Does colour affect the quality or quantity of children's stories elicited by pictures?

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Abstract

The current study investigated the effect of colour versus black and white pictures on the stories children told using the pictures as stimuli. Participants were 22 preschool children aged 4-6 (M 59.98, SD 7.52) attending daycares in a Western Canadian city. Two story sets of five pictures each, depicting stories with similar structure, were used as stimuli. Two versions of each story were made, one in colour and one in black and white. Each child was presented with one of the stories in colour and the other in black and white; versions and stories were counterbalanced across children. Stories were analysed for differences in content using story grammar, in amount using total number of words used in telling the story, and in vocabulary variety using number of different words used. Children were also asked which of the two stories they had preferred and why they preferred that story. Results indicated that stories children told did not differ on any of the variables; children told stories that were similar in content, length, and word variety regardless of whether the pictures used to elicit stories were in colour or black and white. When asked which story they preferred, roughly equal numbers of children expressed a preference for each version; when asked why that story was preferred, only four children ascribed it to colour, while the majority

of children gave content-related reasons for their preference. We conclude that colour or lack thereof in picture stimuli does not appear to affect stories told by preschool children who are typically developing.

Keywords

Story stimuli, children, story assessment, children's narratives

The ability to tell and understand stories has been extensively studied in the last few decades. Children's story-telling abilities can provide insight into their cognitive and linguistic development (Stein and Albro, 1997). Story tasks are recommended for use in language assessment (Hughes, McGillivray, and Schmidek, 1997; Paul, 2007), and normed, standardized story tasks have become available in recent years (Gillam and Pearson, 2004; Schneider, Dubé, and Hayward, 2004).

A number of research studies have demonstrated that the way that stories are elicited will affect the quality of the stories told by children. For example, story retell tasks, in which a child is told a story and is asked to tell it back, elicited stories that differed in amount of story information (Schneider, 1996; Schneider and Dubé, 2005) as well as in the ways that characters and objects were introduced and referred to (Schneider and Dubé, 1997). Animated stories elicited stories from children with a greater number of words and more diverse syntactic structure than still pictures taken from the animations (Rice and Roudebush, 1989). Thus, the selection of stories used to assess children's underlying storytelling ability is very important – children may appear to be more

or less competent depending on the stimuli and methods that were used to elicit stories from them.

One variation that has not been studied in relation to stories is the difference between black-and-white and colour story materials. This issue has come up informally on occasion, when the authors have been asked for permission to colour the black and white pictures of the Edmonton Narrative Norms Instrument (ENNI; Schneider, Dubé, and Hayward, 2004). We have not granted permission to colour the pictures, because we could find no evidence of the effect that such a change might have on the elicited stories. It seemed possible that colour pictures would be more advantageous in catching and maintaining children's interest and attention. On the other hand, black-and-white pictures could be beneficial because they may be less distracting, particularly for younger children (Husband and Hayden, 1996).Thus there are practical as well as academic reasons to investigate this question.

While this question has not yet been investigated with regard to stories, some research has been devoted to it with regard to standardized test materials. Husband and Hayden (1996) investigated the effect of colour versus black and white stimuli in two subtests of standardized tests. Participants were 31 children

in kindergarten/first grade and 47 children in fifth/sixth grade. The materials consisted of colour and black and white versions of the Stanford-Binet Absurdities Subtest and the Wechsler Intelligence Scale for Children III (WISC III) Picture Completion Subtest. Both tests are normally given in colour; gray-scale versions were made of each subtest. Children received odd items in one condition (colour or gray-scale) and even items in the other condition. Children were also asked whether they preferred the colour or gray-scale items. Although the majority of students reported a preference for colour and thought they had performed better on colour items, there was no statistically significant difference in responding on the gray-scale versus colour test items. Husband and Hayden concluded that the colour in the stimuli for assessment instruments made no difference to the scores. However, due to students' reported preference for colour items, they recommended that colour be added to other standardized tests.

The author of The Expressive One Word Picture Vocabulary Test-3rd Edition (EOWPVT; Brownell, 2000) conducted a study to investigate whether scores would differ when black and white or colour test plates were used. Two groups of 100 children matched on age and demographic characteristics served

as participants. One group was given the EOWPVT with colour test plates; the other was given the test with black and white test plates. The analysis revealed that there were no significant differences in test scores. The authors concluded that black and white and colour test plates yield the same results.

Thus there appears to be no effect of colour on children's responses to discrete test items. It is still possible, however, that children would be influenced by colour in a more creative, open-ended task such as storytelling. We wanted to find out whether stories depicted in colour versus black and white would differ in amount or quality of story information provided. We expected that if there were an effect, it would be likely to show up in story length and complexity. We assumed that the more interested and engaged the children were in the pictures, the more they would say about the story and the more essential story information they would provide. Thus we chose three measures to compare the conditions: story information, number of words, and number of different words.

Our research questions were:

1. Do stories elicited from children by pictures in colour differ from those elicited by pictures in black and white in:

Story information (number of story grammar units)?

Quantity (total number of words used to tell the story)?

Lexical variety (number of different words used in telling the story)?

2. Do children express a preference for stories based on colour?

Our expectation was that there would be no difference between the stories elicited from colour pictures and those elicited from black and white, regardless of whether children expressed a preference for one or the other. We had no expectation about whether children would mention colour as a factor in their preference for one story over another.

Methods

Ethical approval

Permission to conduct the study was granted by the Health Ethics Review Board of the University of Alberta. Parents of participating children were given information about the study and signed consent forms to indicate their permission for their children to participate in the study. Children were asked for their assent before participating.

Participants

Children were recruited from five daycares in predominantly middle-class neighbourhoods in the city of Edmonton. Directors of the daycares were asked to refer all children to the study aged 4 through 6 who had no known developmental problems and who spoke English as a first language. No additional recruitment criteria were used. Daycare directors and parents were informed that the purpose of the study was to compare children's stories told from colour versus black and white pictures. All children whose parents returned signed consent forms and who gave verbal assent to the examiners were included in the study.

The sample consisted of 22 children between the ages of 48.3 and 77.77 months. The mean age was 59.98 months with a standard deviation of 7.52. There were 9 girls and 13 boys in the sample.

Materials

Stimuli for the study consisted of the first five pictures of two stories, A3 and B3, from the Edmonton Narrative Norms Instrument (ENNI; Schneider, Dubé, and Hayward, 2004). Each set of five pictures depict a single complete

episode story. According to the story grammar model (Stein and Glenn, 1979), a complete episode contains the basic story grammar units and describes one or more characters engaging in goal-oriented behavior. Each story depicted two animal characters and an object (ball in A, balloon in B). A description of story pictures and the story grammar units they depict is contained in the appendix. Two versions of each story were prepared, one colour and one black and white.

Procedures

The data collection took place within each daycare facility. Each child was seen individually. Two examiners were present, one administering the task and the other serving as listener. The examiners were graduate students in speech-language pathology. Before the stories were administered, the participants were told the purpose of the study and what was required of them. The participants were presented with three stories, one at a time, and were asked to tell a story for each one based on the pictures. The first was a training story in black and white that was administered to familiarize the child with the task. The training story was followed by two stories, which were administered in a random order for each participant. Half of the participants received story A in colour and B in black and white, while the other half received A in black and white and B in colour.

Before each story was administered, the participant was shown each picture, one at a time. Then the examiner asked the child to tell the story to the listener, and pointed out that the listener would not be able to see the pictures. After the two stories were administered, the participants were asked to state which one they preferred and why. The examiners kept comments and prompts to a minimum (e.g., "Tell me what is happening in the story"). Each participant's data was audio-recorded.

Transcription

The stories were transcribed orthographically using the program Systematic Analysis of Language Transcripts (SALT; Miller and Iglesias, 2010). To obtain an accurate word count, contracted forms were spelled out (e.g., *he's* was spelled as *he is; gonna* was entered as *going to*).

Analysis

The data were analysed for amount of story information included in each told story. The ENNI story grammar scoring protocol was used (Schneider, Dubé, and Hayward, 2004). The protocol specifies scoring criteria for each story grammar (characters, setting, initiating event, internal response, internal plan,

attempt, outcome, and character reactions). The participants received credit for each of the elements included to receive a total score out of a possible thirteen. Stories were scored by a scorer blind to the condition in which each story was elicited. To determine scoring reliability, another scorer scored 5 stories from each condition (a total of 10/44 or 23% of all stories). A comparison of total story grammar scores using Pearson *r* yielded agreement between scorers of .939, $p < .0001$.

Stories were also analysed for total number of words and number of different words, using the SALT program. The number of different words and the total number of words were calculated for each story. All words were counted, with the following exceptions: unintelligible words; mazes (false starts, repetitions, fillers such as 'uh' and 'um'); and words in utterances not related to the story.

Data analysis

Independent samples *t*-tests were used to determine whether there was a significant difference between the colour version and the black and white version for each of the three measures: story grammar, number of words, and number of

different words. The alpha value was set at 0.05 for each comparison; no adjustment was made for multiple tests because our prediction was that there would be no differences between the two conditions. It can be argued that if a *p*-value is sufficiently high, the null hypothesis can be considered to be supported by the evidence – in other words, the statistical results can be considered to demonstrate a lack of difference between groups (Huberty, 1987). Since our prediction was that the conditions would not be different, we set a beta level of 0.30 (as recommended by Huberty, 1987). Any *p*-values that fell below 0.30 would be considered too low to reject conclusively the possibility of Type II error (accepting the null hypothesis when it was actually false, e.g., interpreting results as indicating no difference between groups when there is a difference). In contrast, *p*-values higher than .30 would be considered evidence of a true lack of difference between conditions.

Results

There were no significant differences for any of the three variables tested (see Table 1). All of the *p*-values far exceeded the chosen beta level of .30. Effect size estimates using Cohen's *d* were very small (.07), indicating that even with a much larger N, group differences would not be large enough to be

considered important. Note that for two of the variables, total number of words and number of different words, the small mean difference favours the black and white condition, while for the remaining variable, story grammar, the difference favours the colour version.

The age range in our sample was large, considering the changes that typically occur in storytelling abilities in this range (Schneider, Hayward, and Dubé, 2006). To examine the possibility that children at the younger end of the range examined here may have differed from older children on whether they differentiated the two conditions, we calculated the difference between stories told from colour and black-and-white picture sets and correlated the difference score for each variable with age in months. We reasoned that a significant correlation with age would suggest that younger children were differentiating the conditions to a greater (or lesser) degree than older children. For example, if younger children told better stories with colour pictures and this tendency lessened with age, there would be a significant negative correlation of a difference score with age. Table 2 displays the correlations and significance levels. None of the correlations were significant, indicating that children did not differentiate the conditions to a greater or lesser degree with age. Using r^2 as an

estimate of effect size (Corty, 2007), we find that effect sizes are again small. However, two of the three correlations have p-values under .30, and thus we do not take the results as completely supporting acceptance of the null hypothesis. We can say that for this sample of children, no significant correlation between age and difference score was obtained for any of the variables.

It was possible that, regardless of whether differences were found between the two conditions, participants might have a preference for colour pictures over black and white ones. To investigate this possibility, we asked participants, "Which story did you like best?" Information on story preferences between the colour and black-and-white stories were collected from 17 participants. Nine children preferred the colour narratives, seven children preferred the black and white narratives, and one child liked them equally. We also asked children why they preferred the favored story. Only four children indicated that they liked one story better because of the colour pictures. Nine children based their preference explanations on content such as characters, settings or events. Examples of content-related comments were, “because the airplane sank”, “because it had a pool” and “because there was a bunny and it was funny”. Four children did not provide a reason for their story preference. The

results suggest that story preference was primarily based on story content rather than the visual presentation of the story.

Discussion

This study investigated whether children's stories would be different depending on whether they were elicited using black and white or colour pictures. Previous research on variations in methods for eliciting stories from children had found that there can be differences in quality of stories depending on method. Differences in storytelling due to whether black and white pictures or colour pictures were used had not yet been investigated. The possibility existed that colour pictures might interest children more and thus result in stories with more information or word usage; alternatively, black and white pictures could be easier to read and thus would result in better stories from young children. We found that children's stories did not differ in amount of content, number or words, or variety of words, regardless of whether or not colour was used to elicit them. The difference in scores for stories told from colour versus black and white pictures did not increase or decrease across the age range, suggesting that there is no developmental change in the limited age span examined in this study.

In addition, there was no preference for coloured pictures for the majority of the participants. This result differs from that of Husband and Hayden (1996), whose participants reported a preference for colour test items. The difference in the two studies' findings may lie in the way that children were asked for a preference. In the Husband and Hayden study, children were asked whether they preferred coloured or gray-scale items. In the current study, children were asked which story they preferred, and why. It may be that while children will express a preference for colour over black and white when directly asked to choose, they will choose one story over another on other grounds when asked more generally about story preference. Only four children expressed preference for a story based on colour, whereas nine based their choices on some aspect of story content. It is interesting to note, however, that no children stated that their preference was due to the use of black and white.

This study is limited by its small number of participants. Obtained *p*-values were large, suggesting that a study with a larger number of participants would not find different results, assuming that the same pattern of results were found; however, with a small sample the possibility exists that the sample was not representative and a larger group would yield different results. We chose the

age range of 4 to 6 years because we believed that preschool children were the most likely to be influenced by a factor such as colour. The possibility exists that younger or older children would be more likely to be affected by this variable. Drawing a participant sample from higher or lower socioeconomic areas could also potentially have yielded different results.

The current study involved young typically developing children and found no differences in their stories due to whether picture stimuli were in colour or black and white. Future research should include children with language and/or cognitive difficulties. It has been suggested that for children with such difficulties, as well as younger children, black-and-white line drawings could facilitate attention to the information in pictures (Husband and Hayden, 1996). Preschool children did not show such an advantage for black and white drawings in the current study; however, it could still be explored for children with atypical development.

Conclusions

Past research has found that variations in stimuli used to elicit stories from children can affect the quality of the children's stories and hence our evaluation of children's storytelling abilities (Rice and Roudebush, 1989; Schneider, 1996;

Schneider and Dubé, 1997, 2005). If we had found that the quality of children's stories were affected by whether stories were presented in colour or black and white, there would have been implications for choice of narrative stimuli for clinical and research purposes. The data obtained in the present study provided no evidence that there is any advantage to using either colour or black and white stimuli, at least for children in this age range who are developing typically. Children included the same amount of story content and use similar amounts and variety of vocabulary regardless of whether pictures were in colour or not. The majority did not express a preference for stories based on colour. Thus it would appear that story stimuli can be provided either in colour or black and white to assess the story ability of children with typical development. When choosing narrative stimuli, greater attention should be paid to variables known to affect quality of storytelling, such as the modality of presentation (oral versus pictorial; Schneider and Dubé, 2005).

Appendix. Pictures used as stimuli.

Picture	Story Grammar Unit	Story A	Story B
1	Characters	Male giraffe with a toy airplane, female elephant	Female dog with a balloon, male rabbit
	Setting	by a pool	in a park
2	Initiating Event	Giraffe plays with plane	Rabbit goes to balloon
	Internal Response	Elephant interested in plane	Rabbit wants balloon
	Internal Plan	Elephant decides to take plane	Rabbit decides to take balloon
3	Attempt	Elephant takes plane	Rabbit unties balloon
4	Outcome	Plane goes into pool	Balloon floats away
5	Reactions	Giraffe is angry Elephant feels sorry	Dog is angry Rabbit feels sorry

Note: Black and white versions of these stories are available on the ENNI website, http://www.rehabmed.ualberta.ca/spa/enni.

Table 1. **Comparisons between Black and White and Colour Conditions by Measure**

Measure	Black and White Mean (SD)	Colour Mean (SD)	*t*	df	Significance (2-tailed)	Cohen's *d*
Story Grammar	8.27 (2.16)	8.41 (1.56)	-.339	21	.74	.07
Number of Words	57.59 (22.44)	56.09 (23.23)	.458	21	.65	.07
Number of Different Words	29.77 (8.78)	29.14 (9.21)	.420	21	.68	.07

Table 2. **Correlation of age in months with score difference between conditions by variable (N = 22).**

	Pearson's *r*	*p*	Effect size (r^2)
Story Grammar	.25	.25	.06
Number of Words	.33	.14	.11
Number of Different Words	.22	.33	.05

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