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The impact of media literacy on children's learning from films and hypermedia

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ABSTRACT

Within the extensive literature on the role of educational media in children's learning and the factors influencing that learning, the possible impact of media literacy remains unexamined. The present study examines the influence of media literacy on learning from television and hypermedia environments. In a sample of 150 children with a mean age of 5.33, a computer-based test was used to assess media literacy, and recognition and inference questions were used to measure learning. The influence of intelligence, media usage, and socioeconomic status as independent variables was also assessed. Hierarchical regression analyses showed that media literacy was a significant predictor of learning from media, even when controlling for other relevant factors such as intelligence.

Ever since television and computers became widely available to a broad public, researchers have examined their effects on children's development. Both of these media have given rise to concerns based on assumptions or evidence of their negative influence on children's development in the suppression of other activities (Cantor, 2012; Koolstra, van der Voort, & van der Kamp, 1997) or in creating a disposition to aggressive behavior (Bushman & Huesmann, 2012). However, other research, focusing on the educational impact of media, suggests that well-designed and age-appropriate educative media can impart knowledge (e.g., Mares, Sivakumar, & Stephenson, 2015; Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011). Aside from the characteristics of educational media that influence learning, researchers have also examined personal characteristics of learners such as demographics, age, and gender (for an overview, see Kirkorian & Anderson, 2008). The present study examines the effect of media literacy as another personal characteristic that has not to our knowledge been examined to date.

1. Media literacy

Definitions of media literacy change often as existing technologies evolve and new technologies appear (Guernsey & Levine, 2015). Such definitions usually include competencies like accessing, understanding, analyzing, and evaluating media messages; creating media messages; participating; and reflecting (e.g., Hobbs & Moore, 2013; Rogow, 2015). In the current article, we will depend mainly on Potter's (1998, 2013) concept of media literacy, as it adopts a developmental perspective. According to this conception, children between the ages of 3 and 5 years develop the so-called "rudimentary skills" of media literacy. Between 5 and 9 years, children begin to develop critical evaluation skills, which become ever more important in adolescence and adulthood, when "advanced skills" are acquired. Rudimentary skills relate to the fundamental capability to read media symbols, to recognize the patterns those symbols create, and to ascribe meaning to those patterns. We (Nieding & Ohler, 2008) encapsulated these abilities in the term *media sign literacy* ("Mediale Zeichenkompetenz") (p. 382), proposing that this is the most important aspect of media literacy development in young children.

1.1. Development of media sign literacy

The first milestone in the development of media sign literacy (MSL) is the ability to use symbols. This ability is closely linked to other developmental markers such as understanding of intentionality, mental states, cultural conventions, and iconicity (Namy & Waxman, 2005). The understanding that symbols (e.g., pictures or films) refer to something other than themselves is referred to as *representational insight* (DeLoache, 2002). International comparative studies have shown that this capability is not innate but is based on experience of pictures;

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infants in Western cultures show earlier understanding of the representational nature of pictures than children who have had no previous experience of pictures (Callaghan, Rochat, & Corbit, 2012; Walker, Walker, & Ganea, 2013). The way in which infants grasp at photographs as if they were objects (e.g., DeLoache, Uttal, & Pierroutsakos, 1998) is further evidence that infants do not yet understand that photographs are representational. By the age of 18 months, however, children rarely grasp pictures in this way; instead they begin to point and attempt to talk about the represented objects (Uttal & Yuan, 2014). However, the child's understanding of the representational nature of photographs is not fully developed at 18 months, as they have yet to learn exactly how photographs relate to their referents. Even 3-year-olds still make errors in this regard, believing for instance that photographs taken in advance will change if the represented scene changes (Donnelly, Gjersoe, & Hood, 2013). Similarly, 3-year-olds assumed that popcorn would spill out of a televised popcorn bowl if the television was turned upside down (Flavell, Flavell, Green, & Korfmacher, 1990). These and other results show that the development of representational insight follows a similar course for video as for still images; while 9-month old infants try to grasp objects on the screen, between 15 and 19 months of age, they will instead begin to point at the screen (Pierroutsakos & Troseth, 2003).

Note that our concept of media sign literacy is related to what DeLoache called "symbolic sensitivity"—"a general expectation or readiness to look for and detect the presence of symbolic relations between entities" (DeLoache, 1995, p. 112). Evidence for the connection between MSL and symbol reading comes from a longitudinal study (Nieding et al., 2016), which showed that children's MSL at age 4 years predicts their competence in precursors of reading and writing as well as mathematics—skills that rely heavily on the understanding and manipulation of symbol systems.

However, our conception also encompasses more complex symbol systems such as formal features and early skills of critical evaluation, such as the reality-fiction distinction, as outlined in the following sections.

1.1.1. Understanding formal features of television

Viewing films and related media requires an understanding of the visual production and editing techniques characteristic of such symbol systems. Because film's formal visual features (Rice, Huston, & Wright, 1986) are often used to compress time and space or to emphasize certain information, comprehension of such features is a crucial component of film literacy. This facility has become increasingly important as the pace of editing in modern formats accelerates, even in children's programs—for instance, the editing pace of *Sesame Street* increased from 4 cuts per minute in 1977 to 8 cuts per minute in 2003 (Koolstra, van Zanten, Lucassen, & Ishaak, 2004).

Understanding of editing techniques develops significantly between the ages of 3 and 7 years (Smith, Anderson, & Fischer, 1985). At first, children learn to comprehend the so-called first-order editing rules ("matching the position" and "matching the movement"; d'Ydewalle & Vanderbeeken, 1990), which incur relatively low-level cognitive demands, as they are fairly close to natural perception. In the next step, children come to understand second-order editing rules, related to spatial relations (e.g., movement or viewing direction in dialogue scenes). Finally, rules relating to the continuity of actions (flashback, flash-forward, cross-cutting[1] etc.; third-order editing rules) are understood. These findings are supported by eye movement data for film cuts (Munk, Rey et al., 2012) and by children's re-enactments of film sequences (Munk, Diergarten, Nieding, Ohler, & Schneider, 2012; Smith et al., 1985).

Understanding of formal features is closely linked to children's level of cognitive development. For instance, understanding zoom shots depends on an understanding of physical conservation as described by Piaget (1974), in which preoperational children (usually below the age of 7 years) have difficulty in understanding that a certain quantity will remain the same despite adjustment of the container or of apparent size. This understanding is also required in zoom shots, as an object appears bigger when shown in close-up. Children classified as "nonconservers" (second grade and lower) in a classical Piaget conservation task mistook a candy bar in a television close-up as larger than one in a more distant shot (Acker & Tiemens, 1981). Similarly, an understanding of panning shots (i.e., sideward shifts of scene) seems to be related to visual working memory capacity in pre-school children (Pittorf, Lehmann, & Huckauf, 2014) and their comprehension of spatial relations in dialogue scenes relates to spatial perspective-taking ability (Comuntzis-Page, 2005).

1.1.2. Distinguishing reality and fiction and different program formats

Even 2-year-olds have some understanding that what they see on TV does not usually influence the real world; for instance, they will have more difficulty imitating behavior seen on television as compared to a live demonstration (Hayne, Herbert, & Simcock, 2003). However, the ability to distinguish reliably between reality and fiction does not fully develop until about the age of 11 years. Children's theories about reality and fiction in television develop in parallel with more general fantasy-reality judgments (Mares & Sivakumar, 2014). In making this distinction, children's errors go both ways; young children often believe that fictional events are real, but they can also mistake real events as fictional (Woolley & Ghossainy, 2013). This erroneous skepticism can pose problems when children are required to learn from televised content (Mares & Sivakumar, 2014). In attempting to distinguish between real and fictional content, children refer to different program formats (Wright, Huston, Reitz, & Piemyat, 1994). For instance, 4- to 6-year-old children understand that cartoons are fictional (Downs, 1990), and these can subsequently be distinguished from formats such as *Sesame Street*. Eventually, news can be discerned from children's and adults' shows (Wright et al., 1994).

1.1.3 Computer literacy

As well as television, children now become accustomed to computers and tablets early in life, and these become increasingly important from about the age of three years (Iene Miene Media, 2012, cited in Bus, Takacs, & Kegel, 2015). Touchscreen devices are also popular with children, and their finger-based interface allows very young children to perform simple tasks (Neumann & Neumann, 2014). Speed and accuracy in tapping and dragging improves significantly between 3 and 6 years of age (Vatavu, Cramariuc, & Schipor, 2015), and children's skill in using pointing devices (e.g., the computer mouse) has been shown to improve continuously in terms of speed and accuracy between the ages of 4 and 12 years (Joiner, Messer, Light, & Littleton, 1998).

A longitudinal study by Saçkes, Trundle, and Bell (2011) revealed that gender had a significant influence on computer literacy development, such that boys showed a larger growth in these skills compared to girls. While socioeconomic status and availability of a computer in the home were unrelated to the development of these skills over time, both predicted children's initial computer skills, suggesting that access is relevant for the development of computer skills in early childhood.

2. Learning from media

Across the wide range of computer-assisted learning materials, research has broadly confirmed their effectiveness (Fletcher-Flinn & Gravatt, 1995; Tamim et al., 2011). For instance, one training study confirmed that Head Start children who used educational software over a period of 6 months performed better on their school readiness tests than children following a standard Head Start curriculum (Li, Atkins, & Stanton, 2006). Similar positive effects of computer-based training were reported for precursors of reading (Mioduser, Tur-Kaspa, &

[1] This technique establishes action occurring at the same time in two different locations. The camera cuts away from one action to another, suggesting simultaneity.