Video storybooks as a bridge to literacy

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Video Storybooks: a Worthwhile Investment for all Young L2 Learners?

Abstract

This study tested whether the rich visualizations in video storybooks promote language acquisition in five-year-old children from low-SES families who learn the book language as a second language. The participants had either low ($n = 61$) or average L2 language proficiency ($n = 36$) according to a standardized test. Children heard the focal story four times accompanied by video or by static images. We pre- and posttested story understanding and children's expressive knowledge of book-based vocabulary. The results demonstrate that exposure to digital picture storybooks is a powerful stimulus for L2 language learning. The richer the visualizations the more beneficial picture storybooks are, not just for the least proficient L2 learners but for the average scoring group as well.

Introduction

Contemporary formats of the traditional print storybook, made possible by technological advances, may open up new ways of "reading" picture storybooks. For instance, digital storybooks provide the option of an oral text, which - unlike the traditional book format - allows young preliterate children to "read" independently. More importantly, these books include new media to present a story. Though the digital format is not yet standardized like traditional picture storybooks, the latest generation often presents video as a substitute for the static pictures. This new format thus combines the abstract, de-contextualized language of storybook texts with rich visualizations to convey story content to young preliterate children. As such, it may be particularly suitable for familiarizing young L2 children with the more formal academic language in storybooks that is essential for learning academic skills (Anderson, Anderson, Lynch, & Shapiro, 2003).

Do L2 learners benefit from exposure to digital picture storybooks especially when they include video? This study tests which children's story comprehension and language learning will benefit from independent encounters with digital books. Although effects of new media on learning are, as yet, not fully understood (Chambers, Cheung, Gifford, Madden, & Slavin, 2006), the first experiments with digital storybooks suggested that L2 children scoring in the lowest quartile on standardized language tests benefit from additional information sources like video as evidenced by better story comprehension (Verhallen, Bus, & De Jong, 2006). In the same line, repeated readings of digital storybooks with static illustrations benefited vocabulary, but with the addition of video, books were even more effective for vocabulary acquisition (Verhallen, & Bus, 2009).

Thinking about the practical implications of the findings with digital picture storybooks so far, we wondered whether only L2 pupils far behind the main stream in language proficiency benefit from the video for comprehension of the story text and language learning. Though video storybooks are likely to be motivating for most children due to the attractive animations, music and sound, additions may not be an equally strong incentive for learning with all children. Rich embellishments like video, music and sound effects may only affect children's cognitive skills in the very initial stages of learning a second language. In this study we report effects of digital books and especially video additions on story comprehension and learning new vocabulary.

As long as children's L2 vocabulary is limited they may experience problems in deriving *story actions* from the story language even when illustrations commensurate with the text are present. Our previous research suggested that a low proficient group of L2 learners benefits from more explicit visualizations as provided by video additions (Verhallen, Bus, & De Jong, 2006). Video splits events that are normally compressed into just one static illustration into small portions, thus showing the successive steps that form the action (Gibbons, Anderson, Smith, Field, & Fisher, 1986). Showing a frozen moment in time as in the static picture may provide insufficient information to create a mental representation of an action. For instance, in the video version of Winnie the Witch when Winnie trips over Wilbur yet again, you see Winnie coming into the garden, tripping over Wilbur, flying through the air and landing in a rosebush accompanied by upbeat music and matching sound effects. In the static version only the end result is visible, namely Winnie upside down in a rosebush with a bewildered Wilbur next to her. However, not all L2 learners may need the step-by-step depictions of the different stages in an action to create an accurate mental representation of story actions. For children with average L2 skills, the oral narration combined with static pictures may suffice, even when static pictures only partially represent the story's actions (Nodelman, 1988).

On the other hand, it may be the case that children scoring average on L2 skills as well as a group with substantial gaps in L2 comprehension may need help beyond static illustrations to understand more complex facets than story actions. Understanding causal relations is an important element of story comprehension (Thompson & Myers, 1985). The motives and emotions of story characters form reasons for their actions and understanding those may help to connect story events into a meaningful whole (van den Broek et al., 2005). Gaining insight into these connections may cause problems even for kindergarten children who are more advanced in understanding the story language (Thompson & Myers, 1985; Van den Broek, Lorch, & Thurlow, 1996). At the age of five, most children's theory of mind is still underdeveloped and, as a result they will experience problems in deriving what connects story events from text and pictures (Wellman, 1990). Children may therefore need additional help: Seeing what successively happens and how characters respond to events, as especially the video version of the story does, may enable them to make inferences about psychological causation of new events (Gibbons et al., 1986). For instance, seeing Winnie stumbling over Wilbur, tumbling down the stairs, looking exasperated when she finally ends up at the bottom of the stairs may make it easier to understand that Winnie feels very angry.

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Our findings so far indicate that video provides L2 children with a guide to selecting the important or central content in visualizations that relate to the spoken text thus stimulating their vocabulary development (Verhallen & Bus, 2009). Irrelevant visual details in static illustrations may attract attention at the expense of attention to core elements. Children may thus generate misconceptions (Beck & McKeown, 2001; Hartman, 1961; Leung, 2008; Mar, 2004; Verhallen & Bus, 2006) because people are inclined to make sense even of incongruent information (Cennamo, 1993; Salomon & Snow, 1968). To explain the effects of enriched visualizations on vocabulary learning we assume that the close temporal proximity of words and images in video storybooks heightens the probability that words are learned (Dubois & Vial, 2000; Paivio, 2007). For instance, when the text says that Winnie waves her wand we see the actual gesture while the static picture shows Winnie with her hand up high holding the wand. Children with limited L2 vocabularies, however, may experience severe difficulties in keeping up with the spoken narration in spite of the contiguity of visual information and language (Nation, 2006) and fail to distract single words from the text that relate to the visualizations (Goh, 2000; Lund, 1991; Verhoeven, 2000). We expect therefore that the vocabulary of all L2 learners benefits from video additions but that the least proficient L2 learners may not benefit to the same extent from the close temporal proximity of words and images in video storybooks and learn fewer words.

The present study aimed at testing differential effects of video on story comprehension and vocabulary; expectations were that:

1. children benefit from independent exposure to digital picture storybooks;
2. especially L2 pupils far behind the main stream in language proficiency benefit from video additions for comprehension of story actions;
3. regardless of pupils' L2 proficiency, video additions do facilitate understanding of the more complex psychological causation;
4. L2 children may expand their vocabulary as an outcome of encounters with digital storybooks, especially when phrases in the narration are synchronized with portions of the picture as in the video version. However, not all pupils may benefit to the same extent; when children lag far behind in L2 proficiency, they may have difficulties extracting single words from the stream of spoken text and as a result will often fail to connect words to pictures despite the close temporal proximity of words and images in video storybooks, thus missing a chance to expand their expressive vocabulary.

This study

To test these hypotheses we selected Turkish and Moroccan children from immigrant families with low-educated parents from the same neighborhoods and schools but different in L2 proficiency. The most typical L2 group scoring in the lowest quartile on a standardized Dutch language test was compared with a less common L2 group scoring in the second and third quartile. Actually, only about 20-30% of the Turkish and Moroccan immigrant population in Dutch schools score at an average level on Dutch language tests. Testing the differential effects of book exposure we evaluated effects after repeating the story four times. Research has shown it is only after repeated exposures to books that there is any benefit to the use of new vocabulary (Justice, Meier, & Walpole, 2005) and recall of story details (Verhallen , Bus, & De Jong, 2006).

Method

Design

A pre-test-post-test design was used with two treatment conditions (video storybook versus static storybook) and a control group. The treatments consisted of four repetitions of the same story in either static or video format in four separate sessions. Children in the control group played with the nonverbal interactive computer game *Midnight Play* in all four sessions. Based on their scores on a standardized Dutch language test for kindergarten, children were identified as either high or low L2 proficiency. High L2 proficiency children ($n = 36$) were comparable to most of their Dutch peers as their language scores centered on the mean. Low L2 proficiency children ($n = 61$) had scores in the lowest quartile of the Dutch norm group. Within both groups, children were randomly assigned to a condition with the restriction that boys and girls and Turkish and Moroccan children were distributed about equally across conditions. Data collection was spread over a period of two years.

Subjects

In order to test the effect of L2 proficiency on outcomes of the intervention 97 children were selected from ethnic minority low-income families within schools in the same neighbourhood. All children had a home language other than the Dutch language spoken at school, i.e., Turkish, Moroccan-Arabic or Berber. As is the case for the majority of Turkish and Moroccan children in the Netherlands (Luyten, Cremers-van Wees, & Bosker, 2003), educational level and occupational level of all parents in this experiment

were low, i.e., only a few years of vocational training and/or performing unskilled labour. Combined with the fact that they have to learn the language of teaching as a second language, these children have a considerable educational disadvantage (Bosker, 2000). Moroccans and Turks were chosen since these two major immigrant groups in the Netherlands raise their children in their native language resulting in a limited proficiency in the Dutch language, the language of instruction, at the start of school (Verhoeven, 2000). Children had to be recruited from quite a few schools and classes because the strict age criterion limited the number of eligible Turkish and Moroccans children per school during the same time frame.

The selection of subjects took place in the following sequence: (1) inner city schools in The Hague with more than 70% of pupils from low educated, ethnic minority families were randomly selected; (2) we selected all Turkish and Moroccan 5-year olds from classrooms within these schools; (3) all children who had not attended school for at least one year were excluded; (4) after written parental consent was obtained by the school, three selection tests were administered: a standardized Dutch language test (CITO), the Raven Coloured Progressive Matrices and a test of familiarity with the focal book. Selected children scored in the first or in the second and third quartile of the language test; the few higher scoring children were excluded. All children scored in the normal range on the Raven nonverbal intelligence test and none of the participants were familiar with the focal book.

Procedure

Tests and sessions took place in a separate room at school. The experimenter collected the child from their classroom and took him or her back at the end of the session. All sessions were videotaped. One experimenter was present during testing and two experimenters during intervention sessions: one to instruct the child and start the computer and one to video-record the session.

Materials

As intervention material we used digitized versions of the picture storybook, *Heksenspul* [Winnie the Witch] by Thomas and Gorky (1996). Based on word frequencies (Schrooten & Vermeer, 1994) about 10% of all content words were estimated to be unknown to young L2 children. *Heksenspul* has a story structure that is commonly found in children's books: a problem, trying out several solutions, describing their consequences

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and the characters' reactions, until the best solution is found. The static version is similar to the print book except for the computer voice that provides an oral rendition of the narration. In the video version the illustrations are turned into film-like representations of events with matching music and sound effects. The identical text is told in the same voice. The experimenter controlled the start of the program and the pace at which oral and visual information was presented in both versions.

Midnight Play (Pacovská, 2000) is a nonverbal interactive computer game consisting of a series of computer screens where changes in scenery, sound effects, music and movement can be obtained by clicking the mouse or dragging objects.

Table 1 *Characteristics of Subjects per Condition*

		Video	Static	Control
Ethnicity - % Moroccans	Low	45.45	50.00	52.63
	High	61.54	50.00	54.55
Gender - % Female	Low	40.91	55.00	47.37
	High	61.54	50.00	54.55
Age in months (*M*, *SD*)	Low	66.95(2.65)	66.20(3.44)	66.26(2.60)
	High	68.46(3.26)	69.17(2.52)	68.55(2.66)
Raven's Progressive Matrices	Low	4.22(1.45)	4.00(1.24)	4.96(1.88)
(Mean standardized scores, *SD*)	High	5.14(1.63)	4.43(1.95)	5.34(2.09)
Number of schools[1]	Low	10	9	6
	High	10	6	6
Number of classes[1]	Low	19	20	14
	High	12	11	11

Note[1] The number of schools and classes from which subjects were recruited.

Note[2] Low L2 group total *n* = 61; video *n* = 22 ; static *n* = 20; control group *n* = 19

High L2 group total *n* = 36; video *n* = 13 ; static *n* = 12; control group *n* = 11

Selection tests

Children's Dutch language proficiency was assessed with the *CITO Language Test for senior Kindergarten Children* (CITO [Centraal Instituut voor Toets Ontwikkeling], 1996). This standardized test was administered by the experimenter to each child individually.

Nonverbal intelligence was assessed with *The Raven Coloured Progressive Matrices* (Van Bon, 1986). Children with scores beyond 2 SD below the mean were included.

Target book familiarity was tested by presenting each child with six book covers on a computer screen, one of which was the Winnie the Witch story. Children were excluded from participating when they appeared to know the Winnie the Witch story.

Tests of story comprehension

Pretest – Prior to the intervention story comprehension was assessed by eliciting a retelling of the print storybook *Slaap lekker, Meneer Beer* [Peace at Last] by Jill Murphy (1995) read once to the child by the experimenter. Children were prompted to retell the story with the help of the pictures and were given ample time to do so as they controlled the pace of the retelling.

Based on Stein and Trabasso's (1982) story grammar, the story was divided into story actions and implied story elements. *Action* elements (*n*=13) were story events that consisted mainly of physical actions to attain the goal of the protagonist while *implied* story elements (*n*=12) formed the reasons for these actions like setting a goal to solve the problem and internal responses to actions, thus providing coherence between story actions.

Posttest – Children retold the Winnie the Witch story once with the static pictures and once with the video images of the digitized book as stimulus. The order, in which children retold the story by either the static pictures or the video, was counterbalanced within each intervention group. During retelling, the video version was stopped at the same points in the story as in the static version. After indicating that he or she had finished retelling that particular section of the story, the experimenter accessed the next screen or showed the next part of the video to the child.

In the same way as we had done for Peace at Last, the Winnie the Witch story was divided into actions (*n* = 11) and implied story elements (*n* = 6); see for examples Table 2. Scores of the static and the video retelling were combined, as both formats might be helpful in different ways. It is feasible that the static pictures might serve as a memory aid resulting in a more complete story line; the video might elicit more story details.

Test of vocabulary acquisition

The pre- and post-test for expressive story vocabulary consisted of 42 content words selected from the focal story text, i.e., 21 nouns, 14 verbs and 7 adjectives with a low frequency in several data sets (Schrooten & Vermeer, 1994). Pictures derived from the digital picture storybook were shown on the computer screen and children were asked to finish a matching sentence orally presented by the experimenter, i.e., *This is a… (wand);*

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She is …(furious); He looked … (ridiculous). A practice item preceded the test in order to ascertain children's understanding of the task. Pre- and posttest were identical. The intraclass correlation coefficient (r = .97) was high.

Table 2 *Action and Implied Story Elements in Heksenspul [Winnie the Witch]*

Implied	Winnie's house and everything in it is black, including her cat Wilbur
Implied	Winnie cannot see Wilbur when he closes his eyes
Action	Winnie repeatedly stumbles over Wilbur
Implied	Winnie decides to do something to solve the problem
Action	Winnie magically turns Wilbur into a green cat
Action	Winnie sees Wilbur everywhere in the house, even on her bed
Action	Winnie puts Wilbur outside
Action	Winnie stumbles over Wilbur in the green grass
Implied	Winnie is furious
Action	Winnie changes Wilbur into a cat of all colours
Action	Wilbur crawles into the grass
Action	Wilbur hides in a tree
Implied	Winnie worries about Wilbur
Action	Winnie magically turns Wilbur into a black cat
Action	Wilbur comes out of the tree
Action	Winnie changes her house into a house of all colours
Implied	The problem is resolved, Winnie can now see Wilbur everywhere

Statistical analyses

We conducted ANCOVAs with regression techniques to test effects of treatments after controlling for background variables. Analyses were carried out for the three dependent variables separately (i.e., *action* story elements, *implied* story elements, and *vocabulary*). As a first step we entered background variables that might influence outcomes, i.e., gender, ethnicity, non-verbal intelligence, age, L2 proficiency and pretest scores. Gender, ethnicity and L2 proficiency were contrast-coded and the continuous variables - age, non-verbal intelligence and pretest scores - were centered. As a second step we entered two contrasts, the first comparing treatment groups with control group and a second comparing the video and static group. In a third step we tested the hypothesis that effects of treatments may depend on initial language proficiency by cross-multiplying the coded level of L2 proficiency with the coded variables of the treatment effects. We hypothesized that on some measures video effects may be strongest for children with the

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lowest L2 proficiency. As an indicator of explained variance for each predictor we used squared partial correlations (Cohen, Cohen, West, & Aiken, 2003).

Results

Correlations

Table 3 presents the bivariate correlations between the variables included in the analyses. Pretest scores were all only moderately correlated with one another ($\leq$ .37) indicating that there was not one skill underlying all three measures. The correlations between posttest measures were substantially higher ($r \geq$ .65) reflecting that children become more equal as a result of treatment. Children with a higher score on non-verbal intelligence had more knowledge of the story vocabulary prior to the intervention (r = .26). The posttest measures were shown to be positively correlated with L2 proficiency ($r \geq$ .21), meaning that children more proficient in L2 understood the story better and retained more words. Correlations between gender and ethnicity on the one hand and vocabulary posttest scores on the other were marginally significant, indicating that girls as well as Moroccan children tended to profit more from the intervention. Age correlated significantly and positively with implied story elements at the post-test indicating that maturation affects this skill.

Treatment effects

To fulfil test requirements one outlier in the vocabulary test was winsorized (Hampel, Ronchetti, Rousseeuw, & Stahel, 1986) and a square root transformation was applied to scores on *implied* elements. As can be seen in Table 5, treatments caused effects after controlling for gender, ethnicity, non-verbal intelligence, age, language proficiency and pretest scores. After entering two contrast-coded treatments (contrasting treatment groups with the control group and the video with the static group), models for all three dependent variables improved significantly. Entering interactions between L2 proficiency group and the two contrast-coded treatments as a third step improved the model for *actions* but not for *implied* elements and *vocabulary*. Table 5 presents therefore the full model with interactions for *actions* but not for *implied* elements and *vocabulary*.

Effects on actions

As can be seen from the results for *actions* in Table 5 (first column), background variables explained 22% of the variance. Treatments explained an additional 38% of the

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Table 3 *Bivariate Correlations*

	1	2	3	4	5	6	7	8	9	10
Background variables										
1. Gender	-									
2. Ethnicity	.11	-								
3. Non verbal intelligence	-.07	-.19	-							
4. Age in months	-.09	-.12	.02	-						
5. L2 proficiency	.08	.06	.17	.36**	-					
Pre-tests										
6. Story Actions pre-test	.09	.02	.11	.09	.35**	-				
7. Implied Story Elements pre-test	.03	.08	.03	.10	.16	.26**	-			
8. Vocabulary pre-test	.13	.12	.26**	.23*	.42**	.37**	.24*	-		
Post-tests										
9. Story Actions post-test	.00	.11	-.09	.06	.30**	.46**	.23*	.52**	-	
10. Implied Story Elements post-test	-.06	.06	-.06	.21*	.21*	.31**	.22*	.49**	.68**	-
11. Vocabulary post-test	.19	.19	-.01	.19	.41**	.40**	.25*	.66**	.70**	.65**

$^{*}p < .05$ level $^{**}p < .01$ level (2-tailed).

variance. In the main effects equation, exposure to a digital storybook was the strongest predictor of story actions (squared partial $r = .50$). Video accounted for an additional 5% of the variance. This main effect of video is no longer present when we move to the full model with interactions. The interaction between the video-static contrast and L2 proficiency was statistically significant. An insignificant main effect of the video-static contrast but significant interaction between L2 proficiency and the video-static contrast indicates that not all children profited from video to the same extent. Figure 1a, derived from the numbers in Table 5, visualizes the differential effect of video in the two L2 proficiency groups. Children with a low L2 proficiency benefited more from video than from the static book whereas the group with a high L2 proficiency understood story actions equally well in both formats. Linear regression analyses carried out for the low and high level group separately, with contrast-coded treatment effects entered after background variables, showed that the contrast-coded video versus static group accounted for a significant amount of variance in the low L2 group (squared partial $r = .22$, $p < .000$) but not in the high L2 group (squared partial $r = .01$, *n.s.*).

Effects on implied elements

Background variables did not account for differences in *implied* elements. We see in the main effects model in Table 5 (column 2) that treatments explained an additional 39% of the variance. Although mean scores in Table 4 indicated no differences between static and video for the high level group, format caused an effect after controlling for background variables as shown by Figure 1b. The a priori contrast of treatment and control groups was the strongest predictor of *implied* elements (squared partial $r = .42$). Video explained an additional 5%.

Table 4 *Mean Scores and Standard Deviations for Post-tests for Action and Implied Story Elements and Story Vocabulary*

		Story Actions	Implied Story Elements	Vocabulary
Low L2	Video	6.42(1.26)	1.65(1.07)	12.45(3.46)
	Static	4.65(1.56)	0.95(0.75)	9.30(3.48)
	Control	2.11(1.44)	0.20(0.30)	6.84(2.81)
High L2	Video	6.37(2.47)	1.73(0.99)	15.08(4.41)
	Static	7.21(1.11)	1.77(0.69)	15.00(4.67)
	Control	3.98(1.44)	0.55(0.44)	10.09(1.70)

Table 5 *Prediction of Outcome Measures*

Variable	Story Actions	Implied Elements (square root)	Story Vocabulary (winsorized)
	Unstandardized beta (*SE*)		
Background Variables			
Intercept	5.14(.22)***	.94(.06)***	11.28(.34)***
Gender (Female = +1; Male = -1)	-.17(.21)	-.02(.06)	.38(.33)
Ethnicity (Moroccan = +1; Turkish = -1)	.15(.22)	-.00(.06)	.23(.35)
Raven standardized scores	-.22(.13)	.03(.03)	-.49(.21)*
Age in months	-.03(.08)	.02(.02)	.00(.12)
L2 proficiency level (High = +1; Low = -1)	.45(.25)	.12(.06)	.79(.39)*
Pre-test scores	.36(.08)***	.04(.03)	1.09(.15)***
	Model statistics		
Adjusted R^2	.22***	.06	.49***
Main Effects Model			
Intercept	5.05(.16)***	.92(.04)***	11.21(.30)***
Gender (Female = +1; Male = -1)	-.15(.15)	-.02(.04)	.47(.30)
Ethnicity (Moroccan = 1; Turkish = -1)	.23(.15)	.01(.04)	.38(.31)
Raven standardized scores	-.05(.09)	.01(.03)	-.27(.19)
Age in months	-.05(.05)	.01(.02)	.00(.11)
L2 proficiency level (High = +1; Low = -1)	.47(.18)*	.11(.05)*	.96(.35)**
Pre-test scores	.31(.06)***	.05(.02)*	.85(.14)***
Intervention groups versus control	1.03(.11)***	.24(.03)***	1.01(.23)***
Video versus static	.37(.18)*	.11(.05)*	.85(.35)*
	Model statistics		
ΔR^2	.38***	.39***	.11***
Full Model with Interactions			
Intercept	5.07(.15)***		
Gender (Female = +1; Male = -1)	-.11(.15)		
Ethnicity (Moroccan = 1; Turkish = -1)	.25(.15)		
Raven standardized scores	-.02(.09)		
Age in months	-.06(.05)		
L2 proficiency level (High = +1; Low = -1)	.53(.18)**		
Pre-test scores	.27(.06)***		
Intervention groups versus control	1.01(.11)***		
Video versus static	.26(.18)		
Contrast intervention v control * L2 proficiency level	-.10(.11)		
Contrast 4X video versus 4X static * L2 proficiency level	.46(.19)*		
	Model statistics		
ΔR^2	.03*		

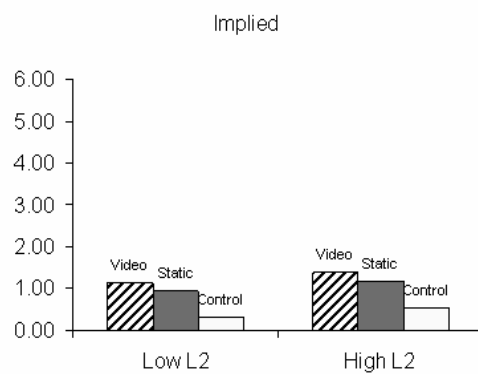* *p<.05. ** p<.01. *** p<.001.*

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Figure 1

A*:* Post-test Scores on Story Actions (max = 11) after Corrections for all Background Variables.
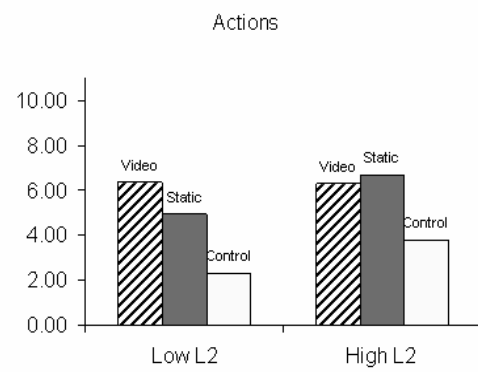
Actions

B*:* Post-test Scores on Implied Elements (max = 6) after Corrections for all Background Variables.

Implied

Effects on vocabulary

Background variables explained 49% of the variance in vocabulary with the best predictors being L2 proficiency and pretest scores. We see in the main effects model in Table 5 (column 3) that treatments explained an additional 11%. The a priori contrast of treatment and control groups explained 18% of the variance (squared partial *r*). Video explained an additional 6% for both L2 levels as Figure 2 demonstrates.
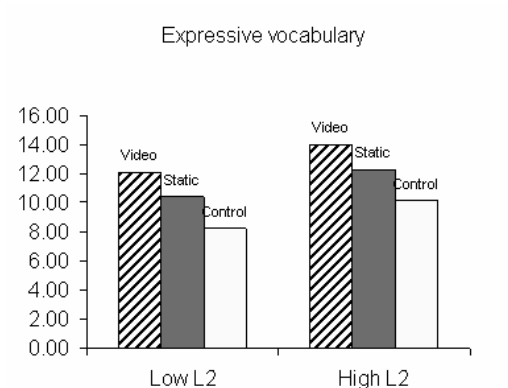
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Expressive vocabulary

Figure 2 Post-test Scores on Expressive Vocabulary after Corrections for all Background Variables.

Discussion

Digital storybooks in general are not just a powerful incentive for L2 learners' understanding of age-appropriate stories but an incentive for learning words as well. On average L2 children learn slightly more than 5 words (*SD* = 3.46) from independent repeated encounters with digital stories, the high level children benefiting most. The main question: "Are video storybooks a worthwhile investment for all L2 children?" can be answered positively. The rich visualizations in video storybooks benefit high and low proficient L2 children's story comprehension and vocabulary.

Effects are mostly present regardless of second language proficiency with the exception of story actions. The retelling of story *actions* was positively affected by video additions in the low L2 proficiency groups but not in the high L2 group. The high L2 group did not depend on a video display of the story action. They were able to use information in the static picture and text to create a mental animation comparable to the video (Hegarty, 2004). Although actions in a story are quite noticeable and may be easily discerned and remembered (Gibbons, et al., 1986), adding video to the story text provides an extra boost for low L2 proficient children's retelling of actions, probably because video provides more explicit information about actions than just static images (Höffler & Leutner, 2007).

Comparable to the findings of Van den Broek et al. (1996), five-year-old children apparently find psychological causation more difficult to understand than physical causation (Thompson & Myers, 1985), as is indicated by the low average scores on

implied story knowledge. Children retold on average 54.75% (*SD* = 16.82) of actions in the Winnie the Witch story but only 24.63% (*SD* = 15.85) of implied elements. Even clearly portrayed emotional responses, sometimes with matching sound effects or music, were often missing from children's retelling. The enriched visualizations in video storybooks benefit all children's retelling of implied story elements as is indicated by more implied story elements being retold after exposure to video books (*M* = 28%; *SD* = 17.08) than after exposure to static books (*M* = 21%; *SD* = 13.74). Overall, video additions support children's attempts to gain a more complete and sophisticated understanding of the story (Sadoski & Paivio, 2004). Comparable to other studies (Thompson & Myers, 1985; Van den Broek et al., 1996) this age group apparently needs a more precise presentation of successive events to understand causation.

Video additions positively affected learning of story *vocabulary* for high as well as low L2 children. Video may have facilitated connecting words to images by zooming in on the relevant images as the matching phrase is spoken out loud thus substantially heightening the probability that words are connected to images (Paivio, 2007). The finding that vocabulary improves more when digital books include video diminishes what might be assumed to be a drawback of video storybooks, i.e., that children just focus on the 'easy' to process video images while ignoring the story language. The outcomes are quite the reverse: children seem to make use of video additions to understand and retain words from the text.

After all initial differences including L2 proficiency level were taken into account, L2 children learned, compared to a static storybook, more than one and a half new words extra from listening to a video storybook. This sounds as a very modest effect but it becomes more impressive when we extrapolate this finding to a series of books. "Reading" 10 video storybooks, each four times, young L2 children would on average gain almost 63 words with books in video format compared to almost 46 words with a static book format, assuming that the books' vocabularies vary and each book, like the Winnie the Witch story, offers a unique set of unknown words. Although stories with static pictures on the computer promote L2 children's language proficiency and in particular their knowledge of academic language as presented in books, using video storybooks significantly increases learning from book encounters.

Limitations and future directions

The lower numbers of high proficiency L2 children may have reduced the chance that statistical tests would show significant effects but this was inevitable. It reflects the actual situation in schools. However, the effects of video on implied elements and vocabulary indicate that variances in this group were sufficient.

It is possible that children did notice actions and implied story elements but failed to include those in their retellings (Hayes & Casey, 1992). Asking children questions about the story content might have led to different results. However, there is no reason to assume that this disadvantage of the retelling as an indicator of story understanding works more strongly in one of the groups and would thus have changed the pattern of outcomes.

The present findings for the cognitive effects of video storybooks may not apply to the same extent to L1 children even though the majority of this group scores in the same range. Research shows that although the breadth of L2 learners' vocabulary can be comparable to L1 learners, the depth is not always the same. Compared to L1 children, L2 learners have a more superficial knowledge of words (Verhallen & Schoonen, 1998). As a result, video may have helped L2 children, but this positive effect may not be found with L1 children (Silverman & Hines, 2009).

Practical implications

From an early age children from middle class homes are read to on a daily basis providing them with a huge educational advantage compared to children from low SES homes (Teale, 1986). They are better prepared to profit from reading instruction in first grade and further on (Juel, 2006; Raudenbush, 2009). Differences in academic skills resulting from early exposure to storybooks could be diminished if children were to visit Internet websites that provide a virtual library of digital storybooks on a regular base (Verhallen & Bus, 2009). The present study shows that L2 learners benefit from encounters with digital storybooks even without a mediating adult. Providing digital storybooks with all the trimmings seem to be the indicated way to promote learning from story encounters among young L2 learners. Video additions, more than static images, have a significant impact on deriving sophisticated information from the story text as well as on the learning of academic vocabulary, two essential skills needed to profit from reading education later on (Anderson, et al., 2003). Concerns that video storybooks work as a prosthetic, that indeed enables children to enjoy the story but reduces the probability that children develop language skills like understanding new stories, seem unwarranted.

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The present results show that video storybooks benefit text comprehension skills like understanding what connects story events and vocabulary, and they may also be advantageous to other important aspects of learning like motivation that were not tested in this study. The number of digital storybooks, available on the Internet has expanded substantially in recent years (Madej, 2003). Sites like Nickjr (Nickolodeon) for young children provide animated stories in *Just for Me Stories*; Public Broadcasting Services (PBS) has a site where the stories of *Arthur* can be seen and a host of other sites provide digitized stories. This means that children can already choose from an extensive selection of video storybooks.

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