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## The relationship between television exposure and children's cognition and behaviour: A systematic review

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## ABSTRACT

The aim of this article is to systematically review the literature studying the association between television viewing and children's executive function, academic performance, attention, language and play. Using keywords: *television, children, infants, attention, language, education and cognition*, five online databases were searched. Seventy-six studies that met all the inclusion criteria were reviewed. The findings suggest the relationship between television viewing and children's development is complex. First, the likely effects of television may depend on children's individual characteristics, family and social context. Second, the features of television, such as content and editing pace, and the type of exposure (foreground or background) may affect outcomes. Specifically, watching high-quality educational content during preschool years improves children's basic academic skills and predicts subsequent positive academic performance. Conversely, television viewing in infancy is disruptive to play; it reduces the quality and quantity of child-parent interactions and is associated with inattentive/hyperactive behaviours, lower executive functions, and language delay, at least in the short-term. It remains unclear whether these interactions between television and cognition are long lasting. Future research should focus on the systematic investigation of the pathways that link particular components of television and the type of exposure with individual and contextual factors, to investigate their potential unique and combined effects on development. Researchers must also address the challenge of investigating the diverse and rapidly changing technologies to which the current generation of children are exposed.

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### Introduction

The relationship between screen-based media, television in particular, and children's cognitive development has been researched for over four decades, producing conflicting results. On the one hand, literature provides support for the long-term benefits of educational television for cognitive development and behaviour (e.g., [Mares & Pan, 2013](#)). On the other hand, the negative associations reported in correlational studies between television and children's development, especially attention and language outcomes, are a cause for concern among parents and early-years professionals.

There is little doubt that children and adolescents are prolific users of visual media. Adolescents simultaneously use a variety of different media, multitasking between a computer to do their homework, chatting with their friends on social networking sites, and listening to music or playing a computer game ([Roberts & Foehr, 2008](#)). Younger children still prefer "tra-

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ditional” television over newer forms of media (Gutnick, Robb, Takeuchi, & Kotler, 2010; Ridout, 2013). However, in light of recent figures showing that three-quarters of under-fives in the UK use a tablet or a smartphone (Childwise Research, 2016), traditional media may soon lose its dominance, even among the youngest of users. Although watching television remains young children’s favourite pastime, the rise in popularity of touchscreen devices and the new means of accessing TV content have created further challenges for researchers that go above and beyond studying the potential effects of single-screen viewing. As Oakes (2009, p. 1139) puts it “media exposure is now like air or water: ubiquitous, ever evolving and not easily coded as data for a given analysis”. Therefore, it appears timely to examine and summarise the results of research into traditional media, to identify robust associations and effects, to help develop a theoretical framework that could guide future research on children’s development in this “new media age”.

The extent to which cognitive processes are affected by television viewing is contentious. Some studies indicate that time spent viewing (e.g., Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004), exposure to particular content (e.g., Conners-Burrow, McKelvey, & Fussell, 2011), early onset (e.g., Chonchaiya & Pruksananonda, 2008) and editing pace (e.g., Lillard & Peterson, 2011) are associated with poor attention, lack of behavioural control, delayed language and deficits in executive functions. However, other studies have suggested that television viewing is not a strong predictor of these cognitive skills (Bittman, Rutheford, Brown, & Unsworth, 2011; Schmidt, Rich, Rifas-Shiman, Oken, & Taveras, 2009; Stevens & Mulrow, 2006). Finally, there is some support for the potential benefits of watching age-appropriate educational content. For example, watching programmes designed to reinforce preschool learning (e.g., *Sesame Street* or *Blues Clues*) improves children’s early numeracy and literacy skills (Baydar, Kağitçibaşı, Küntay, & Gökşen, 2008) and is associated with positive educational outcomes in adolescence (Anderson, Huston, Schmitt, Linebarger, & Wright, 2001).

Despite these inconsistencies, abundant correlational evidence, supported by a number of methodologically sound experimental studies, should allow one to identify the key associations between television viewing and developmental outcomes, as well as the mechanisms underlying these relations. Given the complexity of today’s digital media, and the challenges that this rapidly evolving technology poses for scientific inquiry, it is important to identify any methodological gaps in past research to guide the creation of effective ways of investigating the potential impact of new media on children’s development.

Previous reviews tended to summarise findings pertinent to a particular age group (e.g., Thakkar, Garrison, & Christakis, 2006), synthesised literature concerning a single TV programme (e.g., Fisch, Truglio, & Cole, 1999; Mares & Pan, 2013) or focused on a single outcome measure (e.g., Moses, 2008; Nikkelen, Valkenburg, Huizinga, & Bushman, 2014). No review to date has integrated the findings covering a wide age range and a broad spectrum of outcomes. Thus, the aim of this article is to review the current state of literature to explore the associations between childhood television viewing and this broad spectrum of outcomes. Specifically, we intend to evaluate this literature in the light of the strengths and weaknesses of the different research methodologies used. Most research has used one of two methods: either cross-sectional or longitudinal correlation between television viewing and psychological measures. However, in the last decade, there has been an increase in the number of experiments, which predominantly examine vocabulary learning from televised material, the effects of editing features on children’s cognition and behaviour and child-caregiver interactions in the presence of television. Finally, this review aims to offer a comprehensive synthesis of the current literature and to provide a resource for researchers studying the potential effects of media on children’s cognitive development.

## Methods: search procedure and inclusion criteria

MedLINE (PubMed), Cochrane Library, ERIC, PsycARTICLES, and the Web of Science were last searched in December 2015 using the following strategy: child\* OR infant\* OR preschool\* AND television OR film AND attention, play, academic, education, behaviour, cognition, vocabulary, language. Further hand searching of the reference lists in the relevant published literature was conducted to identify any studies that were not returned in the electronic search. There was no date restriction concerning the manuscript publication. Only articles published in the English language were considered for inclusion.

To be included in the review, the studies had to involve participants younger than 14 years or, for longitudinal research, participants had to be younger than 14 during the first wave of data collection. Furthermore, included studies had to investigate either the associations between (correlational studies) or the effects of (experiments) foreground or background television exposure on cognition, attention or play. Finally, for the experimental studies, the outcome variable had to measure the effects of television on specified outcomes, and not attention to or comprehension of the material presented on the screen. Materials used in the studies considered for the review included “real-life” television/films (including those that were specially edited for the purpose of the study), and specifically-designed videos that were developed for the sole purpose of research. To provide a comprehensive summary of the literature, studies that adopted a variety of methodologies were included (cross-sectional correlational studies, prospective and retrospective cohort studies and experiments). However, case study reports were excluded from the review. Finally, this article predominantly focuses on the cognitive outcomes; therefore, studies investigating social and emotional outcomes, including aggression, were excluded from this review.

## Results

Using the pre-set criteria, the initial search of the relevant databases identified 8812 studies. Duplicates were removed (1166) and the exclusion criteria applied to the title and the abstract, which removed another 7561 articles. After scrutiny

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