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REPEATED-VIEWING AND CO-VIEWING OF AN ANIMATED VIDEO: An examination of factors that impact on young children's comprehension of video content

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The experiment reported here was concerned with the effect of repeat-viewing and adult co-viewing on the comprehension of an animated feature length movie. Four- to six-year-old children watched a movie on video either once or five times, and either with their mother present or on their own. The findings revealed that, after controlling for language skills and interest in the type of video watched, children who watched five times had higher comprehension scores than children who watched only once. Furthermore, children who watched the video repeatedly were also better at character identification and at identifying the good and bad qualities of one of the main characters in the movie. The presence of a mother, who was explicitly asked to co-view the movie with her child, did not facilitate comprehension. The findings are discussed in terms of the educational benefits of repeat viewing. Theoretical implications are also noted.

Children under the age of five years spend most of their waking time at home playing and watching television (Huston, Wright, Marquis & Green, 1999). It is not surprising, therefore, that children's television viewing habits have been the topic of much research in the past 30 years (see Singer & Singer, 2001). Contemporary researchers argue that television viewing should not be treated as a one-dimensional construct (Valkenburg, 2001), and that the medium of television is not homogeneous in its impact on children's development (Anderson, Huston, Schmitt, Linebarger & Wright, 2001). Both of these arguments contributed largely to the planning of the current study. A further contribution to the inception of this project was the fact that video viewing is highly pervasive in the lives of very young children (Buena Vista, 2002; Skouteris, Sleeman, Taylor & Kelly, 2002). Clearly, young children are experienced viewers of videos.

In previous studies, video watching has been incorporated into general television watching (e.g. Huston et al., 1999; Huston, Wright, Rice, Kerkman & Peters, 1990). However, watching videos is different from watching television programs, for several reasons. First, videos can be watched at a time that suits the child, whereas episodes of a television program or films on television have to be watched at the scheduled time of broadcasting. Second, videos can be paused, stopped, rewound to repeat sections or moved forward to avoid certain parts; this level of viewer control is not available

when watching television. Third, videos of feature films provide a viewing experience for a young child that is not readily available on television. In contrast to the short 30-minute episodes of educational programs such as *Play School* or *Blues Clues*, these videos usually run for more than an hour and portray a 'story' as opposed to structured curriculum-based activities. Finally, as is the case with favourite books, young children often demand to watch favourite videos repeatedly (Mares, 1998). In a recent study exploring the media diet of Australian children aged three–six years, one child was reported as having watched the same video almost every day for a year (Skouteris et al., 2002).

Why do children watch videos repeatedly? Repeat viewing appears to have implications for how the content of videos is understood and used by children. This may not seem surprising given that the benefits of repetition for learning have also been shown with reading (Levy, Nicholls & Kohen, 1993; Martinez & Roser, 1985; Samuels, 1979). The findings of several studies have revealed, with children younger than six years, that repeated viewing of educational, curriculum-based television programs improves comprehension of the material presented (Crawley, Anderson, Wilder, Williams & Santomero, 1999; Sell, Ray & Lovelace, 1995).

Sell et al. (1995) asked four-year-old children to watch an edited version of a *Sesame Street* episode once a week for three weeks. This edited version included an 'Alphabet Treasure Hunt' and, after each viewing,

children's plot comprehension was assessed by asking the question: 'How do you play Alphabet Treasure Hunt?', followed by one of three prompt questions: 'Tell me more about that', 'What else happened?', or 'What was the first thing that happened?' (p. 54). Sell et al.'s findings revealed that children did better on the plot comprehension questions after repeated viewing. However, asking comprehension questions after each viewing may have alerted children to the aims of the experiment; they may have been cued to the fact that they needed to focus on the script of the game. Furthermore, the answering of questions involved retelling part of the story and that, in itself, may have facilitated comprehension. Children not only saw the program three times but also had the opportunity to rehearse program content on two occasions prior to the final viewing.

Crawley et al. (1999) replicated Sell et al.'s study, taking into account these possible confounds. They showed three- and five-year-old children an episode of *Blue's Clues* either once only or once a day for five consecutive days. A comprehension test was administered at the end of either the single viewing or the five repeat views, depending on the group the child was in. Crawley et al.'s findings revealed that children exposed to the same episode of *Blue's Clues* every day for five days performed better at solving both a familiar and a novel problem (the former was shown in the episode, whereas the latter was not shown) and on the comprehension test than did children who watched the episode only once.

To our knowledge only two studies have examined the effects of repeatedly viewing a movie, as opposed to a curriculum-based television program, on comprehension of the content. Mares (1997, as cited in Crawley et al., 1999) showed six- to nine-year-old children an edited version of a children's feature film and found that children who watched the film repeatedly were better at character identification and making inferences about the movie than were children who had seen it once only. In another study reported by Mares (1998), four- and five-year-old children better understood characters' motives, emotions and actions if they saw a simple televised audiovisual story four times as opposed to just once. In this simple story, there was an ugly but kind old woman and a pretty but mean old woman. Repeated viewing facilitated an understanding of the ugly woman being kind (or the pretty woman being mean), hence reducing bias based on 'physical appearance'.

Given the dearth of research, the first aim of our study was to examine how four-to-six-year-olds' comprehension of an animated movie was affected by repeated viewing. We were keen to determine whether the positive effects of repeatedly viewing a movie on comprehension of the video content, as reported by Mares, are robust. An animated movie was chosen because animation is popular among children of this age (Skouteris et al., 2002). Children watched the whole movie as they usually do at home, rather than an edited version or a simple story. We assessed their overall comprehension of the storyline and characters and, given the positive findings shown by Mares regarding characters' motives and actions, we also examined the extent to which overall character identification and an understanding of the 'good versus bad' characters was facilitated by repeat viewing.

With repeated viewing, comprehension of the characters and events depicted may increase because of sustained attention to the program. Indeed, Anderson and his colleagues (see Anderson & Lorch, 1983; Lorch, Anderson & Levin, 1979) argued that young children's attention to a television program is driven by their comprehension of the material. If the material is comprehensible, the child is more likely to attend; if the material is incomprehensible or becomes too familiar, visual attention will decrease (Rice, Huston & Wright, 1986). In contrast to this active theory of processing television content, Singer (1980) argued that if television is rapidly paced it interferes with comprehension. That is, children are seen as passive viewers because their attention is captured primarily by the formal features of television, with little attention paid to the processing of the actual content.

In their study involving repeated viewing of a *Blues Clues* episode, Crawley et al. (1999) tested both the passive theory of Singer (1980) and the active theory proposed by Anderson and colleagues. Given that the formal features that capture a young child's attention, such as scene changes and movement, elicit orienting reactions, and these reactions habituate to repetition, Crawley et al. argued that one would expect a decline in visual attention over repeat views for all pre-school children, regardless of specific age, if Singer's theory is to be supported. In contrast, based on Anderson and Lorch (1983) and Huston and Wright's (1983) theories, Crawley et al. predicted that comprehension of three-year-olds would benefit from repetition and that their visual attention would increase over repeat views, whereas, for five-year-old children, repetition

may lead to familiarity with the program content that may then lead to a decrease in looking at the screen. Their findings were more consistent with the latter theories than with Singer's. Whereas the three-year-old children's visual attention to the screen remained high and constant over the five repeat views, looking at the screen by five-year-olds decreased from the first to the fifth viewing, and this decrease was larger for five-year-old boys than for five-year-old girls.

Interestingly, the mothers of three- to six-year-olds in Skouteris et al.'s (2002) study reported that their children paid closer attention to the whole video, and took on characters in their role-play if they had watched an animated movie-length video repeatedly and were very familiar with its contents. Clearly, changes in visual attention with repetition warrant further exploration and this was a further aim in this study. It should be noted that, while a positive relationship between visual attention and comprehension of television content has been reported (Anderson, Lorch, Smith, Bradford & Levin, 1981; Krull & Husson, 1979; Lorch et al., 1979), attention is not a sufficient condition for comprehension nor is comprehension a sufficient condition for attention (Huston & Wright, 1983). Indeed, children can and do comprehend material presented on television even when they are not looking at the screen (Lorch et al., 1979).

The final aim in our study was to explore whether co-viewing an animated movie with a parent leads to better comprehension of the video content. This aim was inspired by an earlier finding that a large proportion (71%) of mothers reported being present frequently when their children watch television and that this level of co-viewing frequency was greater for animated movie-length videos (Skouteris et al., 2002). Collins, Solbol and Westby (1981) showed that seven- to eight-year-old children's comprehension of a television program increased when a co-viewing adult was present to talk to them about the program content. Adults may provide the scaffolding required to assist the child's understanding.

To our knowledge, the effects of co-viewing a movie with an adult on pre-school children's overall comprehension of the program content have rarely been examined. Interestingly, Rice, Huston, Truglio and Wright (1990) explored the impact of adult co-viewing on vocabulary development with pre-school children. Their findings revealed that viewing television alone at age three to 3.5 years predicted positive vocabulary development at age five years, whereas viewing television without an adult at the age of three to 3.5 years was not related to vocabulary development at this latter age. It appears that co-viewing has no effect on vocabulary development. Whether overall comprehension of program content increases when young children co-view with an adult was investigated here. We reasoned that, for co-viewing to have an impact on comprehension, a parent and child should interact in both a verbal (e.g. talking about the program, asking questions and answering questions) and non-verbal way (e.g. pointing to the screen to attract the attention of the other person, laughing together at a funny scene) and respond to each other's questions or comments about the movie. As such, we expected that, if co-viewing is occurring, interactions based on the program content should be responded to more than not responded to. This assumption was also explored.

In summary, we were concerned with addressing four research questions:

1. Does repeat viewing result in better comprehension of the video content, and specifically the 'good versus bad' theme in an animated movie for children?

2. Do children who co-view an animated movie with their parent have greater comprehension of the video content?

3. Is percentage of time looking at the screen related to comprehension of video content?

4. How does visual attention change with repetition?

In relation to the first two questions, we were interested in determining the effects on comprehension of repeated exposure to the video and parental co-viewing, over and above child/viewer characteristics that might influence comprehension of video content. The first of these child characteristics was verbal ability. Five-year-old children with high verbal or language skills have been shown to comprehend more of a television program than have children with lower verbal skills (Jacobvitz, Wood & Albin, 1991). Jacobvitz et al. (1991) argued that higher verbal skills in children allow more capacity to process the meaning of the story being depicted because less attention needs to be paid to lower-order processing such as understanding the meaning of words.

The second child/viewer characteristic was interest in the type of program watched. While our earlier research findings showed clearly that children at the age of four–six years watch feature-length animated videos regularly (Skouteris et al., 2002), we proposed that the amount of interest in animated movies may

impact on comprehension of the program content, just as interest in what children read, or have read to them, facilitates literacy skills and comprehension. As such, we hypothesised that, when controlling for these child factors, children who watch an animated movie five times would have better comprehension of the video content on the whole, would better identify the characters in the program, and would have a better understanding of 'good versus bad' characters than would children who watch the video only once. No predictions were made about the effects of parental co-viewing on comprehension of the video content, given the lack of previous research.

In relation to the third research question, we hypothesised, based on the findings of Crawley et al. (1999) with the older children, that four- to six-year-old children's attention to the screen would decrease across repeated views, but that overall looking at the screen would remain high. No prediction was made with respect to the fourth question because of the inconsistency in previous findings.

Method
Participants

A total of 77 preschool children (41 girls and 36 boys) participated in this study (M=62.6 months, SD=10.1 months, age range=46–82 months). The participants were all born in Australia, had English as their first language and came predominantly from middle-class families living in the northern and south-eastern suburbs of Melbourne. Children were allocated randomly to one of four experimental conditions. Half of the children watched the animated movie once; the other half watched five times. In each of these two conditions children were further divided into view-alone or co-view conditions. That is, overall, half the children watched the video alone and the other half watched it with their mother, who was instructed to co-view. The number of children in each condition and their gender and age details are presented in Table 1.

Materials

An animated movie video (*101 Dalmatians 2*) of 70-minutes duration was used in each experimental condition. This movie had not been released for public viewing at the time of testing. The children watched the video in a room set up to resemble a home. Two couches faced a television monitor and video player. A small table placed to the side of one couch held pencils, paper and several story books in order to resemble a home environment where children usually watch television/videos with toys or activity materials nearby. A desk-height table and two chairs, needed for the administration of the vocabulary task and comprehension questions, was positioned behind the couch set-up.

A set of comprehension questions was designed for the video to assess character identification and comprehension of what was happening throughout the program. Parents completed a questionnaire to assess general demographic information. Child interest in watching feature-length animated films was assessed by asking the mothers to respond to the following question, using a four point Likert-scale, from 1 (no interest at all) to 4 (high interest): 'What level of interest does your child have in feature-length animated videos; e.g. *Shrek, Toy Story, Barbie in the Nutcracker?*' As a screening test of verbal ability, the Peabody Picture Vocabulary Test-Revised (PPVT, Dunn & Dunn, 1981) was used to assess children's receptive vocabulary. The entire test session, that is the video watching and completion of comprehension questions, was recorded using a ceiling-mounted camera, in the left-hand corner of the room, connected to a video-recorder and colour television located in the control room of the laboratory. This recording allowed us to measure visual attention in terms of the percentage of time the child was oriented towards, or looking at, the television screen.

Procedure

Children and their parents were invited to the Child Development Unit in the School of Psychological

Table 1. Number of children, their mean age and gender, in each experimental condition		
	View Alone	Co-View
Single view	n=19 (9 girls and 10 boys)	n=19 (10 girls and 9 boys)
	M age=62.42 months	M age=60.37 months
	(SD=10.65)	(SD=10.22)
Repeat view	n= 20 (11 girls and 9 boys)	n=17 (9 girls and 8 boys)
	M age=61.80 months	M age=64.94 months
	(SD=10.48)	(SD=9.13)

Science at La Trobe University for two test sessions, one week apart. Parents remained with their child for the entire duration of testing.

The first test session began with the first or only viewing of the video. Parents of participants in the view-alone condition were asked not to discuss the contents of the video with their child. If their children spoke to them about the movie, they were asked to say they were too busy to talk to them at that time. Parents of participants in the co-view condition were instructed to interact with their children about the movie, to discuss the characters, the storyline and the themes, and to respond fully to any comments or questions from their children.

Parents who did not co-view in the testing room completed the questionnaire placed on the table behind the couch. Parents who co-viewed completed the questionnaire at home and brought it back when they returned for the second session.

For children in the single-view condition, this viewing was followed by the comprehension questions. Children were asked 33 questions about the movie. Of these, 26 questions focused on events depicted in the movie (e.g. 'How many episodes of "Thunderbolt" had Patch seen?' and 'What did Lightening tell Thunderbolt about the next show?') and seven focused directly on character identification and on an understanding of the good versus bad characters. All questions were open-ended and, in most cases, the child received one point for giving some information and two points for giving all the information. The 26 event-related questions added up to a maximum score of 48. The remaining seven were divided into two categories: (1) one question focused on character identification (the children were presented with pictures of all the main characters and asked to provide the names of these characters) with a maximum score of 16; (2) three focused on identifying who was a good character (maximum score of 6) and three questions on who was a bad character and what they did that was good or bad, with a maximum score of 10. As part of these 'good' and 'bad' character questions, children were required to identify the different good and bad qualities of Thunderbolt, one of the main characters. The Thunderbolt score was calculated by adding a point for each piece of crucial information about Thunderbolt's character; this included identifying Thunderbolt as both good and bad and providing an event from the video that demonstrated his good (maximum 2 points) and bad qualities (maximum of 2 points), and by identifying that Thunderbolt's motivation during the rescues was to become famous and that he had lied to Patch and

wasn't a real wonder dog (maximum 3 points). Hence, the Thunderbolt score had a maximum of seven points and, overall, a maximum score of 80 could be obtained on the comprehension test. Two coders independently scored the answers to the comprehension questions for all participants. Inter-rater reliability between the two coders on these scores was 100 per cent.

Parents of children in the repeat-view condition were provided with a 'take home pack' which included the video of the repeat program to be watched and instructions on how the child should view the program three more times at home (abiding by the view-alone and co-view condition the child was in). All children returned to the Child Development Unit exactly one week later, at which time the experimenter administered the PPVT to each child. Children in the repeat-view condition were then asked to watch the repeat view program for the fifth time. Once again, parents were reminded of their viewing condition (either alone or co-view). This final viewing was followed by the comprehension questions for that group of children.

Results

An alpha level of .05 was used for all statistical tests. Preliminary analyses revealed that males and females did not differ significantly on their overall comprehension scores and their percentage of time looking at the screen (comprehension, $t(73)=.33$, $p=.74$; looking at screen, $t(73)=1.75$, $p=.08$). In all subsequent analyses the data of boys and girls was collapsed.

Table 2 presents the mean scores and standard deviations for the comprehension test (scored as a percentage of correct responses) and Table 3 presents the means scores and standard deviations of the percentage of time looking at the screen. The mean PPVT standard score and standard deviation for the sample was 108.83 (12.34) and the participants' mean rating of interest in feature length animated videos was 2.61 (.59).

Table 2. Mean comprehension scores

	M	SD	n
[a]comprehension overall	48.17	16.78	75
comprehension single view	41.81	14.22	38
comprehension repeat view	54.70	16.87	37
comprehension view alone	47.77	17.13	39
comprehension co-view	48.61	16.63	36
[a]Comprehension score range 0–80			

Table 3. Mean percentage of time looking at the screen

	M	SD	n
Looking at screen overall	92.40	9.93	75
Looking at screen single view	96.71	3.81	38
Looking at screen first of repeat view	93.44	8.01	37
Looking at screen fifth of repeat view	89.27	11.20	37

Percentage of time looking at the screen across repeat views

Interobserver reliability for the scoring of percentage of time looking at the screen was assessed by having two coders code 20 of the videotapes independently (10 in the single view and 10 in the repeat-view condition), with $r=.91$, $p<.0005$. A one-way ANOVA revealed that the percentage of time looking at the screen differed significantly from the first to the fifth view. While children watched the screen for a significantly shorter proportion of time on the fifth viewing, $F(1,36)=9.34$, $p=.004$, the findings revealed that children spent almost the whole time looking at the screen for both the first and fifth views.

To assess whether there was a relationship between percentage of time looking at the screen (collapsed across all conditions) and comprehension of program content (collapsed across all conditions), a bivariate correlation was run. There was no association between these two variables, $r=.05$, $p=.65$. Indeed, there were no significant correlations even when the relationship between comprehension and percentage of time looking at the screen was compared for each experimental group separately.

Repeat viewing, co-viewing and comprehension

In order to explore the effects of co-viewing on comprehension, it was necessary to first ascertain that children and parents did in fact co-view. We examined in detail the level of interaction between mother and child by coding the video footage of the pair watching the movie on the only (single) viewing for children in the single-view condition ($n=19$) and for both the first and fifth viewing for children in the repeat-view condition ($n=17$). These interactions were coded as the number of mother- or child-initiated interactions responded to by the child or mother, respectively, and the number of interactions initiated by either the mother or the child that were not responded to. Interactions included both verbal and non-verbal behaviours, such as commenting on the characters (child: 'I don't like Cruella'; mother: 'No, she isn't very nice') and child smiling at parent and parent smiling back during an amusing episode. The video footage of 10 children in each experimental condition was assessed for inter-rater reliability, with $r=.93$, $p<.0005$. The means and standard deviations (in brackets) for the total number of interactions responded to and the total number of interactions not responded to were 15.87 (9.72) and 9.84 (7.61) respectively, for all co-view participants. The number of interactions, initiated by either the mother or the child, that were responded to was significantly greater than the number not responded to, $t(36)=3.78$, $p=.001$.

Given that we were interested in determining the effects on comprehension of repeated exposure to the video and parental co-viewing, over and above child/viewer characteristics that might influence comprehension, the association between these control variables and comprehension was explored first (see Table 2 for relevant scores on comprehension; see Table 4 for PPVT and interest in feature-length animated videos). There was a significant correlation between children's comprehension scores and their PPVT scores ($r=.27$; $p<.01$), and between comprehension and interest in feature-length animated videos ($r=.25$; $p<.01$). The results of two one-way ANCOVAs, one to explore the effects of co-viewing on comprehension and the other to explore the effects of repeat viewing on comprehension, controlling for PPVT scores and interest in feature-length animated, revealed that there was no significant main effect for the alone/co-view condition $F(1,62)=.04$, $p=.84$. However, there was a significant main effect for the single/repeat condition $F(1,70)=20.87$, $p<.0005$, with comprehension scores being significantly higher for participants in the repeat viewing condition. There was also no correlation between comprehension and the number of interactions responded to by the child/mother, $r=-.03$, $p=.87$, and between comprehension and interactions not responded to, $r=-.21$, $p=.25$.

Good versus bad characters

The means and standard deviations for overall character identification, good guys, bad guys and Thunderbolt score for the single and repeat view conditions are presented in Table 4. The scores for each category were higher for the repeat view condition.

Table 4. Mean percentage correct and standard deviations for the Character Identification score, Good Guys score, Bad Guys score and Thunderbolt score

	Condition	n	% correct	SD
[a]Character ID	single	38	26.6	16.6
	repeat	37	48.8	22.7
[b]Good Guys	single	38	75.5	35.2
	repeat	37	77	34.8
[c]Bad Guys	single	38	58.2	29
	repeat	37	69.5	24.4
[d]Thunderbolt	single	38	35.2	19.9
	repeat	37	51	24.8

[a]Character ID score range 0–16
[b]Good Guys score range 0–6
[c]Bad Guys score range 0–10
[d]Thunderbolt score range 0–7

Overall character identification was significantly better with repeat viewing than with single viewing, $t(73)=4.83$, $p<.0005$, as was identifying the good and bad qualities of Thunderbolt, $t(73)=3.01$, $p=.004$. The difference between single and repeat view for both the good guys score and the bad guys score did not reach significance, $t(73)=.19$, $p=.84$ and $t(73)=1.82$, $p=.07$ respectively, albeit the latter result suggests a trend toward repeat viewing facilitating an understanding of bad guys.

Discussion

We addressed four research questions in this study. The first explored the effects on comprehension of video content of repeatedly viewing an animated movie. The test group was children aged four–six years. Our hypothesis that, when controlling for both interest in the video and receptive vocabulary, children who watched an animated movie five times would have better comprehension of the video content was on the whole supported. The children in the repeat-view condition were also better at character identification and were better able to identify the good and bad qualities of Thunderbolt than were children in the single-view condition. Interestingly, however, there was no significant difference between single and repeat view for both the good guys and the bad guys scores, albeit for the bad guys there was a trend toward the children in the repeat-view condition scoring higher than children in the single-view condition.

Our findings in relation to the effect on the comprehension of the program's content of repeatedly viewing a video support and extend the findings of Sell et al. (1995), Crawley et al. (1999) and Mares (1998). Clearly, children better understood the video content after five viewings and were better able to talk about characters; in particular, the children were better able to identify why one of the main characters, Thunderbolt, was both a good and bad guy. Why is increased comprehension of video material important? Mares points out the behavioural outcomes of viewing, such as imitation of antisocial and prosocial content. She argues that children who at first do not understand the connections between violent actions and consequences may be more inclined to imitate these violent acts than are children who have watched a video repeatedly and understand that violent or bad behaviour leads to punishment. Similarly, prosocial acts that initially are not obvious to young children may become so with repeated viewing, leading perhaps to more positive behaviours. It is possible that, if repeated viewing facilitates children's understanding of prosocial and antisocial behaviours and the consequences associated with each, then repetition of video material depicting such information might be a useful tool in teaching these behaviours. Mares also points out that repeat viewing may have implications for achievements in areas such as vocabulary development or acquisition of story grammars. Future research should be directed toward systematically exploring whether repeated viewing of appropriate television/video content can foster social and academic development in young children.

The second research question involved exploring whether co-viewing a video with a parent leads to better comprehension of the video content. Given that researchers have argued that co-viewing is fairly uncommon with young children (Dorr, Kovaric & Doubleday, 1989), it was important to first establish whether or not our attempt to elicit adult co-viewing was successful. In the co-viewing group, we found that the number of interactions initiated by either the mother or the child that were responded to—during the video viewing—was significantly greater that the number not responded to. As such, it appears that parents and children in this study were co-viewing when asked to do so. Despite this interaction, co-viewing did not improve children's comprehension of the video content. In accordance with the findings of Rice et al. (1990), who explored vocabulary development, it appears that adult co-viewing does not facilitate understanding of video content when the video watched is specifically geared toward a young

child audience. Given that the children might have already been familiar with the original *101 Dalmatians*, it is possible that parental interaction with the video was not needed to make certain characters and events salient to the children.

The findings here do not suggest that co-viewing is futile. Indeed, there are other reasons why adults should co-view with young children; researchers have proposed that co-viewing is important because parents can monitor what their children are watching and so can potentially reduce the negative effects of violent content by disapproving of violence (Jordan, 2001; Hogan, 2001). So, while there appears to be no evidence that co-viewing helps to facilitate children's understanding of the material presented, as was argued by Jordan (2001) and Hogan (2001), further research is needed to explore the situations in which adult co-viewing is important in terms of processing program content when young children are the viewers.

Exploring the third research question—whether percentage of time looking at the screen and comprehension of video content are related—revealed that there was no significant association between these two variables. This finding does not accord with the positive relationship between visual attention and comprehension of television content reported in previous research (Anderson, et al., 1981; Krull & Husson, 1979; Lorch et al., 1979). Given that visual attention to the screen was so high in this study, it is possible that children were looking but not necessarily comprehending, which suggests that visual attention is not a sufficient condition for comprehension (Huston & Wright, 1983).

The final research question was 'How does visual attention or looking at the screen change with repetition?' As mentioned previously, attention to the screen was very high for both the first and the fifth viewings, albeit the percentage of time spent looking at the screen for the fifth viewing was significantly lower than for the first viewing. This finding supported our hypothesis and, in accordance with the theories of Lorch et al. (1979) and Rice et al. (1986), suggests that young children's attention to the screen while watching a video is driven by their comprehension of the content and that, as the content becomes more familiar and predictable, visual attention is likely to decrease. Our findings do not support Singer's (1980) theory that children are passive viewers and that the formal features of the program interfere with comprehension. Children's comprehension clearly improved over repeat views despite their visual attention declining.

Our findings also revealed that children's language abilities and their interest in feature-length animated videos were correlated positively with comprehension of content. These two factors are outlined in Fisch's (2000) capacity model of children's comprehension of both the narrative and educational components of an educational television program. Fisch identifies both viewer and program characteristics that are purportedly important for successful comprehension. The model is silent, though, in respect of the impact of repeat viewing and how this might contribute to increased comprehension. In fact, developmental theories of learning have little to say about the effects of repetition (Crawley et al., 1999).

Clearly, the mechanisms involved in understanding material that is presented to children in educational programs and in animated feature-length movies warrant further investigation. In addition, the current findings should be extended by exploring whether children transfer the information they process from a feature-length animated movie to a new situation. Can children transfer knowledge gained in one context to a new situation or context, such as an understanding of the negative consequences of being deceitful (as portrayed by Thunderbolt in the movie)? While a review of the literature by Fisch (2004) reveals that educational television is capable of producing transfer, none of this literature addresses animated feature-length movies that are so frequently watched by young children. Anecdotal evidence from parents suggests that pre-school children are able to use information obtained from these videos in their imaginative and creative play (Skouteris et al., 2002). Systematic exploration of significant learning transfer from such animated movies is warranted to confirm these anecdotal accounts.

References

Anderson, D. R., Huston, A. C., Schmitt, K. L., Linebarger, D. L., & Wright, J. C. (2001). Early childhood television viewing and adolescent behavior: The recontact study. *Monographs of the Society for Research in Child Development, 66*(1, Serial No. 264).

Anderson, D. R., & Lorch, E. P. (1983). Looking at television: Action or reaction? In J. Bryant & D. R. Anderson (Eds.). *Children's understanding of television: Research on attention and comprehension* (pp. 1-33). New York: Academic Press.

Anderson, D. R., Lorch, E. P., Smith, R., Bradford, R., & Levin, S. R. (1981). The effects of peer presence on preschool children's television viewing behavior. *Developmental Psychology, 17*(4), 446-453.

Buena Vista (2002). *Buena Vista kids leisure report.* Australia: Author.

Collins, W. A., Sobol, B. L., & Westby, S. (1981). Effects of adult commentary on children's comprehension and inferences about a televised aggressive portrayal. *Child Development, 52*(1), 158-163.

Crawley, A. M., Anderson, D. R., Wilder, A., Williams, M., & Santomero, A. (1999). Effects of repeated exposures to a single episode of the television program 'Blue's Clues' on the viewing behaviors and comprehension of preschool children. *Journal of Educational Psychology, 91*(4), 630-637.

Dorr, A., Kovaric, P., & Doubleday, C. (1989). Parent-child coviewing of television. *Journal of Broadcasting and Electronic Media, 33*(1), 35-51.

Dunn, L. M., & Dunn, L. M. (1981). *Peabody picture vocabulary test—revised.* Circle Pines, MN: American Guidance Service.

Fisch, S. M. (2000). A capacity model of children's comprehension of educational content on television. *Media Psychology, 2*(1), 63-91.

Fisch, S. M. (2004). *Children's learning from educational television: Sesame Street and beyond.* Mahwah, NJ: Lawrence Erlbaum Associates.

Hogan, M. J. (2001). Parents and other adults: Models and monitors of healthy media habits. In D. G. Singer & J. L. Singer (Eds.), *Handbook of children and the media* (pp. 663-680). London: Sage.

Huston, A. C., & Wright, J. C. (1983). Children's processing of television: The informative functions of formal features. In J. Bryant & D. R. Anderson (Eds.). *Children's understanding of television: Research on attention and comprehension* (pp. 35-68). New York: Academic Press.

Huston, A. C., Wright, J. C., Marquis, J., & Green, S. (1999). How young children spend their time: Television and other activities. *Developmental Psychology, 35*(4), 912-925.

Huston, A. C., Wright, J. C., Rice, M. L., Kerkman, D., & Peters, M. (1990). The development of television viewing patterns in early childhood: A longitudinal investigation. *Developmental Psychology, 26*(3), 409-420.

Jacobvitz, R. S., Wood, M. R., & Albin, K. (1991). Cognitive skills and young children's comprehension of television. *Journal of Applied Developmental Psychology, 12*(2), 219-235.

Jordan, A. B. (2001). Public policy and private practice: Government regulations and parental control of children's television use in the home. In D. G. Singer & J. L. Singer (Eds.). *Handbook of children and the media* (pp. 651-662). London: Sage.

Krull, R., & Husson, W. (1979). Children's attention: The case of TV viewing. In E. Wartella (Ed.), *Children communicating: Media and development of thought, speech, understanding.* Beverly Hills, CA: Sage.

Levy, B. A., Nicholls, A., & Kohen, D. (1993). Repeated readings: Process benefits for good and poor readers. *Journal of Experimental Child Psychology, 56*(3), 303-327.

Lorch, E. P., Anderson, D. R., & Levin, S. R. (1979). The relationship of visual attention to children's comprehension of television. *Child Development, 50*(3), 722-727.

Mares, M. L. (1998). Children's use of VCRs. Annals of the American *Academy of Political and Social Science, 557,* 120-131.

Martinez, M., & Roser, N. (1985). Read it again: The value of repeated readings during storytime. *Reading Teacher, 38*(8), 780-786.

Rice, M., Huston, A., Truglio. R., & Wright, J. (1990). Words from 'Sesame Street': Learning vocabulary while viewing. *Developmental Psychology, 26*(3), 421-428.

Rice, M., Huston, A., & Wright, J. (1986). Replays as repetition: Young children's interpretation of television forms. *Journal of Applied Developmental Psychology, 7*(1), 61-76.

Samuels, S. J. (1979). The method of repeated readings. *Reading Teacher, 32,* 403-408.

Sell, M. A., Ray, G. E., & Lovelace, L. (1995). Preschool children's comprehension of a Sesame Street video tape: The effects of repeated viewing and previewing instructions. *Educational Technology Research and Development, 43*(3), 49-60.

Singer, J. L. (1980). The power and limitations of television: A cognitive-affective analysis. In P. H. Tannenbaum & R. Abeles (Eds.), *The entertainment functions of television.* Hillsdale, NJ: Erlbaum.

Singer, D. G., & Singer, J. L. (Eds.) (2001). *Handbook of children and the media.* London: Sage.

Skouteris, H., Sleeman, F., Taylor, M., & Kelly, L. (2002). *Children's responses to animated Disney films: A mother's perspective.* Unpublished report presented to Buena Vista Home Entertainment.

Valkenburg, P. M. (2001). Television and the child's developing imagination. In D. G. Singer & J. L. Singer (Eds.). *Handbook of children and the media* (pp.121-134). London: Sage.