Brief Report: Television Viewing and Risk for Attention Problems in Preschool Children

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Objectives This study examined whether high levels of television viewing are associated with attention problems and hyperactivity in preschool children. Methods Parent and teacher ratings of inattention, hyperactivity and impulsivity, objectively measured activity level, and parental estimation of early television exposure were collected for a sample of preschool children. Separate linear regression analyses were conducted with parent and teacher behavioral ratings and objectively assessed activity level as outcome variables. Results Results indicated that after controlling for demographic factors (i.e., age, sex, and SES), television exposure accounted for a significant proportion of the variance in teacher ratings of inattentive/ hyperactive behaviors, as well as objectively measured activity level. Conclusions These findings partially replicate those from a recent, highly publicized study indicating a correlation between television exposure and attention-deficit/hyperactivity disorder (ADHD)-associated behaviors. However, it remains unclear as to whether elevated levels of television viewing are the cause or result of ADHD symptoms.

Key words ADHD; preschool; television.

Attention-deficit/hyperactivity disorder (ADHD) is among the most common psychiatric disorders in children (Lahey et al., 1994) and represents a significant factor in many referrals for psychological evaluations (Demaray, Schaefer, & Delong, 2003). There is a wealth of research to suggest that ADHD is a multifactorial disorder with both genetic and nongenetic/environmental contributing factors.

One environmental factor that has received recent attention is television viewing during early childhood. After controlling for a number of risk factors, a recent study reported that television viewing at ages 1 and 3 years predicted attention problems at 7 years of age (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004). These findings generated considerable media attention. Nevertheless, an important limitation of that study was the index of attention problems, which was based on five questions that were unlikely to truly capture the characteristics of ADHD. Parents were asked if the child had “difficulty concentrating,” was “easily confused,” was “impulsive,” had “trouble with obsessions,” or was “restless.” Scoring for each item was collapsed into a dichotomous system, and children were classified into groups of those with and without attention problems with the cutoff score of 1.2 standard deviations above the mean on the index of attention problems. Although the authors noted that this was not equivalent to a diagnosis of ADHD, symptoms were assumed to be consistent with an ADHD diagnosis. In a subsequent study, a Danish research group was unable to replicate these findings with a more robust assessment of ADHD-related behaviors (Obel et al., 2004).

Television is a ubiquitous part of life for many families and young children spend considerable time watching television (Certain & Kahn, 2002). As such, knowledge regarding the relationship between the amount of early television viewing to attentional and behavioral...
functioning, and potentially the emergence of ADHD, is of considerable public health concern.

In light of the equivocal nature of the previous findings and the omnipresent nature of television in contemporary society, we sought to replicate the findings in a sample of children where we could use more comprehensive and valid ratings, as well as an objective measure of ADHD-related behaviors while controlling for a limited number of demographic factors. Specifically, we examined the relationships of parent and teacher ratings, as well as objectively measured activity level, to early television viewing.

Methods
Participants
One hundred and seventy children (105 boys, 65 girls) were recruited from community preschools as part of a longitudinal study of young children at risk for ADHD. Children were recruited using ADHD checklists completed by parents and teachers, with those in the control group exhibiting three or fewer symptoms of ADHD (n = 54), and those at-risk for ADHD exhibiting at least six symptoms of inattention or hyperactivity/impulsivity by either parent or teacher report (n = 116). The mean age for the sample was 4.31 years (SD = 0.51 years; range = 2.90–5.87). Among the participants, 37.1% were non-Hispanic Caucasian, 7.6% were African American, 16.5% were of Asian descent, 14.1% were Hispanic, and 24.7% were of “other or mixed ethnicity” according to demographic data obtained from the parents. The families were of primarily middle class status with a mean SES score of 61.70 (SD = 17.32) on a measure of socio economic prestige (Nakao & Treas, 1994), although a wide distribution of economic levels were represented (range = 20–97). Mean estimated IQ, based on the Information subtest of the Wechsler Preschool and Primary Scales of Intelligence – Revised (Wechsler, 1989), was within the average range with a scaled score of 10.87 (SD = 3.17); estimated FSIQ ≥ 80 was required for inclusion in the study.

Children and their parents participated in a full assessment battery as part of the larger study. There were no gender or ethnic restrictions, but both the children and their parents were required to be English-speaking. Children diagnosed with mental retardation, a pervasive developmental disorder, a diagnosed neurological disorder (e.g., epilepsy), or those who were taking systemic medication for a chronic medical condition were excluded from participation. The larger project from which this study was derived was approved by the Queens College Institutional Review Board, and parents gave informed consent for their child to participate.

Measures
Television Viewing
Information about the amount of time participants typically spent watching television was gathered during a semistructured interview. Parents were asked to estimate the average number of hours their child spent watching television or videos during both a typical weekday and weekend day. To calculate the mean hours of daily television exposure, the typical weekday time was multiplied by five (number of weekdays per week) and the typical weekend day time was multiplied by two (number of weekend days per week). The two values were added and then divided by seven to calculate the average number of hours spent watching television during a typical day. The mean number of hours spent watching television per day in this sample was 2.35 hr (SD = 1.37 hr; range = 0–8.57 hr). This procedure was the same as that used by Christakis and colleagues (Christakis et al., 2004).

ADHD Checklists
Parents and teachers were asked to complete checklists based on ADHD symptoms listed in the DSM-IV as part of the child’s participation in the project. The checklists consisted of the 18 ADHD behaviors listed in DSM-IV, which were rated on a 4-point scale (0 = not at all; 1 = just a little; 2 = pretty much; and 3 = very much). Raters were asked to rate behavior over the last 6 months. Ratings were summed across questions separately for each informant yielding total possible scores from 0 to 54. The mean DSM-IV teacher checklist sum was 15.80 (SD = 16.80; range = 0–51). The mean DSM-IV parent checklist sum was 16.78 (SD = 12.29; range 0–53). Previous research indicates that this type of checklist is a reliable and valid assessment tool for children with ADHD (DuPaul et al., 1998), and appropriate for use with diverse populations (Reid et al., 1998). Child’s age was modestly, but significantly, correlated with parent (r = .15, p = .05) but not teacher (r = .05; p > .10) reports of ADHD symptoms. Parent and teacher reports were significantly correlated with each other (r = .54, p < .001).

Actigraphs
Each child’s motor activity during the 2 hr standardized one-on-one assessment session was recorded using two solid-state actigraphs worn around the waist and nondominant ankle. The actigraphs utilize internal...
accelerometers to record number of movements per unit time. Descriptive statistics for activity in 1 min epochs were generated separately for each child’s ankle and waist actigraph. Previous research suggests that recorded activity level can be reliably measured using actigraphs and is correlated with parent and teacher reports of activity level (Reichenbach, Halperin, Sharma, & Newcorn, 1992). Actigraphs have also been found to discriminate between hard-to-manage preschool boys from controls (Campbell, Pierce, March, Ewing, & Szumowski, 1994), as well as clinically referred youth with and without ADHD (Halperin, Matier, Bedi, Sharma, & Newcorn, 1992).

Waist and ankle actigraph data were combined by calculating the mean of the waist and ankle medians for each child. This procedure was chosen to reduce the number of dependent variables and to reflect the child’s global activity level. When data from only ankle or waist actigraph were available because of equipment malfunction (16 participants), regression equations based on the entire sample were used to estimate the likely mean. Composite actigraph scores obtained in the laboratory were significantly correlated with teacher ($r = .31, p < .001$) and parent ($r = .23, p < .01$) ADHD ratings.

**Data Analysis**

Regression equations were constructed with variables entered hierarchically in blocks with pairwise deletion of missing variables. For each outcome variable (summary of teacher-reported ADHD symptoms, summary of parent-reported ADHD symptoms, and actigraph data), three demographic variables (age, sex, and SES) were entered in the first block as covariates, and television viewing was entered in the second block. Both the amount of unique variance explained in the outcome variable and the standardized beta coefficients were of interest.

**Results**

Results from the three regression equations are presented in Table I. The demographic covariates accounted for only 1.1% ($p > .10$) of the variance in activity level as measured by the actigraphs; television viewing added 4.2% ($p = .01$) to the variance explained.

Post hoc analyses were conducted to determine whether dividing the ratings from the ADHD checklists into separate inattention and hyperactivity–impulsivity components would shed further light on the findings. However, results did not differ from DSM ADHD ratings submitted to the regression model as a unitary construct.

**Discussion**

This study examined whether demographic factors and television viewing are associated with inattention and hyperactivity in preschool children. These relationships were examined using parent and teacher reports, as well as objectively measured activity level. The results were similar to the findings of Christakis and colleagues (Christakis et al., 2004). Although demographic characteristics account for some of the ADHD-related behaviors, television viewing was significantly associated with objectively measured activity level, as well as teacher reports of these behaviors, after adjusting for

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<th>Table I. Summary of Regression Results</th>
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Beta weights reflect predictive influence of each variable in the final equation. $^p < .05, \ *** p < .01, \ **** p < .001$. 

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demographic variables. Parent reports were only marginally associated with television viewing.

Despite using a different study design, the similarity of our findings to those of the recent study is notable. Using a large, epidemiologically sound sample, Christakis and colleagues demonstrated a predictive relationship between television viewing and later parent-rated attention problems. Both studies employed the same measure of television viewing. However, perhaps owing to the smaller and more manageable sample size, we were able to use more comprehensive measures of ADHD behaviors, which were obtained both from parents and teachers, as well as objective laboratory measures of activity level. Taken together, the findings from the two studies clearly indicate an association between television viewing and reports of behavioral difficulties associated with ADHD.

Due to our cross-sectional design, inferences regarding causation and direction of effects must be made extremely cautiously. Thus, it is difficult to determine whether high levels of television viewing cause greater inattention and overactivity, or whether being more active and oftentimes troublesome results in children being “attended to” by the television in increasing amounts because children with attention problems and high levels of activity are perceived by parents to be more difficult to manage (Barkley, 1995).

Due to their longitudinal study design, Christakis et al. (2004) interpreted their findings to indicate that elevated levels of television viewing resulted in attention problems. However, even within the context of a longitudinal design, this type of causal inference must be viewed cautiously. It is well-known that the behaviors associated with ADHD are quite stable, and that these children are very “difficult to manage” during the preschool years (Campbell et al., 1994). As such, it is quite likely that those in their sample who were most inattentive at 7 years of age were also difficult to manage earlier. As such, it is still possible that they were in front of the television during the preschool years more than their peers as a result of their difficult behavior. This potential confound could be teased out if behavioral ratings were also available from early childhood in these children.

Yet, it is not unreasonable to posit a relationship between excessive television viewing and later attentional difficulties. Activities such as television viewing are highly reinforcing to children, with minimal requirements of effortful processing (Shiffrin & Schneider, 1984). In view of neurodevelopmental processes, such as synaptic pruning and dendritic aborption, which are highly experience dependent, it would not be surprising to find adverse cognitive consequences, such as inattention, linked to excessive television viewing. However, in view of its very early onset and the high proportion of variance accounted for by genes (Swanson et al., 2001), we believe that it is unlikely that television viewing has a formidable role in the emergence of ADHD.

On the other hand, one also needs to consider the possibility that more difficult children spend more time watching television because of their behavioral difficulties.

As described above, children with ADHD are far more difficult to manage than typically developing preschoolers; as such, television can provide a break for overwhelmed or underskilled parents. The fact that the association with television viewing was observed on both subjective and objective measures indicates that these difficulties are not specific to the perception of a particular person. A confluence of factors related to the child’s behavior may influence the amount of television viewing. First, the television could serve as a surrogate babysitter for the parent. In addition, it is well-known that children with ADHD are highly responsive to continuous reinforcement (Wigal et al., 1998) and that they oftentimes do not appear inattentive or hyperactive in settings that provide high levels of interesting stimulation. As such, not only would parents of children with ADHD be reinforced by their child’s television viewing, but the children also are likely to gravitate to such stimulation.

Such a scenario could be quite concerning as children enter school and expect high levels of stimulation in the classroom environment similar to what they experience while watching television.

The limitations of this study do not diminish the veracity of the positive, and potentially disturbing, association between television viewing and ADHD-related behaviors as assessed via parent and teacher ratings. It is likely that many physicians, teachers, and other professionals who work with families of young children encourage parents to seek activities other than television viewing for their preschool children. However, this recommendation may have particular importance to parents of children with behavioral difficulties because of their tendency for social isolation and their need for the development of social skills.

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