the amount of information recalled from a 168-word script in the case of the Renfrew Bus Story [20]. Despite these simple complexity levels of the most-researched stories, most children between 4 and 8 years of age fall far below mastery of the narrative structures and events. The storytelling task we used provides a concrete but open-ended framework in which children can spontaneously produce natural language samples. Although language variables derived from natural speech samples and standardized assessments tend to correlate, their shared variance is often modest, indicating that natural samples assess unique qualities of language [21]. Using an elicited storytelling task, we collected natural language samples from which we calculated the child's linguistic and structural abilities.

Hypothesis

Our aim in this study is to investigate how the different components of stories develop in children from 4 to 10 years, using a structured narrative task. In accordance with prior research, we hypothesized that different components of storytelling follow distinct developmental trajectories. We postulated that narrative cohesion and narrative structure in children's stories would increase with age reflecting increased storytelling skills, whereas numbers of words, propositions, and episodes would not necessarily increase. To study these trajectories, we devised a storytelling task that requires the use of verbal production in the service of a specific, applied, and meaningful goal.

Materials and methods

Participants

This study assessed 344 Italian children (167 female/177 male) in a cross-sectional design at 4 years (45 f/45m), 5 years (20f/22m), 6 years (20f/21m), 7 years (20f/21m), 8 122 years (20f/20m), 9 years (21f/21m), and 10 years (21f/27m). Child verbal IQ was assessed with the age-appropriate Wechsler scale (Cornoldi et al., 2013). All children had a verbal IQ in the normal range ($M = 104.6$, $SD = 7.8$). The socioeconomic status (SES) of the parents, calculated with the Four-Factor Index of Social Status (Hollingshead, 1975), indicated a middle status in the Italian population ($M = 32.87$, $SD = 14.67$). The study was approved by the legal advisory board of University of Trento and was conducted according to the principles expressed in the Declaration of Helsinki. Written informed consent was obtained from the participants' legal guardians.

Procedure

The Bear Family Task, a structured task that stimulates play and storytelling in children, was administered identically to all the children in the sample. The Bear Family Task utilizes toys and figures as props to facilitate storytelling. The props include standard, age-appropriate, feminine, masculine, and gender-neutral toys and figures that allow for different play behaviors. The figures include a father bear, a mother bear, two bear cubs, a doctor, a policeman, a goose, and a rabbit. The toy set provides three environments: a kitchen, a living room, and a playground. The Bear Family Task is administered in two successive 5-min parts. During the first part, children are asked to play with the toy set. During the second part, children are asked to tell a story about the Bear family. A maximum of two prompts was offered to children to encourage them to tell stories. Children's stories were videorecorded, transcribed verbatim, and subsequently analyzed by means of the Bear Family Coding System [22], which enabled us to analyze five features of children's stories.

Measures

The Bear Family Coding System includes the following measures:

1. Number of words (WORDS). WORDS is the total number of words a child uses to tell the story. For example, the story: “Once upon a time there was a family of bears living in the woods” has 14 words.
2. Number of propositions (PROPOSITIONS). PROPOSITIONS are basic units that express each action of the story. For example, the story: “Once upon a time // there was a family of bears // living in the woods” has 3 propositions.
3. Number of episodes (EPISODES). EPISODES are actions that stand by themselves but relate to a complete series of events by subordination and specification relationships. For example, the story: “Once upon a time there was a family of bears living in the woods” has 1 episode.
4. Narrative cohesion index (COHESION Morrow:1986aa; possible range = 1 - 8). COHESION represents the degree to which different parts of a story functionally depend on other parts. It reflects whether the story develops around a theme, a topic, or one or more conflicts and resolutions. For example: “Once upon a time there was a family of bears living in the woods. It was a sunny Sunday morning and the dad told his family: ‘Let’s go the waterfall at the end of the wood to have a picnic.’ They went to the waterfall, but the weather became rainy and they couldn’t have their picnic. They came back home, and invited their friends, a family of pandas, and spent all day together playing and laughing has a score of 8. (There is a problem “the rain and they can’t have their picnic,” then there is a mediation element “they come back home and invite friends,” and a positive solution “they spent all the day playing and laughing with a family of pandas”)
5. Narrative structure index (STRUCTURE Morrow:1986aa; possible range = 1- 6). STRUCTURE is the presence of typical story elements, such as an introductory phrase (“Once upon a time”), a protagonist (“The Bear family”), a temporal setting (“It was a sunny Sunday morning”), a physical setting (“The Bear family was living in the wood and decided to go to the waterfall at the end of the wood”), a conclusion (“Mum and daddy turned off the light and the holidays ended”), and long-term consequences (“The Bear family didn’t think anymore of the picnic and lived

happily ever after”) has a score of 5. (“Once upon a time” – introduction phrase; a family of bears living in the woods – protagonist; it was a Sunday morning – temporal setting; the waterfall at the end of the wood – physical setting; and spent all the day together playing and laughing – conclusion; however, there is not a long-term consequence – for these reason the example shows a structure index 5 and not 6.)

Procedure

Two raters, blind to the hypotheses of the study, were trained to use the Bear Family Coding System. Training was accomplished through analysis of a set of master transcripts not used in the study and group discussions with an expert on the Bear Family Coding System. Interrater reliability was calculated on 25% of the sample using Cohen k. Mean reliability of the different measures was highly acceptable, $k = .96$, $SD = 0.01$, Range = .93 -.97.

Results

Preliminary Analysis

Prior to formal data analysis, all dependent variables and potential covariates were examined for normality, homogeneity of variance, outliers, correlations among variables, and influential cases [23]. Transformations were applied to resolve problems of non-normality, and residuals were examined for influential points. The distance of each case to the centroid was evaluated to screen for multivariate outliers [24]. Preliminary correlations were conducted to investigate associations between variables. Significant correlations between verbal IQ and the Bear Family measures were found; therefore, verbal IQ was controlled as appropriate in subsequent analyses. Correlations are reported in Table 1. No child gender differences were found in Bear Family measured variables; therefore, the data are reported for girls and boys combined. No differences for Socio-Economic status emerged.

Analyses

Table 2 presents descriptive statistics of Bear Family measured variables. A MANCOVA, using AGE as factor and controlling for Verbal IQ, was performed on all narrative measures. A significant main effect for AGE emerged, $F(8,334) = 7.80$, $p = .001$; $d = .30$.

Then, separate ANCOVAs were performed on each Bear Family variable. WORDS showed no significant effect for AGE, (Fig. 1A). However, PROPOSITIONS, $F(6,332) = 2.40, p \leq .05, d = .16$, (Fig. 1B); EPISODES, $F(6,330) = 3.20, p \leq .05, d = .19$, (Fig. 1C); COHESION, $F(6,333) = 45.59, p \leq .001, d = .73$ (Fig. 1D); and STRUCTURE, $F(6,333) = 26.98, p \leq .001, d = .53$ (Fig. 1E) showed main effects for AGE.

Table 1. Correlations Between Demographic and Bear Family Variables.

	Words	Proposition	Episodes	Cohesion	Structure
<i>Age</i>	.13*	.19**	.10	.74**	.64**
<i>VerbalIQ</i>	.10	.14*	.10	.34**	.24**
<i>Words</i>		.86**	.83**	.36**	.31**
<i>Propositions</i>			.83**	.36**	.34**
<i>Episodes</i>				.34**	.27**
<i>Cohesion</i>					.74**

Table notes: * $p < .05$; ** $p < .01$.

Table 2. Means and Standard Deviations of Bear Family Variables by Age.

	Words	Proposition	Episodes	Cohesion	Structure
<i>4yr</i>	12.37 (± 4.99)	4.69 (± 2.26)	3.26 (± 1.76)	13.84 (± 13.16)	.94 ($\pm .75$)
<i>5yr</i>	13.94 (± 5.75)	4.79 (± 2.41)	3.74 (± 1.97)	15.93 (± 9.10)	1.42 ($\pm .51$)
<i>6yr</i>	12.87 (± 4.87)	5.37 (± 2.13)	4.33 (± 1.25)	26.45 (± 19.10)	1.49 ($\pm .58$)
<i>7yr</i>	14.45 (± 5.09)	5.84 (± 1.76)	4.70 (± 1.42)	43.50 (± 24.42)	1.69 ($\pm .47$)
<i>8yr</i>	15.60 (± 4.94)	6.48 (± 2.18)	4.51 (± 1.31)	61.17 (± 19.80)	1.92 ($\pm .36$)
<i>9yr</i>	14.87 (± 4.68)	6.11 (± 2.12)	3.95 (± 1.30)	60.54 (± 19.18)	2.04 ($\pm .36$)
<i>10yr</i>	13.71 (± 4.17)	5.62 (± 1.85)	3.81 (± 1.25)	62.19 (± 23.04)	2.01 ($\pm .31$)

Table notes: Mean (\pm StandardDeviations).

Fig 1. Dependent Variables Means and CI. Means and confidence intervals (.95) for number of words (A), number of propositions (B), number of episodes (C), cohesion index (D) and structure index (E).

Correlation Analyses and Spline Regression

Although significant effects of AGE for PROPOSITIONS, EPISODES, COHESION, and STRUCTURE emerged, the zero-order correlations with AGE for the variables PROPOSITIONS and EPISODES were small (Table 1). Therefore, we performed a family of spline regressions [25]. Spline regression models are used when a regression line is broken into line segments separated by points known as knots. A family of spline regressions was used to determine the point on the child age continuum at which the slopes changed (i.e., locations of knots in pairs of regression lines). Spline regression does not assume a curvilinear pattern but instead allows for multiple linear trend lines in segments of the sample.

For PROPOSITIONS and EPISODES, the location of a single knot was estimated using nonlinear least squares regression. For PROPOSITIONS, the knot was estimated at child age 8. For children 8 years of age and younger, every 1 year increase of age is associated with a .44 increase in number of PROPOSITIONS; for children older than 8 years of age, every 1 year increase of age is associated with a .83 decrease in number of PROPOSITIONS. The drop in the slope was significant, $F(1,326) = 5.89, p < .001, R^2 = 0.48$.

For EPISODES the knot was estimated at child age 7. For children 7 years of age and younger, every 1 year increase in age is associated with a .24 increase of EPISODES; for children older than 7 years of age, every 1 year increase in age is associated with a .63 decrease in the number of EPISODES. The drop in the slope was significant, $F(1,326) = 15.23, p < .001, R^2 = 0.54$.

General Linear Model (GLM)

As COHESION and STRUCTURE were strongly associated ($r = .74, p < .01$), a summary index of the two variables was calculated using the mean of their standardized values. The distribution of this summary index was fit using a linear model. The GLM showed that increasing age was associated with the summary index (see Figure 2, $B = .29, SEB = .01, t = 20.06, p < .001; R^2 = .55$).

Fig 2. Summary index of COHESION and STRUCTURE. The index was calculated using the mean of the standardized values the two variables. The GLM showed that increasing age in years was associated with the summary index. The function can be expressed as follows; $\text{Index} = .29 * \text{Age} - 1.81$.

Discussion

We confirmed our hypothesis that components of narrative abilities have different trajectories. We also confirmed our hypotheses the degree of narrative cohesion and narrative structure in children's stories increase with age, whereas number of propositions and number of episodes do not necessarily increase with age but still reflect storytelling skill. We found that narrative complexity (i.e., cohesion and

structure) follows a linear pattern, consistently increasing with each consecutive year in the 4-10 220 year age range we tested. Child storytelling displays increasing numbers of propositions until age 8, which decline thereafter, and increasing numbers of episodes until age 7, which decline thereafter. These patterns show that, as children approach ages 7-8, they become more succinct in their storytelling, using similar numbers of words and increasing numbers of propositions and episodes while generally increasing the narrative complexity of a story. Afterward and up to 10 years of age, the ability to bind propositions and episodes together in a logical way increases, as the ability to use characteristic elements of a story such as opening words and physical and temporal settings. Within the same amount of speech, older and older children build stories with better structure and demonstrative succinctness.

Karmiloff-Smith [26] demonstrated that, when children between the ages of 5 and 7 years were edging into slightly more advanced levels of narrative production, they often showed temporary regressions in the levels of syntactical and lexical sophistication of their narratives. This observation comports with our spline analyses. This regression likely reflects overloads of processing capacities along with the re-organization of their approach towards how narratives should be structured from bottom-up (with a greater focus on discrete components, such as an overreliance on subject pronominal use) to top-down (with a greater focus on thematic content).

Young children's vocabulary, language complexity, and story comprehension increase over time with repeated exposure to written and oral storytelling [27]. Repeated experiences with literature allow children to anticipate typical story components, including the introduction of characters, such as hero and villain or father and mother and conflicts or other situations that those characters face. This is imitated first in dramatic play, when children act out familiar human experiences as means to order, clarify, and understand them [28].

The development of basic language skills (verbal IQ was related to three of five narrative indices; Table 1) is important for narrative comprehension and understanding of causal connections. Play experience and stored knowledge of stories are used to create organic verbal tales. The Bear Family Task includes props, allowing children to combine dramatic play with verbal narrative to build a story.

Additionally, as a child's mnemonic capacities expand with experience and knowledge of ordinary events, connections with emotions in their daily lives make events more memorable [29]. Children tend to speak to the experiences that they know best and have been involved in first hand, and while mundane in nature, the security and structure of their own lives are reflected in their storytelling. The routines of daily life and sequences of events in a story may act as chronological indicators for children to draw from as they are asked to tell their own stories.

Conclusion

Strengths and Limitations

Notably, we studied large numbers of children at multiple ages from 4 year to 10 years, although in a cross-sectional design. We also studied multiple levels of children's storytelling, and included controls for general intelligence and family SES, but we did not study all aspects of children's storytelling nor did we include all possible controls. Some measures of language are quantitative (and can be represented, e.g., as word counts and numbers of propositions), but social and emotional factors that can impact child language and cannot be so easily assessed [30]. For example, shyness might inhibit children, as it has been shown that shy children speak less, use shorter word clusters, and receive lower scores on formal language assessments, most notably those measuring expressive vocabulary and verbal fluency [31]. The Bear Family Task administrator seeks to establish a rapport that is more conversational and to create conditions that will elicit performance representative of the child's language skills, but the task does not account for variance that occurs in children who take exceptionally longer to warm up to new situations. Limiting test administrators to 2 prompts as encouragement to the children to tell their story may downgrade children who need extra time and assistance in acclimating themselves to a condition where they are in the spotlight. Nor did we study children younger than 4 or older than 10; in practice, the numbers of words children produce must initially increase to allow adequate content and quality of communication and then, conversely, likely decrease to avoid repetitions, juxtapositions, off-topic sentences, and jumbled word production. In between, words appear to remain constant.

Moving Forwards

As technology and media continue to influence children in multiple facets of their lives, we may see changes in language development at different age levels. Access to digital learning aids is becoming more prevalent across the world and reaching younger and younger children. The ways in which literative content is absorbed from a variety of sources and across distances provide more opportunities to create and share stories with peers and adults. Experiences in creating stories and sharing thoughts represented symbolically are key skills to reading and writing. With the push to have children reading at younger ages will likely come increased participation in activities that build on those pre-reading and -writing skills. More exercises aimed to increase vocabulary and language concepts conducted with children of younger ages could potentially increase the number of words young children deploy in storytelling.

Although children in modern westernized societies typically are given massive exposure to narratives, including includes countless books and videos, and, research to date indicates that most children by age 6 command only modest skill in telling or comprehending complex narratives. This observation leaves a conundrum of why children do not more readily acquire narrative complexity by hearing and/or viewing those hundreds of narratives at home, preschool, and kindergarten. What kinds of effective interactions would scaffold advances in children's narrative skills, especially since children across cultures begin the process of becoming literate well before they begin formal schooling?

The early narratives children share in conversation with others lay the foundation for various aspects of school readiness. With findings that children with higher expressive vocabulary scores use more within-scene connections and narrate more coherent stories, and that basic language skills of words, propositions, and verbal IQ are consistently related to multiple measures of story cohesion and structure, future intervention research targeting early language may have heretofore unrealized implications for oral storytelling.

Acknowledgments

This research was supported by the Nanyang Assistant Professor Start-Up Grant, the Intramural Research Program of the NIH/NICHHD, USA, and an International Research Fellowship in collaboration with the Centre for the Evaluation of Development Policies (EDePO) at the Institute for Fiscal Studies (IFS),

London, UK, funded by the European Research Council (ERC) under the Horizon 2020 research and innovation programme (grant agreement No 695300-HKADeC-ERC-2015-AdG).

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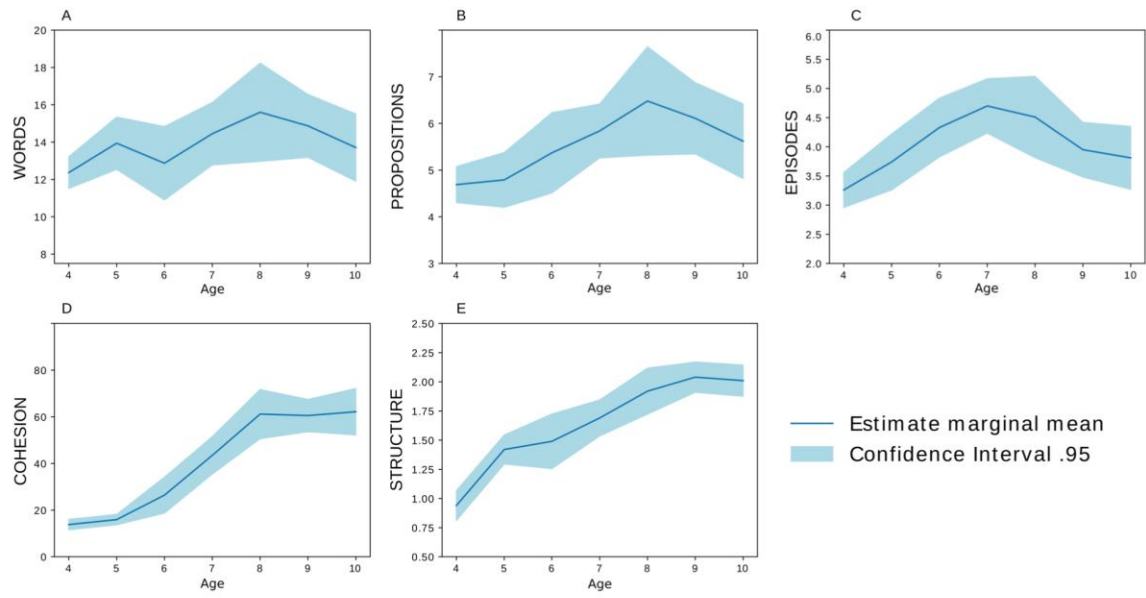


Figure 1

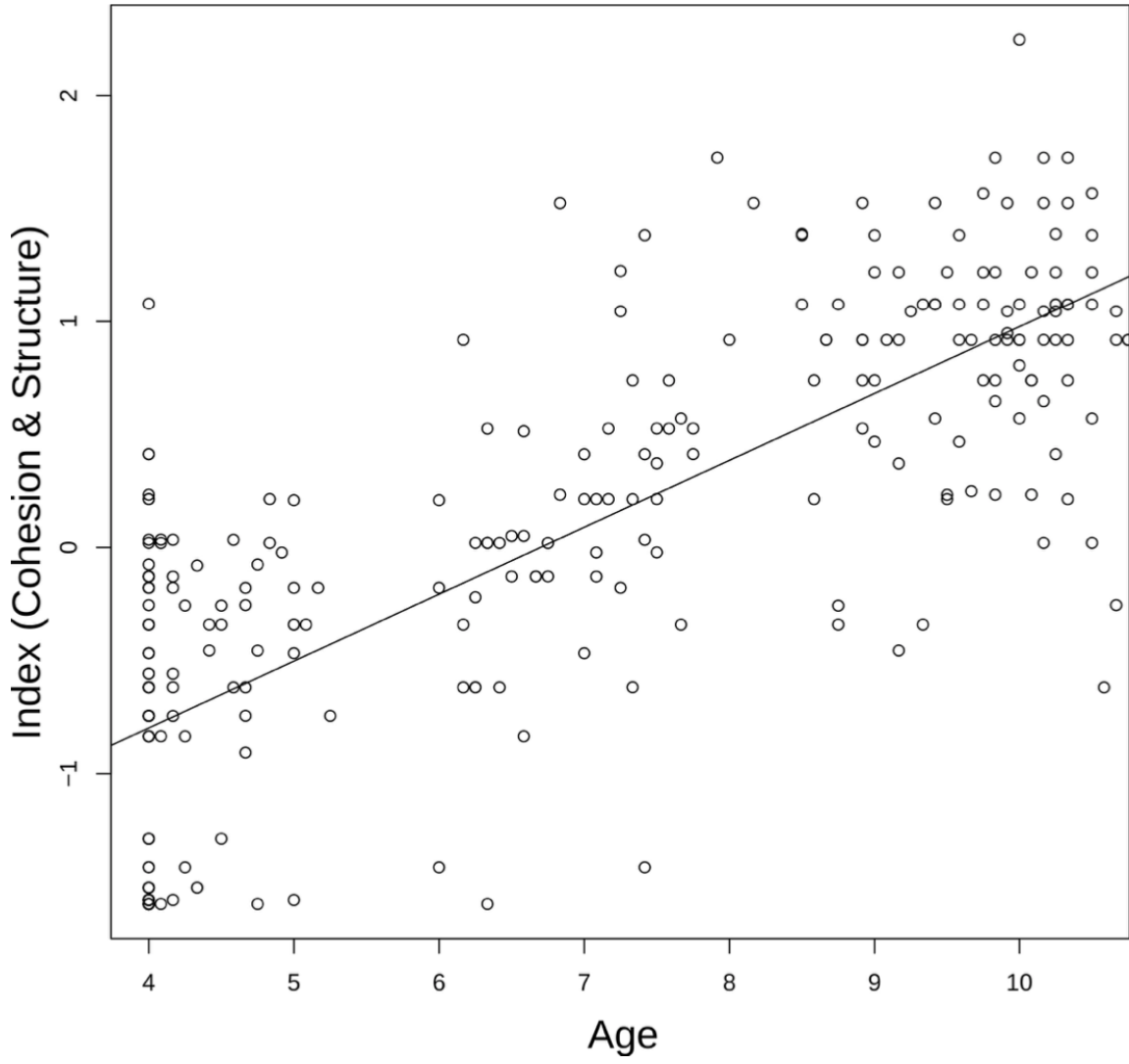


Figure 2