The Relation between Selective Attention to Television Forms and Children's Comprehension of Content

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CALVERT, SANDRA L., HUSTON, ALETHA C., WATKINS, BRUCE A., and WRIGHT, JOHN C. *The Relation between Selective Attention to Television Forms and Children's Comprehension of Content* CHILD DEVELOPMENT, 1982, **53**, 601–610. Children's visual attention to the formal features of a television program was measured and related to their comprehension of central and incidental content. 128 children from kindergarten and third- to fourth-grade classes viewed a prosocial cartoon in same-sex pairs. Each child's visual attention to the screen was recorded continuously and later related for co-occurrence with each of 10 formal features of the program. After viewing, children completed a multiple-choice test of 60 items assessing recall of central and incidental story information. Selective attention and inattention to certain formal features predicted comprehension, especially of incidental content. Younger children's comprehension was associated with attending during perceptually salient auditory features, like sound effects, and with not attending during abstract adult narration. Older children's comprehension was associated with attending during child dialogue and moderate character action and with not attending to camera zooms. Central story content presented with rapid and moderate action levels was well understood by both age groups, suggesting the selective use of perceptually salient features to highlight critical messages in the production of children's television programs. Salient auditory features may call attention to contiguous verbal content, while salient visual features may supplement verbal information with images of visual action appropriate for iconic representation in memory.

Children's understanding of television content depends in part on their growing independence from its sensory demands and their growing familiarity with the formal production features that serve to structure its messages and signal its important and attention-worthy content (Wright & Huston 1981). More precisely, children's processing of television content may depend first on their attention to the forms of the medium and second on the extent to which those forms aid their selection of content for comprehension or provide modes of representation that they can encode.

Formal features are attributes of programs that result from visual and auditory production techniques. Examples are the amount of action (physical movement of characters), and the occurrence of specific visual devices, such as special effects, pans, zooms, and fades, or auditory devices, such as sound effects, music, and non-speech vocalizations. Adult narration and child dialogue, independent of their linguistic content, are also formal features (see Huston, Wright, Wartella, Rice, Watkins, Campbell, & Potts [1981], for definitions of these features).

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The purpose of this paper is to describe the features in a television production that guide children's visual attention and to assess the ways in which children's selective attention to features is related to their subsequent comprehension and recall of story content We consider two ways in which features may influence attention (1) they may attract and maintain attention as a consequence of their salient perceptual qualities, or (2) they may guide a child's attention by their association with comprehensible, interesting, informative, or otherwise attention-worthy content It should be noted that both sets of influences can operate concurrently, and that they are expected to interact in the determination of attentional behavior The first of these we call the *salience* function of features, and the second we call their *marker* function

Perceptual salience of features is a characteristic primarily of the stimulus, not the perceiver That is, it is defined as a property of those formal features which embody a relatively high level of some of Berlyne's (1960) collative variables intensity, movement, change, contrast, incongruity, or novelty (Huston-Stein & Wright 1979) Salient features include rapid action, visual special effects, and sound effects In the "Fat Albert" program used in this study, for example, Fat Albert jumps (rapid action/movement) behind a thin statue which nevertheless fully hides him (visual special effect/incongruity), accompanied by a "zip" noise (sound effect/novelty) While salience is defined independently of viewer characteristics and thus can be effective at any age or cognitive level, experience is expected to attenuate its influence both by generalized habituation and by the gradual acquisition of knowledge about more efficient cues to attention worthiness than is perceptual salience (Wright & Huston 1981) In the absence of measured television-viewing skills, age may be used as a rough index of that learning and development

The marker function of formal features has been described by Lorch, Anderson, and Levin (1979) in conjunction with their hypothesis that comprehensibility of content influences children's attention Specifically, they advanced the idea that children use formal features as signals to mark which content will be comprehensible or incomprehensible Krull and Husson (1979) demonstrated that elementary school children's attention was guided by learned expectations about the sequence of formal features, whereas preschool children did not evidence these attentional patterns

The predictions derived from our developmental model were that younger viewers' *attention* will depend more on salience of features, while older viewers should show more ability to use learned signals or nonsalient features to make attentional decisions Of course, when salient features are used in production to mark important content, then both younger and older children should attend selectively to that content—the younger ones because of the perceptual salience of the features, and the older ones because they have learned the features that signal important content In this instance, the salience, which is effective without knowledge of markers, supplants the knowledge of marker codes lacking in the younger child (e g , Salomon 1979)

When formal features influence attention, regardless of the reason, then they may also affect *comprehension* of content by two means (1) they may draw attention selectively to contiguous content, thereby aiding the child in selecting content for processing, and (2) they may provide a developmentally appropriate mode of representation for encoding content in iconic or symbolic form The first of these processes suggests that children will learn whatever content co-occurs with those features that attract and maintain attention To the extent that developmental differences in attention to salience occur, then younger children will be more likely to learn content associated with salient features than older children This hypothesis is based on the assumption that comprehension is dependent on attention However, Lorch et al (1979) challenged that assumption when they demonstrated that experimentally doubling children's visual attention to a program did not improve their comprehension, but within treatment conditions, comprehension was correlated with attention to specific portions of the program where relevant information was presented Given that young children have difficulty in selecting central from incidental content (Collins, Wellman, Keniston, & Westby 1978), overall increases in attention may not be as helpful to comprehension as is feature-guided selection of important information for further processing Therefore, if producers systematically pair attention-getting formal features with central or incidental content, then these production decisions may benefit or hinder children's comprehension of critical messages, respectively

The second means by which formal features may aid comprehension is through serving as modes of representation The striking visual and auditory events which characterize much

of children's television can provide iconic or echoic images for encoding content Information may be understood differently when it is presented visually than when it is presented verbally Recent work by Meringoff (1980) supports the proposition that, when information is presented visually, young children recall it in pictorial form, whereas information presented through dialogue or story narration is recalled in verbal form Because young children may use iconic forms of representation readily (Bruner, Olver, & Greenfield 1968), their comprehension may benefit from television portrayals which present content messages through pictorial images such as character actions (Hayes & Birnbaum 1980, Hayes, Chemelski, & Birnbaum 1981), or through auditory images such as "sneaking up on you" music (Lesser 1974) Older children's comprehension should benefit as well from selective attention to character speech because they are more proficient at verbal, symbolic encoding of content

Both these functions of formal features in aiding comprehension may be particularly important for young children's understanding of central, plot-relevant content Studies of comprehension indicate a curvilinear relationship between age and recall of incidental, nonessential content, while a linear relationship exists between age and recall of central, plot-relevant content (Collins 1970, 1975, Collins et al 1978) Though cognitive competencies affect this relationship, so may the use of certain formal features In particular, central content messages are often presented through character dialogue (Hayes & Birnbaum 1980) If nonverbal visual and auditory features were used selectively to emphasize and represent such content messages, then perhaps young children's comprehension might improve

In the present study we analyzed the relation between the moment-to-moment occurrence of selected visual and auditory formal features and two aspects of information processing visual attention and comprehension As a first step in examining the roles of formal features as determiners of attention and as aids to mnemonic representation, we describe three sets of relationships in children's natural television viewing (1) developmental differences in attention to salient and nonsalient formal features, (2) developmental differences in comprehension and recall of central and incidental content presented with salient and nonsalient formal features, and (3) the relation between attentional patterns to specific forms and subsequent comprehension of central and incidental content In this correlational design, the role of formal features in enhancing or suppressing visual attention cannot be completely distinguished from their contribution to recall through providing modes of representation of content We can, however, hypothesize that nonverbal auditory features have more potential as signals and markers of attention-worthy content, while visual features may more readily serve as images for iconic representation of content Dialogue, as a feature, provides a symbolic form for verbal representation of content, especially for older children

Method

Participants

Subjects were 128 white children equally distributed by sex and two age levels, kindergarten and third to fourth grades Children attended a midwestern, small-town grade school which served a wide range of SES groups Mean ages were 5-4 for the younger children and 9-10 for the older children

Procedure

Same-sex pairs of children were taken from their classrooms to a mobile laboratory, where they were seated opposite one another at a table Across the room from them was a television monitor Other available activities included paper and crayons, comic books, small toy animals, and play money Children were told by an experimenter that they could read, watch television, play, or talk—just as they watched television at home The experimenter then walked into the next room and activated a videotape recorder which played a black-and-white 15-min edited version of a prosocial cartoon, "Fat Albert and the Cosby Kids"

The television program dealt with the reactions of a group of boys to children who engage in nontraditional, sex-typed activities The major plot involved the boys' feelings of surprise, anger, and denial that a girl was a better athlete than they were The minor plot involved the boys' censure of their leader, Fat Albert, because he liked to bake fudge At several points during the program, the scene shifted to a live adult narrator, Bill Cosby, who made humorous, theme-relevant comments about the plot The conflict resolution occurred when the girl athlete helped Fat Albert play better tennis, resulting in a friendship based on a mutual understanding of feelings

Children were randomly assigned within age and sex groups to one of three treatment conditions Sixty-four children saw the program without modification (control) The other 64

children saw the program with three 30-sec experimentally inserted pauses during which a visual image was frozen on the screen Children who viewed the pause conditions received one of two treatments (*a*) the pause only (pause), or (*b*) the pause accompanied by male narration explaining a portion of the plot or theme (audio label) Effects of these treatments are reported elsewhere (Watkins, Calvert, Huston-Stein, & Wright 1980) [1]

Formal Features

The formal features assessed in this research were grouped into salient and nonsalient categories on the basis of a priori logic and empirical validation across a large sample of children's television programs (Huston et al 1981) Salient features included rapid character action (movement through space at running speed or faster), moderate character action (movement through space at the speed of a walk), music, sound effects, vocalizations, visual special effects (e g , slow motion), camera zooms, and camera pans Nonsalient features were child dialogue, adult narration, and low action (characters stationary and exhibiting little movement)

Each formal feature was scored as it occurred in the program and was recorded to the nearest hundredth of a minute on a Datamyte electronic recorder Scoring was performed in conjunction with a larger study in which 137 children's television programs were coded (Huston et al 1981) Coders were trained until they reached a level of 80% interobserver agreement on each feature category (i e , scoring the same category within 4 8 sec of one another) Reliability was calculated using the formula of 2 × the number of agreements divided by the total number of scores Reliability was checked periodically in two ways comparison of two independent scorers (interobserver agreement), and comparison of two scorings by the same coder at different times (self-agreement) Interobserver agreement ranged from 74% to 82% for different categories, self-agreement ranged from 80% to 89% The formal feature records from the stimulus program were later compared moment to moment with each child's attention

Attention

Visual attention was scored "on" when a child looked at the television screen and "off" when a child looked away from the screen Two observers seated behind a one-way mirror scored attention continuously, using a Datamyte electronic recorder, and videotapes were made as a backup procedure Reliability was assessed by having two independent observers score the same child Three children were scored separately for a total of 45 min Agreement occurred when both observers coded an onset or offset within 4 8 sec of one another For each child, interobserver agreement was 97% for onset and offset of looks, using the reliability formula of 2 × the number of agreements divided by the total number of scores

Comprehension

After viewing the cartoon, children were given a recall test of 60 multiple-choice items This recognition memory test measured a child's comprehension of program content while controlling for possible age differences in verbal production capacities To construct test items, central and incidental elements of the story were identified and put into an open-ended questionnaire of 26 items Sixty college undergraduates viewed the cartoon, then they rated the questions as central or incidental to the plot and filled in answers Central elements were defined as that information which was essential to understanding the story Questions with a minimum of 70% agreement about the centrality of the item were retained Central questions involved either *explicitly* presented facts or *inferences* about character feelings, whereas incidental questions all concerned explicit information Incorrect answers were taken from the college students' open-ended questionnaire responses to form two types of incorrect response choices sex-role stereotypes and confusion alternatives Sex-role stereotypes were answers typically associated with male and female roles Confusion alternatives were derived from information taken from other parts of the program but not applicable for the item in question (Collins et al 1978)

Central and incidental questions were then cross-classified on an independent dimension salient or nonsalient feature presentation The principal criterion for salient or nonsalient classification was the presence or absence of high action levels (i e , movement) at the point in the program where the information was presented Explicit questions were taken from discrete program points, inferential questions were drawn from the point where that content necessary to form the inference was presented Questions where character actions were rapid or moderate during the content presentation were

[1] Treatments described by Watkins et al (1980) did not interact with any of the variables reported here

classified as salient Other salient features, such as sound effects, vocalizations, visual special effects, and music, co-occurred with high action levels (Huston et al 1981) In addition, particularly for central content, child dialogue often accompanied salient feature presentation Items classified as nonsalient were presented with child dialogue or adult narration during low action sequences Central questions presented with salient or nonsalient features had comparable proportions of explicit and inferential questions There were nine incidental questions presented with salient formal features, 10 incidental questions presented with nonsalient features, 20 central questions presented with salient features, and 21 central questions presented with nonsalient features

The 60 items were arranged in three books of 20 questions each The order of presentation was counterbalanced across subjects Questions were presented with a relevant still frame photo, taken directly from the show, and two possible verbal responses Thus, each of the 60 questions consisted of a picture, a question, and two responses An experimenter read each question aloud, pointing to the A and B alternatives Older children individually circled an A or B response on an answer sheet, while younger children pointed to a red A or a blue B, and the experimenter recorded the response Forty questions were presented immediately after viewing, the remaining 20 questions were asked after a 20-min delay [2]

Results

Attention

An earlier analysis (Watkins, Note 2) had demonstrated no significant age differences in total attention to the program On the average, children looked at the screen during 37% of the program The attention scores in the present study were designed to reflect the percent of time that the child attended during the presence of each formal feature—*not* to index total time of looking at the screen For each formal feature, the index of selective attention was the proportion of time the child spent looking at the screen during the presence of each feature as compared with the proportion of time spent looking when the feature was absent

Analyses of attention to each of 10 formal features within the program were performed to assess developmental differences in children's visual attention to salient and nonsalient features Analyses of variance were performed on the selective attention scores for each feature, using age (2) × sex (2) × condition (3) × pairs (64) as between-subjects independent variables, and feature presence/absence (2) as a repeated-measure variable The main effect of feature presence indicated whether a feature was related to selective attention The interaction of age with feature presence indicated age differences in responsivity to features Attention scores were computed for individual subjects, but pairs were used as the unit of analysis [3]

Feature presence —Overall, salient features had positive effects on children's attention Children attended significantly more in the presence than in the absence of rapid character action, $F(1,52) = 20\ 50$, $p < 001$, moderate character action, $F(1,52) = 12\ 39$, $p < 01$, vocalizations, $F(1,52) = 43\ 33$, $p < 001$, sound effects, $F(1,52) = 15\ 87$, $p < 001$, pans, $F(1,52) = 15\ 89$, $p < 001$, and visual special effects, $F(1,52) = 16\ 07$, $p < 001$ By contrast, attention was significantly lower in the presence of music, $F(1,52) = 6\ 11$, $p < 05$, or zooms, $F(1,52) = 8\ 64$, $p < 01$, than in their absence Nonsalient features produced variable effects on children's attention Children attended more in the presence than in the absence of child dialogue, $F(1,52) = 15\ 06$, $p < 001$, but they attended less when adult narration, $F(1,52) = 21\ 96$, $p < 001$, was present than when it was absent

Age differences in attention to features — It was expected that young children would be more attentive than older children to salient features and that older children would be more attentive to nonsalient features, particularly those features that were likely to carry plot information This prediction received minimal support For two of the salient features—music, $F(1,52) = 4\ 86$, $p < 05$, and zooms, $F(1,52) = 9\ 91$, $p < 01$—young children were more attentive than were older children However, the effect takes the form of suppression of attention to these features among older children As predicted, younger children were more re-

[2] In an earlier analysis, immediate recall and delayed recall were compared The major findings reported in the present paper were not qualified by an interaction with delay of posttest Other effects of delay are reported in Calvert and Watkins (Note 1)

[3] Pairs were used as the unit of analysis for the attention scores because the attention patterns of children viewing together were related For the comprehension analysis and the multiple regressions, individuals were the unit of analysis because the comprehension scores of children viewing together were not significantly correlated

sponsive to rapid character action than were older children, but the interaction of age × feature presence was of borderline significance, $F(1,52) = 3\,07$, $p < 10$ For one salient feature—moderate character action, $F(1,52) = 9\,91$, $p < 01$—older children were more responsive than were younger children There were no significant age differences in attention to vocalizations, sound effects, pans, and visual special effects

The prediction that older children would be more responsive than younger children to nonsalient features (i e , speech) was supported at borderline levels of significance only for adult narration Adult narration was negatively related to attention, but more so for younger children, $F(1,52) = 3\,40$, $p < 10$

Comprehension

Each subject received four comprehension scores, representing central or incidental content presented with formal features of high or low salience Item analyses were conducted, separately by age group, on the original 60 items Three items were eliminated because of low correlations with subscale totals Two of the items eliminated contained central questions presented with salient features, the third item contained incidental content presented with nonsalient features

Subjects' comprehension scores were proportions, that is, the total number correct divided by the number of questions in the category Arcsine transformations were performed to normalize the distributions A 2 (age) × 2 (sex) × 3 (condition) × 2 (content type) × 2 (mode of presentation) mixed analysis of variance was performed on the transformed scores Age, sex, and condition were between-groups factors, content type (central or incidental) and mode of presentation (salient or nonsalient) were repeated measures Tukey's Protected t Tests were used for post hoc, pairwise comparisons, given a significant F

Effects of formal feature salience—There was a significant main effect of feature salience, $F(1,116) = 10\,98$, $p < 01$, and a significant interaction of feature salience × content type, $F(1,116) = 46\,59$, $p < 001$ The means for each age group are shown in figure 1 The pattern of scores is comparable for the two age groups Central content presented with salient formal features was better recalled at both age levels than was central content presented with nonsalient features This difference was significant for both age groups Salient features were associated with better recall of central but not incidental information Contrary to prediction, recall of incidental content presented with nonsalient forms was significantly better than recall of incidental content presented with salient forms

Highly salient features were expected to aid younger children's comprehension more than that of older children The interaction of feature salience × age only approached significance, $F(1,116) = 3\,43$, $p < 07$ The main effect of age was highly significant, $F(1,116) = 341\,95$, $p < 001$ As expected, the difference in comprehension between high and low salience was larger for the younger than for the

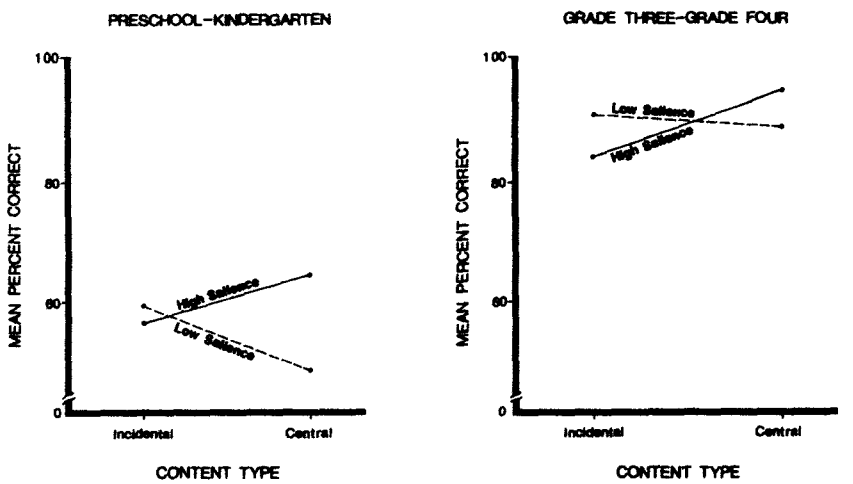

FIG 1—Mean proportion correct on comprehension test as a function of feature salience and content centrality

older children The three-way interaction of feature salience × content type × age was not significant, and inspection of figure 1 suggests that high salience was associated with the comprehension of *central* content for both age groups Older children understood incidental content presented with low salience features better than that presented with high salience features, for young children, feature salience made little difference in comprehension of incidental content

As in previous studies, there was an interaction of age × centrality, $F(1,116) = 8\,77$, $p < 01$ Older children were more selective in recall of central over incidental information than were younger children Overall, younger children recalled incidental content better than central content, whereas older children recalled central better than incidental content

Selective Attention as a Predictor of Comprehension

One reason for children's better comprehension of central content presented in salient forms as opposed to nonsalient forms may be the attention-holding power of salient formal features As a test of this hypothesis, an index of each child's *net attention* to each formal feature was computed That index was the difference between attention during the feature and during its absence For example, a child's net attention score to child dialogue was the percent of attention during child dialogue minus the percent of attention during portions of the program without child dialogue It was expected that attention to salient features would predict comprehension of content associated with such features, and attention to nonsalient features would predict comprehension of content associated with those features Correlations of these net attention scores with the four comprehension categories were calculated separately for each age group Then net attention scores were used to predict comprehension scores in a multiple-regression analysis The predictors were net attention to rapid character action, moderate character action, vocalizations, sound effects, music, zooms, child dialogue, and adult narration The results of the correlation and regression analyses appear in table 1

The correlational patterns and multiple-regression results indicated that net attention patterns predicted incidental better than central comprehension and comprehension of content presented with salient features better than content presented with nonsalient features Comprehension of central content presented with nonsalient features was not significantly correlated with attention to any of the formal features

For both age groups, net attention to child dialogue and vocalizations was correlated with comprehension patterns Though the features associated with comprehension were somewhat

TABLE 1

ZERO-ORDER CORRELATIONS OF NET ATTENTION SCORES WITH COMPREHENSION SCORES FOR FOUR COMPREHENSION CATEGORIES BY AGE GROUP

NET ATTENTION TO FORMAL FEATURE	COMPREHENSION OF CONTENT PRESENTED BY							
	Salient Forms				Nonsalient Forms			
	Central		Incidental		Central		Incidental	
	Young	Old	Young	Old	Young	Old	Young	Old
Rapid character action	− 10	− 12	− 14	− 16	20	20	10	− 24
Vocalizations	28[a]*	28*	51[a]**	15	16	00	30*	21
Sound effects	07	− 01	35[b]*	18	05	17	21	− 06
Visual special effects	06	02	06	13	− 10	− 25	10	01
Pans	− 22	02	− 03	− 24	07	07	− 19	− 16
Zooms	− 15	− 37[a]**	− 12	− 25*	− 18	− 07	05	− 18
Music	− 20	− 23	− 04	− 01[b]	− 15	07	− 15	− 18
Moderate character action	− 15	24	18	21	− 23	− 14	06	− 03
Child dialogue	22	33*	36**	26[a]*	− 16	− 05	31*	31[a]*
Adult narration	− 12	09	− 33*	− 14	− 05	08	− 38[a]**	10
Proportion of variance (R^2)	8%	14%	31%	21%	0%	0%	15%	10%

[a] Variables with this superscript entered the multiple-regression equation as the first predictor of comprehension at $p < 05$

[b] Variables with this superscript entered the multiple-regression equation as the second predictor of comprehension at $p < 05$

* $p < 05$

** $p < 01$

similar for both age groups, there were developmental differences in the best comprehension predictors in the multiple-regression analyses In particular, attention to child dialogue—a nonsalient feature—best predicted older children's comprehension, while attention to vocalizations and sound effects—salient auditory features—best predicted younger children's comprehension Inattention to camera zooms was associated with better comprehension of salient categories for older children, whereas inattention to adult narration was associated with better comprehension for younger children For older children, attention to music entered the regression equation as a positive predictor for comprehension of incidental content presented with salient formal features, after child dialogue was partialed out

Discussion

Overall, the most striking aspect of the age comparisons was the similarity rather than the differences in attention patterns to formal features Children of both ages attended to rapid character action, moderate character action, vocalizations, sound effects, visual special effects, pans, and child dialogue They were selectively inattentive to music, zooms, and adult narration There were trends in attention patterns ($p < 10$) which indicated that younger children attended slightly more to rapid character action and less to adult narration than did older children Although younger children attended more to music and zooms than did older children, this difference reflects older children's inattention to these features Thus, the developmental hypothesis about differential responsiveness to features received minimal support

The lack of developmental differences in attention to salient features may be due to the fact that such features were used in this production to carry important content Thus, older children may attend to salient features when they are informative This interpretation is supported in the comprehension data where there were no developmental differences in recall as a function of salience, instead, children of both age groups understood central content well when it was presented with salient features Thus, children's attention and comprehension appear to benefit from feature salience through middle childhood, at least when such features emphasize important content

Child dialogue held the attention of both age groups, while adult narration lost their attention, as found by Anderson and Levin (1976) The adult narration in this program was dissociated from the story in both time and setting It was probably difficult to comprehend because it contained abstract metaphors with few concrete visual cues to accompany its verbal content These attentional patterns are consistent with the finding of Anderson, Lorch, Field, and Sanders (1981) that children attend more to speech about observable events than to speech whose referent is removed in time and place

One of the stronger developmental differences in attention was older children's preference for moderate character action Moderate character action is often used in educational programming and in programs with complex plots, while rapid action is primarily associated with cartoons (Huston et al 1981) Though attention to moderate or rapid action did not predict comprehension, items associated with these action levels were better understood than were those associated with low action levels

The second developmental hypothesis was that young children would recall content presented with salient features better than content presented with nonsalient features Central information was recalled better by both age groups when content was conveyed through a salient presentation, and this difference was slightly larger for the younger children This relationship was not due to differences in cognitive complexity of the content Central content associated with salient features was as abstract and inferential as the central content associated with nonsalient features Both types of presentation contained dialogue, but the high salience presentations also contained action Thus, the better comprehension of the highly salient presentations may be partially due to dual modes of representing information (Friedlander, Wetstone, & Scott 1974) Processing abstract, central content may be more difficult when it is presented only through speech than when its message is also visually emphasized with a salient feature like action

Incidental content associated with nonsalient features, however, was understood at least as well and sometimes better than incidental content presented with salient features The incidental low salience items were often puns or jokes, which may be especially interesting to young children One reason that feature salience was not associated with better comprehension of incidental content may be that child dialogue did not co-occur with high action for some of the incidental items Thus,

action or visual presentation alone may not be sufficient to insure comprehension but may call attention to contiguous content presented via child dialogue

The analyses of attentional patterns provide information relevant to the relation between attention and comprehension Salient forms could aid comprehension by drawing attention to important contiguous content and by providing a representational form that children readily encode The findings for younger children suggest that salient features were most important for drawing the child's attention to relevant content Young children gained information primarily from attention to nonverbal auditory features, in particular, vocalizations and sound effects apparently called attention to central child dialogue, thereby aiding the comprehension process Attention to visual features, on the other hand, was not significantly related to comprehension, again suggesting that visual modes of representation alone are not sufficient for comprehension It appears that children could comprehend verbal modes of representation when aids to selection were present The difference between younger and older children apparently reflects the growth of the ability to select content for encoding as well as the ability to comprehend or use verbal symbolic information once it is attended to Though young children gained information from child dialogue, adult narration was neither worthy of attention nor informative In fact, young children who attended to this feature were less likely to understand the story than were those who ignored it

Older children also appear to use salient features as guides to central content, but they have more skill in selecting features that provide information in symbolic forms as well Older children gained information primarily from attention during child dialogue and vocalizations and from inattention to camera zooms Salomon's work (1979) suggests that zooms can supplant certain cognitive operations, but for sophisticated viewers, such supplanting can hinder comprehension Thus, inattention to camera zooms may indicate well-developed viewing skills and a relatively mature pattern of selective attention

For both age groups, attentional patterns predicted comprehension of incidental better than central content Incidental content is easier to understand than central, presumably because it is generally concrete, discrete, and factual, by contrast, central content comprehension more often requires temporally integrated processing and inferences about implicit story events (Collins et al 1978) Because the incidental content was well within the cognitive capacities of both age groups studied, variations in selective attention may have contributed more to differences in incidental than in central comprehension Thus, as suggested by Collins (Note 3), comprehension of central content may be limited by the cognitive capacities of children and may require particular skills for processing once the child has attended to the information

Attention patterns also predicted comprehension of content presented with salient features better than content associated with nonsalient features One reason may be that content associated with nonsalient features was usually conveyed verbally and was, therefore, less dependent on visual attention Content presented with salient features involved visual presentation, so its comprehension may have depended more on a child's pattern of looking at the television set

In summary, the findings of the study support the hypothesis that salient formal features marked central content for processing For young children, salient auditory forms—vocalizations and sound effects—called attention to central child dialogue, a symbolic nonsalient feature that they could understand Older children not only selected important dialogue for attention and processing but also ignored camera zooms All children understood central verbal content better when it was presented with salient forms, perhaps because visual action provided opportunities for both iconic and symbolic encoding of content, and because key verbal information was signaled with salient auditory features The selective use of formal features in the production of educational and prosocial children's programs could thus facilitate children's information extraction, thereby enhancing their learning of constructive messages from the medium that pervades their daily lives

Reference Notes

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