

Children's understanding of television depends on two factors: their growing independence from its sensory demands and their increasing familiarity with its formal features of production.

Children's Understanding of the Forms of Television

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This chapter is concerned with children's cognitive development in relation to the information-processing skills used in the course of viewing television. We proceed from one fact and two premises. The fact is that children in America devote more time to watching television than to any other single waking activity. The premises are (1) that television viewing is an intellectually *active* pastime for children, one that involves many, if not all, of their developing intellectual skills, and (2) television as a medium of communication has its own *structure* of forms, formats, and codes for presenting information, a structure that can either facilitate or interfere with children's understanding, depending upon the child's mastery of those codes.

In view of the time children devote to watching television and its prominence within our culture, it would be inconceivable that children's cognitive skills were not applied to, and affected by, the medium. In short, there must be some truth in McLuhan's (1964) speculation that a generation of people

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devoted to a particular medium will come to represent their own knowledge in ways that to some degree reflect the forms, images, and codes of that medium.

In studying the interrelationship of television and cognitive development, three sets of questions have been paramount. First, what are the formal features of television production, measured independently of content, and how are they used to create a syntax of televised communication? Second, how are the formal features of a program related to the interest, viewership, and especially attention that children devote to such a program? Third, how do the forms of television and attention to them determine, support, or elicit different levels of comprehension and understanding in relation to the child's level of cognitive development and her cumulative history of experience with the medium? The focus of our analysis is fundamentally developmental: We seek to formulate and test a model of the processes by which children come to know and understand the medium and its messages.

Formal Features: The Production Techniques and Conventions of Broadcasting

Television consists of moving pictures with sound (words and music) used to tell a story or transmit other forms of information. As those who write, produce, and edit television know, strong production conventions are invoked to arrange the structure of this audio-visual sequence to achieve effective communication. For this reason, we can consider the forms and formats of television with an approach similar to that used by linguists with reference to the rule-governed structure of language. That is, we can attempt to unravel its formal rules, or syntax, and investigate how the syntax will be exploited in the encoding or decoding of the meaningful content or semantics. Separating form from content is a critical analytic exercise if we are to understand both what the medium transmits and what the viewer must understand in order to make sense of the communication. But, as with the separation of syntax from semantics in linguistic analyses, the two must then be resynthesized to appreciate what the receivers comprehend of the content at various levels of understanding and how their understanding develops.

What distinctive production features are used to create televised events? We previously have reported some twenty-five categories of formal features used in television production, each of whose frequencies and durations on the screen can be reliably quantified. By their patterns of cooccurrence across many different programs, single features have been grouped into clusters that constitute a taxonomy of television forms (see Huston and others, forthcoming). These clusters are used in distinctive ways in programs designed for children. Commercially produced children's programming, much of which

is animated, is characterized by rapid action (physical movement of characters), rapid pace (changes of scene and character), and variation of settings. These molar features are accompanied, at a molecular level, by such auditory and visual techniques as sound effects, loud music, visual special effects, and rapid cuts. This package of features combines rapid change, unusual and unexpected perceptual events, and sensory bombardment—sometimes called simply *hype*.

Two other clusters of features emerged from our analysis, and each has distinctive patterns of occurrence. The first is *speech* by adults, children, and nonhumans. Though television is often described as a visual medium, its verbal components are essential; speech often carries much of the information about plot and other aspects of content. The second cluster, which we label *reflection*, consists of long zooms, singing, and moderate levels of character action. These features are used frequently in educational shows for children, and while they may seem to be unrelated, each serves to repeat, rehearse, or elaborate content themes, hence the label *reflection*. Thus, zooms and moderate action present information in a visual, nonverbal form easily understood by children; singing contains rhythm, rhyme, and repetition—verbal forms that are readily encoded and recalled (see Huston and others, forthcoming).

The formal features used in children's television suggest that a model of the developing child lurks somewhere in the minds of producers. While educational programs such as "Sesame Street" differ from commercial, Saturday morning shows, both types of programs contain *variability*, frequent changes of scenes, and unusual visual and auditory perceptual devices. Programs for older children and family viewing rely more heavily on adult speech and relatively inconspicuous forms of visual change. The model of child development implicit in these contrasting sets of production features may be roughly accurate. However, given the ubiquity of television viewing among American children, certain features may also create to some degree the developmental pattern assumed. In either case, this rough model provides a starting point for analysis of developmental changes in children's attention to and comprehension of television forms.

Developmental Issues

Passive versus Active Viewing

While both passive and active viewing occur at all ages, we believe there is a progressive shift with age and viewing experience from relatively passive, momentary enjoyment of the sights and sounds of television (as perceptually gratifying stimulation) toward active processing (Wright, Watkins,

and Huston-Stein, forthcoming). By active processing we mean identifying and recording formal features and bits of content in relation to world-, media-, series-, or program-specific knowledge gained from prior viewing and immediate cues derived from both form and content.

Passive viewing differs from active viewing as a consequence of the viewer's motivation and cognitive competence as well as the form and content of the program. If the viewer either is insufficiently interested or cognitively incapable of understanding the more complex, abstract, and inference-based messages in the presentation, or if the program itself is either very simple or highly familiar, then the viewing will tend to be passive. In this case, what little processing there is will take the form of recognition, involving little temporal or logical integration. The satisfaction in viewing is at a consummatory level.

By active viewing, on the other hand, we do not mean to imply a child deeply involved in the intellectual work of story analysis and critical interpretation. Most of children's television viewing takes place in the context of seeking entertainment: There is little intent to learn, and any learning that does take place is, by definition, more incidental than intentional. What we do mean is that the child, to a certain extent, will be caught up in the active information processing necessary for "getting it." Three factors are determinative here: (1) the child's knowledge base regarding the world, the medium, and the program; (2) the ability to exploit that knowledge base by forming hypotheses and making inferences about what is happening; and (3) the degree to which events on the screen provide minimally challenging, yet potentially integratable additions to what is already known.

Our first hypothesis, then, is that with age there is a greater range of televised presentations that elicit active viewing. This change results from increases in the child's world- and television-knowledge base, as well as basic cognitive development, which, taken together, expand the number and variety of programs that are minimally familiar and comprehensible. Corresponding changes in the child's motivation for viewing, with consequent increases in the form and content complexity of what she chooses to watch, also contribute to this developmental advance.

Saliency versus Informativeness of Features

The formal features used to present the content of any particular program can be evaluated separately for their perceptual saliency and their informativeness in context. Without regard to the meaning conveyed, features can be ordered as sensory events in terms of their immediately manifest perceptual contrasts with what has gone before or what is expected. Using Berlyne's

(1960) terms, we can define as perceptually salient those events that involve high intensity, sharp contrast, sudden change, movement, novelty, incongruity, or surprise. Nonhuman speech, special effects, high levels of action, and pace are examples of perceptually salient features. On the other hand, without regard to its perceptual salience, a formal feature is informative when it advances the plot, resolves uncertainty, marks a break or turning point in content, or otherwise signals the viewer that critical content is or will be presented. While salience is largely a perceptible property of the features themselves, informativeness depends in part upon the context and the viewer. For example, human speech and scene changes are almost always informative; a moderate level of action often is.

While salient features may or may not be informative and may or may not be processed in depth, their very salience provides direct satisfaction and enjoyment to the viewer. Informativeness, by contrast, is a meaningful property only to the viewer who is actively seeking to understand the content at a level of processing beyond superficial perceptual enjoyment. To appreciate features for their informativeness, the viewer must be able to encode content, form hypotheses, and develop a context of expectations.

Accordingly, our second developmental hypothesis is as follows: Cognitive development and accumulated viewing experience should shift interest from perceptually salient events toward those features that convey or signal potentially informative messages regardless of their salience. The developmental progression has been described as leading from exploration to search (Wright and Vlietstra, 1975). As is the case with active versus passive viewing, both exploration and search occur at any degree of program complexity and at any age, cognitive stage, or level of viewing experience. But due to habituation processes over time, interest in perceptually salient features tends to decline unless they are also reliable signals of critical information. With advances in both the child's knowledge base and her information-processing skills, informative features set the occasions for deeper processing by marking the moments when critical content is being presented.

Levels of Processing

The third developmental hypothesis, growing out of the second, is based on general principles of cognitive development. Put briefly, we expect an increment with age in the depth with which content is processed. In documenting this hypothesized trend, Collins and his colleagues (1978) have shown that deeper processing can include two important kinds of inferences about content. One is the filling of gaps where the child supplies from her own knowledge certain content that is implied but not shown. A child is shown looking

longingly into the window of an ice cream store and immediately thereafter is shown walking happily down the street licking her fingertips. The inference is made that in the time period not shown she has consumed a treat. The second type of inference about content is the viewer's induction of the likely feelings and motives that would account for characters' behavior.

Knowledge of the rules and conventions of production may prove essential to the child's attempts to go beyond and to integrate what is explicitly shown. For example, a dissolve between two scenes, such as the dissolve in the ice cream store example, suggests to the sophisticated television or film viewer that a change in time and/or place has occurred, thus signalling a need to consider what may have occurred in the interim. A dissolve between scenes may be more helpful than a cut to the viewer's inference, but only if the viewer knows the convention.

Formal features can also serve to tell an experienced viewer whether one bit of a program is a new ministory that need not be integrated with what precedes or follows it or whether, instead, it is part of a continuing story whose comprehension will require the recall of previously presented material. Thus, formal features such as separators, commercials, changes in animation and the like come to signal the level of processing that will be needed for comprehension, but of course these can be used only if the viewer knows the convention.

Empirical Investigations

In one effort to secure information on these developmental issues, we examined the formal features of sixty-four television programs and then predicted which programs would attract national viewing audiences of different ages. We found a consistent pattern whereby programs high in salient formal features (for example, the action-cluster) were most popular among preschool viewers and declined in popularity as the viewers' age increased. Older viewers preferred programs high in human dialogue (Wright and others, 1980).

While such large-scale surveys can provide preliminary support for our salience hypothesis, more controlled laboratory studies are preferable for determining the ways in which television's formal features may affect momentary attention, comprehension, and recall of content. Accordingly, we have studied five- to ten-year-old children in our laboratory, where we can observe at close range their attention to and comprehension of children's programs and commercials.

Typically our approach has been to show edited versions of selected broadcast programs to pairs of children in laboratory conditions designed both to stimulate naturalistic viewing situations and to permit continuous recording of visual attention to the television monitor and subsequent testing of compre-

hension of content. Typically the viewing situation contains toys, games, and drawing materials, and the children are permitted to play, talk, and watch TV or not, as they choose.

Story retelling, multiple choice questions, and temporal seriation of still photos taken from the program have all been used as indices of comprehension and recall. Age and home viewing reports have thus far served as indices of cognitive development and viewing experience. To date, attention measures have been limited to the child's visual fixation of the screen. We are currently developing a measure of auditory attention.

Attention and Comprehension

Two basic arguments have been advanced concerning the relationship between attention and comprehension in children's processing of television, and there is good evidence in support of each. The first argument holds that visual attention indexes general attentiveness and concentration, minimal levels of which are necessary for comprehension. Above some minimal level of attention necessary for access to content, however, the contribution of attention to understanding is not so clear. Lorch, Anderson, and Levin (1979), for example, found that experimentally induced attention did not increase comprehension as indexed by recall for groups so treated. However, within the treatment groups, comprehension was correlated with the total amount of attention during an hour-long program.

Accordingly, Anderson and his colleagues (1981) advance an alternative argument—that comprehension is primarily a function of the material presented, that comprehensibility is readily discriminated by young viewers, and that their attention is controlled by perceived comprehensibility of content. In a series of studies, these investigators demonstrated that experimental reduction of comprehensibility, such as running the sound track backwards, sharply reduces the visual attention of child viewers in the laboratory.

Both attention and comprehension are multiply determined, however, and, while failure to understand may lose a child's attention, comprehensibility alone will not guarantee it. Moreover, regardless of the determinants of attention, an item of critical information that is never attended to simply will not be available for recall.

Our levels of processing hypothesis clearly predicts that, with increasing cognitive skill and viewing experience, an ever greater proportion of what a child understands will stem from inferences based on prior knowledge, while a decreasing proportion will rely on explicit input. Furthermore, children become increasingly able to make decisions based on minimal signals (and eventually on metacognitive judgments) about which information is worth

attending to relative to the degree of comprehension one is seeking. Thus a series of concurrent developmental changes is likely, anchored in: (1) an expanding knowledge base (including media literacy), (2) evolving interests, and (3) growing processing abilities. Taken together, these factors increase: (4) the selectivity of attention, (5) its growing independence from perceptual salience, and (6) its evolving control by the child. Momentary decisions to attend and to process are based in turn on the comprehensibility, informativeness, relevance, and interest of the material in relation to the nature and depth of the child's viewing involvement. Each of these sets of variables can affect each of the others, so that while each single link must be confirmed separately, the integrated system must eventually be studied operating as a whole within the world. Accordingly, we must consider determinants of attention and comprehension separately before turning to the analysis of their interaction.

The Determinants of Visual Attention

In the viewing situation, where an externally controlled stream of stimulation proceeds at its own pace, the viewer experiences the paradox of attention: How can one even decide whether a stimulus is worthy of attention without first attending enough to determine whether its content is comprehensible, entertaining, relevant, or otherwise deserving of attention? And what is the balance of control between the viewer's decision to watch and the powerful capacity for certain classes of stimuli to demand attention and to override the viewer's choice?

The inertia of attention (or inattention) to television has been demonstrated by Anderson and his colleagues (1979): The longer one has been looking (or not looking), the more likely that same pattern is to continue. Once the decision to look or not to look has been made, it is as though the person continues without a choice. However, changes in attention are most likely at certain nodes in the program. For example, commercial breaks, scene changes, and bit changes, all of which are marked by formal features, provide obvious decision points about whether to start or to stop looking. Between nodes, because of inertia, the viewer continues doing what she has been doing unless there is a distractor in the external environment (Anderson and others, 1979; Wright, Watkins, and Huston-Stein, forthcoming).

Our own research and that of others has clearly demonstrated the power of certain classes of televised stimuli to recruit, maintain, or suppress attention. Younger children (four- to six-year-olds) appear to be susceptible to the attention-arousing effects of television's salient features, especially high speed character movement, special effects not seen in the real world, loud music, sound effects, vocalizations, and nonhuman speech. If a child is

already looking, such features maintain her regard more consistently than do nonsalient features. If not, salient auditory features are more likely to recruit a look than are nonsalient features (Rice, Huston, and Wright, forthcoming). For older children some of these attention-demanding effects occur too, and any developmental hypothesis needs to take this into account. Conversely, certain features such as long zooms and music appear to terminate attention. These attention-suppressing effects are stronger with older than with younger children, suggesting that the older children have learned when *not* to look (Calvert and others, 1981).

Why should certain salient features continue to maintain attention, even for reasonably mature children, while others elicit inattention? One reason may be that some salient features are often used in ways that are informative or are associated with interesting, entertaining content. Another reason might be that salience is multidimensional; children's interest in some features is likely to wane over time, while habituation to other features is less likely. Those features that maintain attention for both younger and older children—vocalizations, sound effects, special visual effects, and pans—are salient by virtue of their novelty, contrast, and incongruity. Because they are used relatively infrequently and/or with high variability, even older children may not be habituated to them and therefore may be subject to their power to demand attention. The salient features that fail to maintain attention for older children—rapid action, zooms, and music—are salient by virtue of more absolute perceptual qualities such as movement and intensity. In addition, they are used frequently and, across occurrences, are probably more homogeneous in content. Thus, they may be more likely to create habituation and satiation effects.

Returning now to the basic issue of attention, we seek to determine how attention is controlled in the intervals between the excitement and suppression of attention. We propose that, in an otherwise inertial system, there is a second set of moments when attention can change, where a decision is likely. Unlike the first set, the proposed attention choice points are not determined simply by stimulus events such as salience and habituation. Instead, they involve events that contrast with the viewer's knowledge and expectations about the program, what has happened so far, and what is likely to happen. Such events are by definition informative. Assuming the child is attending when they occur, their effect on attention depends on two subfactors: the level of processing currently in progress and the magnitude of discrepancy, change, contrast, or new information they convey. We next consider how each of these subfactors may influence attention.

Level of Processing. The level of processing is perhaps best indexed by the time span within which the child must attempt to integrate content with what

is shown earlier and later and with what she knows and expects. Of particular interest are the information-processing demands of the program itself and the discriminable signals of those demands that allow a skilled viewer to decide how much content integration is called for. Consider a simple case—the bit-change boundary. A bit change, equivalent to a chapter break in a story, is a switch to a commercial, preview, station break, new program, or to a new segment within a magazine format program like the news or “Sesame Street.” At bit-change boundaries, attention is momentarily increased, and there is even some evidence that children can tell when a bit change is about to occur (Greer and others, 1981b).

In a magazine format, the size of the temporal chunks of information requiring integration is small, not crossing bit boundaries. In story format, however, the scenes and chapters do require temporal integration across these boundaries, thereby demanding a deeper level of processing. Evidence from a study in progress at our center (CRITC) indicates that both continuity of content (story = high; magazine = low) and its pace (rate of scene and character changes) influence attention. Pace proves more important for younger viewers, while continuity is more important for older ones. Our tentative interpretation of this finding is that younger viewers especially respond to concrete changes in what is heard and seen. Older viewers, by contrast, use their knowledge of format continuity (story versus magazine) to determine the level of processing demanded.

Magnitude of Contrast. We propose that the magnitude of contrast, change, or discrepancy between what the viewer understands and what the program is saying bears a hump-shaped curvilinear relationship to the likelihood of continuing attention. Content that is familiar, redundant, incidental, or irrelevant does not produce sufficient informational discrepancy to cause an attentional choice point. Inertial attention may continue, but no attentional decision is required. Quite similarly, content that is too discrepant, contradictory, or incomprehensible with respect to the child's knowledge store and level of processing, while sufficiently discrepant to require an attentional decision, is also likely to result in a decision not to attend. As Anderson and his colleagues have demonstrated (1979, 1981), children learn to ignore content that is incomprehensible. [Thus, moderately contrasting content (that is, sufficiently discrepant to precipitate an attentional choice point but not so discrepant as to be incomprehensible) is the only kind that will lead to a decision to attend.

Returning to the paradox of attention, we pose the following question: Once an attentional choice point is reached, on what evidence is the decision based? We propose that children learn to use formal features (and stereotyped bits of content) as signals of the comprehensibility, interest value, and infor-

mativeness of forthcoming content. In other words, the forms and content being presented at a choice point are sampled and analyzed for cues as to comprehensibility and informativeness, in relation to what the child is trying to understand and to her interest and involvement in the program. In order to yield a decision to attend, the cues must indicate that content will achieve at least a minimal level both of informativeness and comprehensibility, as well as entertainment. Otherwise attention is likely to cease.

The Determinants of Comprehension

In addition to serving as signals of which content warrants close attention and in-depth processing, television's formal features also facilitate children's comprehension in two ways: as structural markers and as conveyors of connotative or contextual meanings.

Features as Markers of Structure. Experienced film and television viewers know how to parse the material shown. For example, while cuts are used to signal a change of speaker or a new viewing angle, dissolves indicate a change of time and/or place. Other examples abound. In Saturday morning cartoons, brief, stylized graphics called *separators* are used increasingly to mark the boundaries of commercials and are intended to facilitate the child's discrimination of the story from the ads. The long zoom-in tells the experienced viewer to bear in mind the whole, while focusing on a critical part thereof (Salomon, 1979), just as the long zoom-out serves to remind the viewer of the context in which the action has been taking place. The superimposition of print on the screen conveys the beginning or end of a program. Applause, too, often signals the end, while music and silence frequently communicate change in mood or tone.

All these examples of segmental boundary markers differ from those encountered in other media and in real life. They are the synthetic devices whose conventions define the rule-governed system that an experienced viewer must master in order to understand television. Thus, an adult familiar with live football but not with televised games may be confused by the continuous shifting between live-action and instant replay. As one would expect, younger viewers are not proficient in using these segmental markers effectively. In the series, "Fat Albert and the Cosby Kids," the story shifts periodically from its animated plot to live shots of Bill Cosby, who comments on the themes and lessons conveyed by the cartoon. Young viewers respond to the shift as they would to a commercial or station break; for them the story has stopped for a while, as has their attention and processing (Calvert and others, 1981); Palmer and McDowell (1979) found that for preliterate viewers commercial separators not only fail to mark the break between programs and com-

mercials, but may actually mediate a stronger connection between the two, forming a confusing bridge instead of clarifying a boundary.

Perhaps the best analysis of how children master the features marking the structure of television can be found in the work of Salomon (1979). His work has shown that for a child who lacks the required mental skills, production features (such as a zoom to close-up shot) can carry out a transformation for the child. Young children, who are still not capable of carrying out the operation mentally, can comprehend this technique when cued by the simpler convention of a cut to close-up. Older, more experienced viewers can carry out the mental operation of considering a part of the whole when cued by a cut to close-up; they do not need, and may even be confused by, the zoom.

We have demonstrated that an adult who sits with the child and makes interpretive comments during a program can enhance both selective attention and comprehension in the viewer (Watkins and others, 1980). A study in progress at CRITC introduces a magical seer who periodically presents selected previews of portions of the story yet to come, calling attention to critical events and highlights. [This form of production should enhance the young viewer's comprehension by providing in advance an organizing structure within which to interpret the subsequent events. In effect, it is a production technique that supplies a story script or schema to the child who otherwise may not have one. If Salomon's hypothesis is correct, however, the device should prove effective only with the younger or less experienced viewer and could even produce interference or distraction for viewers who do not need it.

Features as Conveyors of Contextual Meaning. Just as formal features segment the stream of television and signal the kinds of processing required for comprehension, they may also convey connotative meanings. Features can mobilize the child's generic knowledge base by invoking cultural or universal symbols to suggest moods, feelings, and the like. In the production of "Sesame Street," for example, music is categorized not only in general terms of joyful, pensive, anxious, and so forth but also with such specific descriptors as "sneaking-up-on-you music" (Lesser, 1974). Our own preliminary analyses indicate that auditory features play a significant part in alerting the viewer to the reality level of a presentation. For example, realistic fiction has studio quality sound, music, and dramatic actors' voices, while nonfiction documentaries have background noise, longer periods of silence, and more frequent use of an unseen narrator. In order to convey their intended meaning, however, these features depend heavily on the viewer's media-specific knowledge.

A more established example of the connotative meaning conveyed by formal features is that of sex-typing in children's commercials. In an initial study we established that television commercials for sex-typed toys differed in their use of formal features (Welch and others, 1979). Compared with sex-

neutral commercials, those for girls' toys contained more fades, dissolves, and background music, whereas those for boys had high levels of inanimate (toy) action, varied scenes, frequent cuts, sound effects, and loud music.

Subsequent research examined children's understanding of the sex-typed connotations of formal features, independent of content (Greer and others, 1981a). Even when an advertised product was neutral, children from ages five to twelve tended to base their judgments of sex-typing on content cues such as number of boys and girls shown or sex of narrator. To obtain children's judgments about commercial forms, three different procedures were used. In one, the children were shown real commercials for neutral products and told to pay special attention to music or camera techniques when making their judgments. All ages performed significantly better than chance at identifying whether the commercial form would be better for a boys' or a girls' toy. Even stronger effects were obtained with the two other methods of obtaining content-free judgments. One involved a hypothetical description of formal features (for example, lots of movement, soft music) instead of a TV presentation. Again discrimination occurred at all ages. In the third procedure, abstract moving shapes and instrumental music provided the content of a set of pseudocommercials produced to differ systematically on formal features. Again, all age groups made better than chance judgments, but the older children outperformed the younger ones. Thus, we may conclude that, while connotative meanings can be grasped in part at an early age, refinements in this form of understanding await further advances in cognitive growth.

The Relation Between Attention and Comprehension

Having outlined the role of formal features in the development of attention and comprehension separately, our remaining task is to analyze their interaction. There can be little doubt that attention and comprehension tend to correlate, but to untangle their causal interrelationship is a major enterprise on which we can make but a start here. So far we have established that, while fluctuating motives and interest levels are critical, most viewers are seeking at some level to understand what they view. Moreover, they attend to content that adds to or advances a plot and informs their momentary understanding and expectations. We also have established the external power of perceptually salient stimuli to demand or suppress attention, as well as the power of format features to provide temporal structure and contextual cues for interpreting the format's meaning.

Two additional questions emerge from our work: Can the occurrence of salient, attention-demanding cues enhance comprehension? Does the child's growing ability to discriminate maximally informative content on the basis of

formal features in turn influence selective attention toward more efficient information pick-up, leading to more effective comprehension and recall? So far our findings support a tentative yes to both questions.

In one study (Calvert and others, 1981), children who saw an animated story were tested for their comprehension of plot-relevant (central) and incidental content. Each item on the comprehension measure tested content that had been presented with salient features (for example, rapid or moderate character action, sound effects) or nonsalient features (for example, dialogue, low action). While the eight- to ten-year-olds answered both kinds of questions correctly, the five- to six-year-olds were correct on 61 percent of the salient items and on only 54 percent of the nonsalient items, a statistically significant difference. In particular, central content involving inference and abstraction was better understood when it was presented with salient formal features than when it was not.

In an attempt to determine whether the attention-getting qualities of salient features contributed to comprehension, we analyzed children's selective attention to various formal features as predictors of their comprehension. (This approach contrasts with previous analyses using total attention to predict comprehension. If features serve as signals or markers, then one must analyze children's differential attention to portions of the program containing those features rather than overall program attention.) For each formal feature, we calculated a child's net attention score (proportion of attention during that feature's presence minus proportion of attention in its absence) and correlated net attention with comprehension.

In general, attention to salient features (such as vocalizations and sound effects) was positively associated with comprehension of content for younger children. The exceptions occurred for those features discussed earlier (music and zooms) that suppress attention for older children. Thus, younger children with developmentally advanced attention patterns understood content more effectively than other young children and attended to certain salient features while ignoring others. Hence, these data provide some evidence that attention to salience influences comprehension of content.

More specifically, attention to child dialogue and moderate character action predicted comprehension of content. Again, selective attention to these two features was a relatively mature attentional pattern.

Concluding Remarks

Our analyses and studies yield two tentative conclusions. First, the forms of television can serve to mark important content and to direct the attention of young viewers. Second, developmental advancement involves increas-

ing ability to select informative content on the basis of particular formal features while ignoring features associated with relatively little plot information. When these findings are combined with what we know about developmental increases in children's depth of processing, knowledge base, and metacognitive insight with respect to their own attempts to understand, the picture of developing media literacy is considerably enriched.

Three further lines of research seem to us particularly pressing. First, we need to examine our findings about the use of formal features with reference to a much wider range of format cues and program types. Second, we need longitudinal evidence on the development of individual differences with respect both to the readiness for, and the manner in which, television content is processed. Finally, we need to develop a quantified measure of television literacy, including reliable submeasures of both attention and comprehension.

If children are to reap the benefits of such research, we must continue to document how various production techniques can be used so that children can better understand television's message and can make more judicious decisions about what to watch and how to watch it. We end where we began; if educational and socially constructive television is going to be increasingly available and if children are going to continue watching large amounts of television, it behooves us to be concerned with the education of the "media generation" in their own media. Conversely, tracing the development of television literacy is essential to understanding the impact of that medium on the cognitive development of present and future generations.

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