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Age Factor and its Role in the Readers' Comprehension of Stylistic Heterogeneity: Evidence from Eye Movements and Default Responses

Maria I. Kiose
Center for Socio-cognitive Discourse Studies
Moscow State Linguistic University
Moscow, Russian Federation

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Abstract. The article discusses the role of the age factor in the readers' comprehension of stylistically heterogeneous texts, here the text fragments containing figurative noun groups of salient and non-salient character. The salience effects on eye movement and default responses are studied in the oculographic experiment where the secondary school children had to read the sentences displaying figurativeness. The earlier detected statistically significant corpus salience indices of referential, linguistic and discourse parameters in figurativeness construal get verified experimentally. In accordance with the Graded Salience and Defaultness hypotheses I assumed that the interpretation of figurative noun groups of varied referential, linguistic and discourse salience will require different cognitive effort in terms of both eye movement reactions and default inferences. Several eye-tracking experiments with adult participants sufficed to prove the dependency, however, the results obtained with children did not support the Salience hypothesis in the part of visual perception. The eye movements of children facing figurative noun groups did not show steady correlation patterns with the salience effects of these groups, whereas the default interpretations correlated strongly with referential, linguistic, and discourse salience. The results show evidence in favor of Mixed-Effects Model of interpretation.

Keywords: stylistically heterogeneous texts, readers' comprehension, eye-tracking experiment, secondary school children, salience, eye movements and default responses.

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* Corresponding author E-mail address: maria_kiose@mail.ru
ORCID: 0000-0001-7215-0604

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Introduction

The problem of cognitive load distribution which a reader has to face when dealing with heterogeneous texts has received a lot of attention and has resulted in the experimental boom in recent years (Sweller, et al. 2011; Ginns, Leppink, 2019). Heterogeneity may be present in different forms, for instance, in the intersection of stylistically or culturally heterogeneous text fragments, in the interplay of language codes, modalities or media channels. All these forms represent different factors which determine different functions of communication (Jakobson, 1960). However, irrespective of the form in which heterogeneity is expressed, it imposes on the reader the necessity to adapt his or her eye movements and interpretation procedure to the new construal schemes. In this study I look at the stylistically heterogeneous textual fragments as potentially hampering the reader's smooth interpretation process in the situation of the reader being a secondary school child.

Stylistic heterogeneity is shaped in various linguistic forms in children's literature, which a child has to comprehend.

Thus, in (1) the figurative nominal group is expressed by the indirect non-entrenched noun *guest*, in (2) – by the entrenched idiomatic group, comprising the indirect verb and noun, *dropped the subject*. In (3) that is the indirect non-entrenched verb *jumped* standing for the animated action of non-animated object. Other detected examples of figurativeness involved indirect adjectives and indirect phrases.

1) *There, inside, looking up at her, was the newborn pig. [...] At this moment her brother Avery came into the room. [...] "What's that?" he demanded. "What's Fern got?" "She's got* ***a guest*** *for breakfast," said Mrs. Arable* (E.B. White. Charlotte's Web).

(2) *The Mole knew well that it is quite against animal-etiquette to dwell on possible trouble ahead, or even to allude to it; so he* ***dropped the subject*** (K. Grahame. The Wind in the Willows).

(3) *The egg* ***jumped*** (P.D. Eastman. Are you my mother?)

The study is aimed at detecting the interpretation models a child adopts when reading and processing textual fragments with integrated referential ambiguity caused by stylistically heterogeneous character of figurative noun groups. Multiple experimental studies have shown that children's and adults' interpretation models are not concurrent, which is explained by the differences in their executive functions (Miyake et al. 2000), expressed in three main components, working memory, cognitive flexibility (the ability to switch from one construal scheme to another), inhibitory control (which is supposed to inhibit one's dominant response to a textual situation in favor of the task requirement) (Lehto et al. 2003; Cutting et al. 2009; Cantin et al. 2016, among others). Interpretation can be assessed in terms of the construal process a child has to accomplish (the construal models he recognizes ad hoc, which we will name default interpretations after (Giora, 1999; Jaszczolt, 2005)), and in his or her eye movement reactions, which we will test oculographically applying the eye-tracking assessment parameters developed in (Rayner, 1998; Staub, 2015) to test the reading performance skills. These two methods of assessment will give us the opportunity to evaluate the degree of cognitive load in each individual case and detect the more and less common interpretation models applied to read and comprehend a stylistically heterogeneous text fragment.

Salience, Textual Heterogeneity and its Interpretation Models

To this date there exist three partly mutually exclusive hypotheses on how we process stylistically heterogeneous information, i. e. the fragments containing lexical or grammatical ambiguity, and select this or that construal scheme. There is the Parallel Process Hypothesis (or the Unrestricted Race Hypothesis) which assumes a single cognitive mechanism for different construal schemes and

parallel processing of several interpretations (van Gompel et al., 2001). According to the Direct Access Hypothesis (Martin, McElree, 2011), the default meaning is accessed directly without the processing of non-default ones. The Strategic Underspecification Hypothesis (Swets et al., 2008) is radically different as it claims that a reader does not in all cases resolves ambiguity, only when it becomes absolutely necessary. These three hypotheses have been continually challenged with none of them being acclaimed as veritable in all cases (cf. (Logacev, 2014)). With the common interpretation theory still unclear, the possible solution of the interpretations modelling problem may be the study of the neural connections which are formed in the mind of a reader when he or she processes the heterogeneous information. Consequently, while verifying the hypotheses the researchers have developed a new cognitive experimental direction exploring the neural connections as the basis for ambiguity resolution.

The Connectionist Model (Feldman and Ballard, 1982) is a network according to which the ambiguity feedback is based on the "best fit" senses of a word when its meaning is processed from lower to upper levels of language. This model has produced several variations (cf. (Small et al., 1988)). Two of its earlier common approaches were the interactive one which holds that only a single meaning is accessed (the Prior Decision Hypothesis) and the modular view which states that all the meanings are accessed simultaneously (the Post Decision Hypothesis) with these two models accompanied by the resolution variant in the form of Semantic Priming Model (Wickelgren et al., 1980) which accounts for faster default effects in case the default meaning is associated with the prime (e.g. if the ambiguous word *key* is preceded by the word *door*). Later connectionist views have given rise to the Cue-Dependent Model (van Dyke, McElree, 2011), Good-Enough Model (Ferreira et al., 2002), Garden-Path Model (Christianson, 2001), Mixed-Effects Model (Pinheiro, Bates, 2000) and even Random Effects Model (Barr, 2013).

Compared to adults, children adopt a different strategy in figurative language reading and comprehension (Ferguson, Slobin, 1973; Gibbs, 1991; Levorato et al., 2007; Rubio-Fernández, Grassman, 2016) which is explained by the specificity of their executive functions development. In this study I will detect the dominant interpretation models applied by the secondary school children reading stylistically heterogeneous text fragments displaying higher and lower degrees of salience, that is more or less typical language construal patterns. The Graded Salience and Defaultness hypotheses (Giora, 1999; Jaszczolt, 2005) have already received approbation in a number of experiments carried out with adult participants (Giora et al., 2015; Giora et al., 2018; Kiose, 2018), however its influence on children's interpretation models still needs to be verified. These experiments have sufficed to show that the reader's default reactions are highly resonant with the salience of lexical, syntactic and discourse construal patterns. Furthermore, salience is graded, which can be assessed statistically by means of parametrical corpus analysis, and then verified experimentally by faster readers' reactions and higher index of default answers, although the interplay of salience parameters also plays a role (Kiose, 2020, in press).

With the secondary school children as experiment participants I will find out what role salience plays in selecting the interpretation model, and whether it is possible to distinguish one dominant interpretation model for defaultness procession and eye movements reactions.

Methods and Experiment Design

In (Kiose, 2019) by means of parametrical corpus analysis I disclosed the age-dependent salience parameters of focusing (Iriskhanova, 2014) which are exploited by the authors of successful Russian literature in their use of figurative language. Additionally, some schemes of parameters interplay, that is when some combinations of salience parameters are frequently exploited together, were also found. In this study the salience parameters of figurative language will be used to assess the interpretation models the children apply to comprehend more and less salient figurative language. Corpus analysis was conducted with reference to 57 fo-

cusing parameters of 8 groups: 1) Embodiment parameters, 2) Reference parameters, 3) Metaphor and metonymy mapping models parameters, 4) Linguistic parameters (morphological, lexical, syntactic, textual), 5) Co-reference parameters, 6) Graphic parameters, 7) Pragmatic parameters, 8) Event construal parameters. The value of each parameter was marked in binomial regime (presence vs. absence). For instance, the presence of Embodiment parameters was acknowledged in the following sentences (4–7). Figurative units are given in bold.

In (4) the parameter of explicit exteroception is present:

(4) *Жук карабкается,* ***как по канату****, по шнурку от тапочки* (В. Крапивин);

Tr.: [the beetle] [climbs] [**like up an (anchor) cable**] [along the shoelace].

In (5) embodiment is expressed in the explicit visual mode:

(5) *Но снеговик задумчиво глядел куда-то своими* ***угольками*** (Л. Воронкова);

Tr.: [but] [the snowman] [looked] [somewhere] [with his **embers**].

In (6) and (7) these are the explicit kinesthetic and auditory modes present:

(6) ***Подпрыгивает*** *телега, гремят пустые бидоны* (Н. Калинина);

Tr.: [**jumps**] [the cart], [bang] [the empty cans].

(7) *Испугалась Вода, зажурчала тихим* ***голосом*** (Я. Таяц);

Tr.: [got frightened] [the water], [jingled with] [quiet] [**voice**].

Having annotated the parameters of four compiled subcorpora (450 pages each) of short stories addressed to four age groups: preschool, primary, secondary school (11-14) and (15-17) I have detected the resonant parameter values for each age group. As in this study I will focus on the secondary school children as the experiment participants, I will give the values of the resonant parameters for this age group which will underlie the stimulus text design. In Fig. 1 several of the resonant parameters are shown as well as the parameters which do not display variability across the parameter values for 4 age groups.

The parameter values demonstrate the salience effects across the four age groups. Thus, the parameter of exteroception in pre-position to the figurative noun group is equally salient whereas the parameter of visual mode is more salient for secondary school literature. Object reference is less salient (more frequent event reference construal is typical of this age group), but the lexemes tend to display more often phonetic or morphological motivation.

Consequently, the selected group of parameters (whose values demonstrated both significant variance with the mean values and similar values to check the hypothesis) were considered to compile the text fragments for the stimulus text for the oculographic experiment. The null hypothesis was that the salience effects in children's reading and understanding the stylistically heterogeneous text fragments

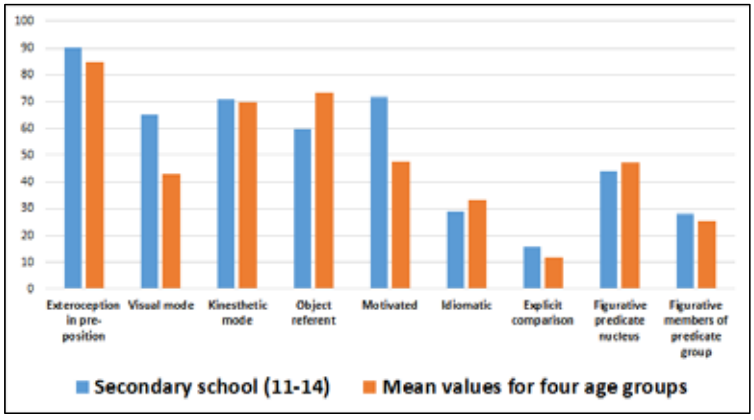

Fig. 1. Resonant and non-resonant focusing parameters for secondary school literature

will correspond to defaultness effects and faster reading reactions.

To assess the defaultness effects, I collected the readers' responses about the reference recognition of the figurative units or groups (Identification Index). To evaluate the reading reactions, I collected data on Reading Path, Reading Time, and Duration of Fixations.

The participants of the experiment were 15 secondary school students (13-14 years old); their parents signed the consent for their participation.

The task set for the participants was to read the sentences presented on the computer screen once and after reading every sentence say aloud what the word in bold stands for, that is what referent it stands for. The students first received some practice doing this task without eye-tracking equipment so that I could become sure they fully understood the task.

The experiment was run with a portable EYETRIBE eye-tracker set, 30 Hz, in order to process the raw data the special software was developed, EYE-TRACK-PROC, to comply with the experiment needs.

The stimulus text contained 12 sentences elicited from the texts for secondary school children with contrasting values of the salient and non-salient parameters. In these sentences the figurative units and complexes were in bold. The reference of these words the participants had to detect and say aloud when reading each sentence.

The sentences presented the contrasted groups of salient and non-salient parameters. The first sentence was given for tuning in for the experiment, its results were not considered. The stimulus text is given in Fig. 2.

The text transcript is given below.

[in] [window] [Kuzma, name] [could see] [long] [empty] [street], [along] [which], [like] [along] [**tunnel**], [runs] [wind].

[Kolya, name] [no way] [couldn't] [get used] [to] [hunger], [and] [his] [hollow] [eyes] [angrily] [flickered], [constantly] [searched for] [**prey**].

[since] [those] [times] [these] [swings], [which] [earlier] [were] [almost] [in] [every] [yard], [forever] [remained] [**memory**].

[somewhere] [escaped] [from] [opened door] [song], [buzzed], [like] [flying by] [**bumble-bee**], [and] [quieted].

[his] [bright] [red] [car], [roaring] [engine – Acc Case], [dashed] [forward], [until] [not] [got out of] [noisy] [**herd**] [and] [disappeared].

[bread] [melted] [with] [unrestrained] [power]: [and] [soon] [in] [hand] [boy – Gen Case] [remained] [thin – Dimin Affix] [**crescent**]. [and] [it – Gen case] [soon] [didn't remain] …


В ОКНО КУЗЬМЕ ВИДНА ДЛИННАЯ ПУСТАЯ УЛИЦА, ПО КОТОРОЙ, КАК ПО **ТРУБЕ**, НОСИТСЯ ВЕТЕР.

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В ОБЕД, КОГДА КУЗЬМА ЗАГЛЯНУЛ В МАГАЗИН, ТАМ СТОЯЛ **ПОЛНЫЙ ТАРАРАМ**. ВСЕ БАНКИ И КОРОБКИ ПО ДЕСЯТЬ РАЗ ПЕРЕСЧИТЫВАЛИ.

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СИТУАЦИЯ СТАЛА НАПОМИНАТЬ **ЗАДАЧКУ НА ЛОГИКУ**: КТО РАЗБИЛ ОКНО, ЕСЛИ ИЗВЕСТНО, ЧТО СОВРАЛ ТОЛЬКО ОДИН МАЛЬЧИК, У ВАСИ НИКОГДА НЕ БЫЛО СОБАКИ, А КОЛЯ ХОРОШО ИГРАЕТ В ФУТБОЛ?

ТИШИНА БЫЛА ПОХОЖА НА **ПЦЁНКУ В ЕГО МИСКЕ** — ОНА БЫЛА ТАКОЙ ЖЕ ГУСТОЙ И ВЯЗКОЙ. ОНА ДЕФОРМИРОВАЛА ГОЛОСА, КОТОРЫЕ ЗВУЧАЛИ НА ЕЁ ФОНЕ ОТРЫВИСТО И ИСТЕРИЧНО.

ПОЗДНЕЙ ОСЕНЬЮ ПЕРЕМЕНЯТ БЕЛКИ СВОИ **КРАСНЫЕ ПЛАТЬИЦА** НА СЕРЫЕ ЗИМНИЕ ШУБКИ.

НАКОНЕЦ БАБУШКА ПОДОШЛА К НЕМУ И СКАЗАЛА: — ОТВЕДАЙ, ВНУЧОК, МОЕГО КОРЖА. КАКАЯ-ТО **СКРЫТАЯ ПРУЖИНА** СРАБОТАЛА ВНУТРИ — РУКИ МГНОВЕННО УСТРЕМИЛИСЬ К КОРЖУ, ПАЛЬЦЫ КРЕПКО СЖАЛИ ЕГО И ВОТЯНУЛИ В РОТ.

Fig. 2. Stimulus text for secondary school children

[at lunch], [when] [Kuzma, name] [looked into] [shop], [there] [stood, meaning was] [complete] [**tararam**, meaning bedlam]. [all] [tins] [and] [boxes] [for] [ten] [times] [were counted again].

[master] [mansion – Gen Case] [already] [in January] [went to Paris]. [in] [town] [started] [babel] [**crowd-make**, meaning pandemonium], [but] [on] [house] [nobody] [infringed].

[situation] [started] [remind] [**task** – Dimin Affix] [for] [logics]: [who] [broke] [window], [if] [known], [that] [lied] [only] [one] [boy], [prep] [Vasya, name] [never] [not] [had] [dog], [and] [Kolya, name] [well] [plays] [football]?

[silence] [was] [alike] [prep] [**mills**] [in] [his] [bowl] – [it] [was] [in the same way] [Particle] [thick] [and] [gluing]; [it] [transformed] [voices], [which] [sounded] [on] [its] [background] [abrupt] [and] [hysterical].

[late] [in autumn] [will exchange] [squirrels] [their] [**red**] [**dresses** – Dimin Affix] [for] [grey] [winter] [coats – Dimin Affix].

[at last] [grandma] [came] [to] [him] [and] [said]: – [taste, verb], [grandson – Dimin Affix], [my] [cake]. [some] [**hidden**] [**spring**] [worked] [inside] – [hands] [momentarily] [fastened] [towards] [cake], [fingers] [firmly] [clasped] [it] [and] [pulled] [into] [mouth].

In sentences 2–4 the more and less salient embodiment parameters are contrasted. In the second sentence there is an explicit marker of the visual mode in *eyes* and *flickered;* in the third sentence no explicit exteroception was present; the fourth sentence contained markers of multimodal (auditory, kinesthetic) exteroception in *buzzed* (auditory), *flying* (kinesthetic), and *quietened* (auditory). In sentences 5–6 the linguistic parameters of syntax are contrasted, i. e. in syntactically non-focal *herd* and focal *crescent*. In sentences 7–8 these were the parameters of phonetic motivation, present in *tararam* and absent in *pandemonium*. In sentences 9–10 these were the reference parameters of singular and abstract reference in *task* and *mills*. The sentences 11–12 show the contrasting parameters of metaphor mapping models, $OBJECT_1$ IS $OBJECT_2$ in COATS ARE DRESSES and STATE IS OBJECT in RESTRAINING AN EMOTION (*not allowing oneself to eat something*) IS A MECHANISM (*a spring*).

It was obvious that the same parameters of salience were present in all the 12 sentences and might have influenced the readers' interpretation, that is why I have annotated all the 12 sentences to see if some parameters will be so active that their effect will be detected in the reading schemes and reference recognition of all the sentences or in most of them.

Experiment Results and Discussion

In the experiment I assessed 1) the Identification Index of the sentences with contrasting parameter values, salient and non-salient, 1) the Reading Paths of the participants, 2) the Reading Time and Fixation Duration.

First, I will demonstrate the results connected with the Identification Index, that is the reference recognition index, which varied a lot within the twelve units. Fig. 3 shows that (apart from sentence 1, which was not considered) the highest Identification Index was in Sentences 3, 4, 6, 8, 9, 10.

A quick look at the correspondences between the sentences with contrasted salient and non-salient parameters (i. e. 2, 4, 6, 7, 9, 11 displaying salient parameters), shows that single salience parameters do not correlate with default reactions. There must be more complex parametric correlations existing. Correlation analysis (Pearson correlation) of salient and non-salient parameters present in all the 12 sentences has revealed several significant values. In Fig. 4 I give the binomial annotation results of the 12 Noun Phrases (NP), the parameters annotated, the Identification Index of the Noun Phrases, and the Correlation Values.

There are several parameters with higher correlation values. Only one parameter actually works as resonant, that is the presence of direct noun phrase in pre-position. Some others were also highly predictable, for instance, fuzzy boundaries or collective character of the object which hampered identification. But the influ-

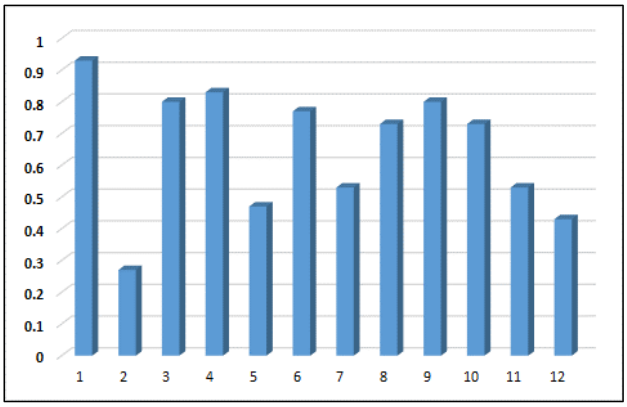

Fig. 3. Identification Index in Figurative Noun Phrases of Sentences 1–12

	NP1	NP2	NP3	NP4	NP5	NP6	NP7	NP8	NP9	NP10	NP11	NP12	Correlation
Direct NP in pre-position	1	0	1	1	0	0	0	0	1	1	0	0	0.736684855
NP related to Direct NP (hypo, hyper, meronymy, antonymy)	0	1	0	0	1	1	1	1	0	0	1	0	-0.51277688
Direct NP reference	1	1	1	1	1	1	1	1	1	1	1	0	0.358243849
Explicit visual mode	1	1	0	0	1	0	1	0	0	0	1	0	-0.467094819
Explicit kinesthetic mode	1	0	0	1	1	1	1	1	1	1	0	1	0.358024059
Explicit auditory / gustatory mode	0	0	0	1	1	0	1	0	0	1	0	1	-0.2376879
Explicit bodily mode	1	1	0	1	1	1	1	1	1	1	1	1	-0.2343757
Explicit multimodality	0	0	0	1	1	0	1	0	0	1	0	1	-0.2376879
Main syntactic focus (predicate, nucleus)	0	0	0	0	0	1	1	1	0	0	0	0	0.075639012
Secondary syntactic focus (predicate, non-nucleus)	1	1	1	1	1	0	0	0	1	1	1	0	0.135869789
Syntactic defocusing (subject)	0	0	0	0	0	0	0	0	0	0	0	1	-0.35624885
Second main syntactic focus (explicit comparison)	1	0	0	1	0	0	0	0	0	0	0	0	0.535139508
Entrenched NP, explicit phonetic motivation	0	0	0	0	0	0	1	0	0	0	0	0	-0.1922391
Entrenched NP, explicit morphological motivation	0	0	0	0	0	0	0	1	0	0	0	0	0.123770383
Object, distinct boundaries	1	1	1	0	0	1	0	0	0	0	0	0	0.151305688
Object, fuzzy boundaries	0	1	0	0	0	0	0	0	0	0	0	0	-0.60305144
Collective object	0	1	1	0	1	0	0	0	0	0	1	0	-0.49715991
State	0	0	0	0	0	0	0	0	0	1	0	1	-0.16755722
Event	0	0	0	1	0	0	1	1	1	0	0	0	0.763475729
EVENT 1 is EVENT 2 transfer	0	0	0	0	0	0	1	1	0	0	0	0	-0.056777779
OBJECT 1 is OBJECT 2 transfer	1	0	0	0	1	1	0	0	0	0	1	0	0.086462591
OBJECT is EVENT (OBJECT PROCESSING or CONSTRUAL) transfer	0	1	1	0	0	0	0	0	0	0	0	0	-0.27343875
EVENT is OBJECT transfer	0	0	0	1	0	0	0	0	1	0	0	0	0.382862117
STATE is OBJECT transfer	0	0	0	0	0	0	0	0	0	1	0	1	-0.16755722
NON-ANIMATED is ANAMATED transfer	0	0	0	1	1	0	0	0	0	0	0	0	-0.00390598
ANIMAL is MAN transfer	0	0	0	0	0	0	0	0	0	0	1	0	-0.1922391
Id Index	0.93	0.27	0.8	0.83	0.47	0.77	0.53	0.73	0.8	0.73	0.53	0.43	

Fig. 4. Pearson Correlation Index of Salience Parameters and Identification Index in Sentences 1–12

ence of one parameter was inexplicable, that is explicit visual mode which somehow hampered identification. Perhaps, it worked as a distractor as it does not give the direct key to inferencing the meaning of figurative groups. In general, the default reactions followed 1) a direct noun phrase in pre-position, 2) a noun phrase related to a direct noun phrase in pre-position (hypo, hyper, meronymy, antonymy relations), 3) absence of explicit visual mode present, 4) explicit kinesthetic mode, 5) absence of syntactic defocusing, 6) noun phrases in explicit comparison (simile), 7) absence of the reference object with fuzzy boundaries, 8) absence of collective object of reference, 9) naming event (rather than state), 10) absence of the mapping model OBJECT IS EVENT, 11) the model EVENT IS OBJECT.

All in all, salience parameters did activate default reactions, although the activation schemes were not so straightforward. Thus, Cue-Dependent Model (van Dyke, McElree, 2011) or Good-Enough Model (Ferreira, et al. 2002) are most likely employed for reference identification, although in most cases that is not the single cue affecting default reactions, but a Mixed Cue-Dependent Model.

Next, we proceed to the analysis of the participants' reading paths. Bearing in mind that salience parameters must work as cues facili-

tating the reading trajectories, I was prepared to see the steady reading paths in the cases of better defaultness reactions. It would mean that Cue-Dependent Model or Good-Enough Model of interpretation was employed not only for default responses procession, but also for the eye movement process. However, I received the trajectories which were far from exemplar. Two contrasting reading paths are given in Fig. 5.

As Fig. 5 shows, the second participant's reading path displayed many chaotic eye movements and reverse saccades, clearly demonstrating top-to-bottom reading (Kliegl, et al. 2006). The trajectory may be caused by activating Garden-Path Model (Christianson, 2001) or Random Effects Model (Barr, 2013). At the same time, the first participant's reading path conforms to the Cue-Dependent Model or Good-Enough Model of interpretation. 11 out of 15 Reading paths obtained demonstrated the effect of bottom-up reading schemes sufficing the Cue-Dependent Model. All in all, the general interpretation model for the reading paths may be described as Mixed-Effects Model (Pinheiro, Bates, 2000) where the default decisions were taken either based on the sentence cues met by the reader during bottom-up reading, or based on a series of cues which he or she searched for intensely throughout the sentence and even the text in top-to-bottom scheme.

Finally, I proceed to the analysis of Reading Time and Fixation Duration. I hypothesized that longer reading time and longer fixations would correspond to better defaultness reactions. As the participants gave their responses after they had read the whole sentence, the method of calculating the Reading Time and Fixation Duration in the areas of interest (in the areas containing only figurative noun phrases) would have led to inherently incorrect results. That is why I evaluated the Reading Time and

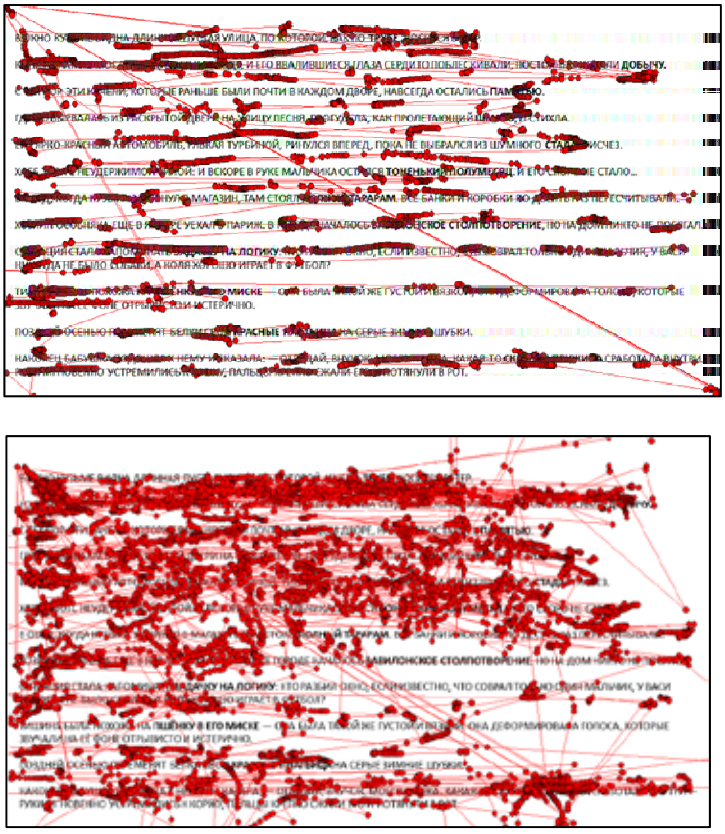

Fig. 5. 2 Reading paths

Fixation Duration on the whole sentence considering the average reading time per one sign. Such assessment also demonstrates the measurement error connected with the presence of other factors which might have influenced the results, but it is less significant than the error received in case of areas of interest evaluation. In Fig. 6 the Reading Time of each sentence per sign (NP Sent) is given per each participant (1 1–15. The average Reading Time (Average) as well as the Identification Index (Id Index) are also calculated.

Surprisingly, the Pearson correlation analysis did not show the rigid correlation (with r equal to -0.2) of average Reading Time and default responses. Although this might be due to other factors of the textual event construal, I am nevertheless inclined to think that this happens because the eye movement interpretation models of children at this age are still not stable.

As for the Fixation Duration the results do not support our hypothesis either. In Fig. 7 I give the diagrams (they are presented here so that the corresponding character of their axes will benefit, although their size in this case differs) showing the Fixation Duration in case of a) correctly and incorrectly identified reference (default and non-default responses) and b) only correctly identified reference (default responses).

As the diagrams show, Fixation Duration did not happen to be uniformly higher in the cases of default responses, although their dis-

	NP1Sent	NP2Sent	NP3Sent	NP4Sent	NP5Sent	NP6Sent	NP7Sent	NP8Sent	NP9Sent	NP10Sent	NP11Sent	NP12Sent
1	0.08489	0.100518	0.164678	0.201242	0.227375	0.27934	0.309896	0.341034	0.312494	0.389013	0.931693	0.485764
2	0.118207	0.100527	0.164322	0.209653	0.240837	0.288764	0.307287	0.35812	0.291141	0.400556	0.928147	0.409759
3	0.324939	0.312473	0.413	0.449463	0.45925	0.528509	0.561574	0.636239	0.579924	0.836797	1.799	0.786549
4	0.196183	0.306427	0.455933	0.601284	0.643404	0.723019	0.726374	0.887043	0.696894	0.870987	1.930027	0.847872
5	0.410244	0.462064	0.669467	0.780442	0.835558	0.935736	0.968226	1.041906	0.815429	1.012261	2.191147	0.980415
6	0.124293	0.129291	0.209089	0.258042	0.282471	0.330557	0.372835	0.385735	0.284082	0.335902	0.70788	0.290026
7	0.128744	0.155327	0.270511	0.335874	0.463087	0.551123	0.622687	0.691744	0.548182	0.689856	1.5432	0.674328
8	0.148244	0.189836	0.336389	0.387758	0.449317	0.506189	0.540139	0.590402	0.478435	0.675922	1.489467	0.615744
9	0.097902	0.175618	0.593567	0.6444	0.683433	0.782708	0.835852	0.924615	0.734906	0.918438	1.998853	1.021236
10	0.132	0.2168	0.463333	0.524495	0.574221	0.668962	0.715661	0.804487	0.690624	0.94434	2.03836	0.856067
11	0.27539	0.337	0.569167	0.637032	0.741712	0.914991	1.088696	1.183949	1.007624	1.368405	3.169467	1.331923
12	0.158805	0.229509	0.3649	0.428779	0.459567	0.515934	0.539852	0.61688	0.488041	0.567516	1.23944	0.566897
13	0.429329	0.624045	0.981433	1.088958	1.129548	1.241462	1.268843	1.364726	1.153388	1.432621	3.304013	1.578221
14	0.272951	0.398464	0.591744	0.6812	0.727615	0.832981	0.855539	0.956778	0.789947	1.059712	2.476227	1.0682
15	0.202683	0.312173	0.479611	0.535011	0.592154	0.710443	0.747809	0.823274	0.634394	0.76649	1.72528	0.812856
Average	0.206987	0.270005	0.448476	0.517575	0.567303	0.654048	0.697418	0.773795	0.6337	0.817921	1.83148	0.821724
Id Index	0.93	0.27	0.8	0.83	0.47	0.77	0.53	0.73	0.8	0.73	0.53	0.43
												-0.20341

Fig. 6. Reading Time per sign in Sentences 1–12 containing Noun Phrases 1–12

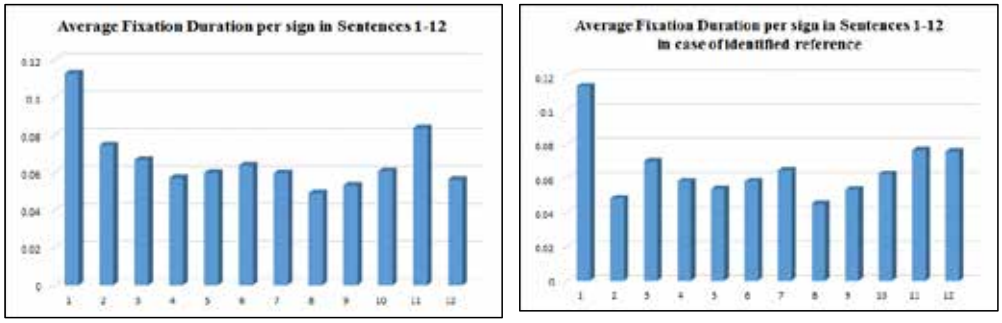

Fig. 7. Fixation Duration per sign in Sentences 1–12 containing Noun Phrases 1–12
in a) all responses, b) default responses only

tribution has a specific character. Surprisingly, the lowest Identification Index of Sentence 2, which means the lowest number of default responses given, might have correlated with longer fixations of those participants who managed to give these default responses; however, this did not turn out to be true. At the same time, Sentence 9 with high Identification Index has practically equal fixation duration in case of default and non-default responses. In total, the eye movement results obtained provide support for the Mixed-Effects Model of interpretation, where the reading paths and reading times are highly dependent of a range of randomly selected factors. Although, the default responses procession model is more likely to be Cue-Dependent or Mixed Cue-Dependent, as the sufficient number of steady salient parameters were found to correlate with default responses.

Conclusion

The study has shown that the secondary school children are already well-tuned for processing default responses in stylistically heterogeneous texts containing figurative noun groups, however, their eye movement reactions still do not show preference for a steady reading model of interpretation. In the experiment carried out with the participants of 13-14 years of age, I have found that their default responses in case of figurative groups of higher salience were more frequent, which sufficed to support the activation of Cue-Dependent Model or Mixed Cue-Dependent Model. At the same time, it should be pointed out that the interplay of salience factors demands further research as their influence is not always consistent.

Surprisingly, the eye movements did not display any rigid correlation with default and non-default sentence processing, which supports the Mixed-Effects Model of interpretation. I assume that its activation results from the children's comparatively little experience in heterogeneous texts reading, whereas their executive functions for processing default responses are sufficiently well-tuned. Both reading time and fixation duration assessment showed that the children applied unstable reading regimes coping with the heterogeneous text. Reading paths analysis additionally proved that the children use both bottom-up and top-to-bottom reading strategies to produce default responses.

All in all, the study suggests that various models of heterogeneity interpretation could be true when we deal with the children's interpretation. What is more, the children's default responses procession may respond to the Cue-Dependent model, whereas their eye movement reactions may follow a different one. This inconsistency may serve to assess the individual child's executive functions development, as well as to disclose the potential success of a heterogeneous text with its future readers.

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Фактор возраста читателя и успешная интерпретация стилистической гетерогенности текста: окулографические и когнитивные показатели

М.И. Киосе
Центр социокогнитивных исследований дискурса
Московский государственный лингвистический университет
Российская Федерация, Москва

Аннотация. В работе устанавливается влияние фактора возраста читателя на понимание стилистически гетерогенного текста, в качестве которого рассматривается текст, содержащий фрагменты более и менее салиентных непрямых номинативных групп. В ходе окулографического эксперимента с участием детей среднего школьного возраста определяются глазодвигательные показатели и показатели распознавания референции номинативных групп, демонстрирующие зависимости от эффектов салиентности. Сами показатели салиентности в отношении референциальных, лингвистических и дискурсивных параметров предварительно выявляются в ходе корпусно-статистического анализа, а в данном исследовании их значимость для интерпретации получает экспериментальную верификацию. Согласно положениям концепций градуальной салиентности и интерпретации «к случаю, по умолчанию», ожидалось, что интерпретация непрямых номинативных групп с разной степенью проявления референциальной, лингвистической и дискурсивной салиентности потребует отличающихся показателей когнитивного напряжения, что обнаружится в изменениях глазодвигательных показателей и в успешности распознавания непрямых значений слов. Данные экспериментов с участием взрослых эту закономерность подтвердили, однако в отношении детей гипотеза градуальной салиентности получила лишь частичное подтверждение, так как изменения глазодвигательной активности не продемонстрировали значимых различий в случае более и менее салиентных групп. При чтении и распознавании контекстуальных значений непрямых номинативных групп не были обнаружены корреляции с проявлениями референциальных, лингвистических и дискурсивных параметров салиентности; в то же время устойчивые корреляции были обнаружены между проявлениями этих параметров и индексами успешного распознавания непрямых значений. Полученные результаты свидетельствуют в пользу реализации смешанной модели интерпретации гетерогенности в детской группе рассматриваемого возраста.

Ключевые слова: стилистически гетерогенные тексты, понимание читателя, окулографический эксперимент, дети среднего школьного возраста, салиентность, глазодвигательные движения и распознавание значений «к случаю, по умолчанию».

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