

*Study concept and design:* All authors.

*Acquisition, analysis, or interpretation of data:* All authors.

*Drafting of the manuscript:* Bona.

*Critical revision of the manuscript for important intellectual content:* Brosco.

*Administrative, technical, or material support:* Brosco.

*Study supervision:* Brosco.

**Conflict of Interest Disclosures:** None reported.

1. Centers for Disease Control. Data and statistics: new data: medication and behavior treatment, attention-deficit/hyperactivity disorder. <http://www.cdc.gov/ncbddd/adhd/data.html>. Published 2015. Accessed September 13, 2015.

2. Evans WN, Morrill MS, Parente ST. Measuring inappropriate medical diagnosis and treatment in survey data: the case of ADHD among school-age children. *J Health Econ*. 2010;29(5):657-673.

3. Hofferth SL, Sandberg JF; Population Studies Center at the Institute for Social Research. Changes in American children's time, 1981-1997. <http://www.psc.isr.umich.edu/pubs/pdf/rr00-456.pdf>. Published 2015. Accessed September 13, 2015.

4. National Center for Education Statistics; US Department of Education. Average National Assessment of Educational Progress reading scale scores and percentage distribution of students, by age, amount of reading for school and for fun, and time spent on homework and watching TV/video: selected years, 1984 through 2008. [http://nces.ed.gov/programs/digest/d12/tables/dt12\\_144.asp](http://nces.ed.gov/programs/digest/d12/tables/dt12_144.asp). Accessed September 13, 2015.

5. US Department of Education. *The Condition of Education 2006*. Washington, DC: National Center for Education Statistics; 2006.

6. National Center for Education Statistics; US Department of Education. Preprimary education enrollment, fast facts; <http://nces.ed.gov/fastfacts/display.asp?id=516>. Accessed September 13, 2015.

## Use of Mobile Technology to Calm Upset Children: Associations With Social-Emotional Development

Although it is known that parents of infants and toddlers with difficult behavior disproportionately use television and videos as calming tools,<sup>1</sup> there are no published data regarding to what degree mobile technologies (such as cell phones and tablets) are used for this purpose. Previous qualitative work with parents has suggested that parental perceived control, defined as feelings of control over children's behavior and development, may determine how parents set limits around screen media use<sup>2</sup> and respond to difficult child behavior.<sup>3</sup> We therefore sought to further explore this observation by examining associations between the social-emotional development of toddlers and mobile media use in a sample of parent-toddler dyads, and to determine whether potential associations are modified by parental perceived control.

**Methods** | The study was deemed exempt by the Boston University Medical Center institutional review board. We surveyed 144 English- or Spanish-speaking parents of healthy children 15 to 36 months of age who were recruited from an urban primary care clinic and 3 Women, Infants, and Children nutrition centers. Survey instructions, questions, and answer choices were read to participants by research assistants. After collecting demographic information, we assessed social-emotional development using the validated Baby or Preschool Pediatric Symptom Checklist.<sup>4,5</sup> Mobile technology use by children was queried using 6 questions adapted from prior surveys<sup>6</sup> asking about the likelihood of allowing smartphone or tablet use by children during different situations, including to calm them down, keep them quiet, while eating, in public, to get chores done, or at bed-

time. Six items from the Parent Opinion Survey<sup>7</sup> assessed parental perceived control regarding their child's development, social relationships, and behavior. Using multivariable logistic regression, we modeled the odds of being somewhat/very likely to allow a child to use mobile technology in different situations, using the child's social-emotional score on the Baby or Preschool Pediatric Symptom Checklist as the primary predictor, controlling for all covariates whose removal from the model changed odds ratios by more than 10%. We then stratified analyses by parental perceived control, which was split at the median value. Owing to sample size limitations, tests for interactions were not performed.

**Results** | Caregivers were primarily mothers (81.3%) of non-white race (78.7%) and foreign-born (64.0%), with a mean (SD) age of 31.6 (7.2) years (**Table 1**). Compared with children without social-emotional difficulties, children with social-emotional difficulties (Baby or Preschool Pediatric Symptom Checklist score  $\geq 9$ ; 58 of 144 children [40.3%]) had a higher prevalence of being given mobile technology as a calming tool when they were upset (61.8% vs 38.1%;  $P = .01$ ) and to keep peace and quiet in the house (69.6% vs 51.2%;  $P = .03$ ); however, there were no differences during other situations such as eating, being in public, doing chores, or at bedtime. After adjustment for potential confounders, associations between social-emotional difficulties and mobile technology use persisted (**Table 2**). Such associations were stronger among parents with low vs high perceived control for calming down (adjusted odds ratio [AOR], 7.63 [95% CI, 2.07-28.1] vs AOR, 1.52 [95% CI, 0.45-5.13]) and for keeping peace and quiet in the house (AOR, 6.48 [95% CI, 1.52-27.7] vs AOR, 2.90 [95% CI, 0.75-11.2]).

**Discussion** | This cross-sectional analysis showed significant associations between increased social-emotional difficulties in toddlers and the tendency of low-income parents to use mobile technology to calm their children or keep them quiet, particularly parents who expressed lower perceived control over their children's behavior and development. While reverse causation can also explain this finding (ie, the exposure to technology affecting social-emotional development), we intentionally stratified analyses by perceived control in order to explore the hypothesis that frustration with the child's behavior would lead to use of digital media as a coping strategy. However, we recognize that these results are exploratory and are from a modest-sized low-income sample, so they may not be generalizable. Longitudinal studies are needed to understand the transactional relationship between the use of digital technology and the developmental trajectories of children.

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Table 1. Demographic Characteristics of Participants

Characteristic	% of Participants	% of Participants, Stratified by Parental Perceived Control Score		P Value <sup>a</sup>
		Below Median (n = 71)	Above Median (n = 73)	
<b>Child</b>				
Age, mean (SD), mo	25.1 (6.8)	25.4 (7.0)	24.6 (6.4)	.63
Premature				
Yes	14.9	15.5	14.3	.84
No	85.1	84.5	85.7	
Sex				
Male	55.6	52.1	58.9	.41
Female	44.4	47.9	41.1	
First child				
Yes	38.2	39.4	37.0	.76
No	61.8	60.6	63.0	
Siblings at home				
Yes	70.8	73.2	68.5	.53
No	29.2	26.8	31.5	
<b>Caregiver</b>				
Age, mean (SD), y	31.6 (7.2)	30.6 (7.4)	31.2 (6.0)	.44
Language				
English	65.3	50.7	79.5	.003
Spanish	34.7	49.3	20.6	
Race				
White non-Hispanic	5.6	0.0	11.0	.01
Black or African American	34.7	33.8	35.6	
Hispanic	52.8	62.0	43.8	
Other	6.9	4.2	9.6	
Sex				
Male	12.5	8.5	16.4	.15
Female	87.5	91.6	83.6	
Marital status				
Married	36.1	38.0	34.3	.24
Single/separated/divorced	38.9	32.4	45.2	
Live with partner	25.0	29.6	20.6	
Education completed				
Elementary/primary school	16.7	18.3	15.1	.11
High school or GED	45.2	52.1	38.4	
College or more	38.2	29.6	46.6	
Employment				
Unemployed	43.8	46.5	41.1	.52
Employed	56.3	53.5	58.9	
Receiving public assistance				
Yes	81.9	87.3	76.7	.10
No	18.1	12.7	23.3	
PHQ-8 Depression Scale score				
<10	87.5	90.1	84.9	.34
≥10	12.5	9.9	15.1	

Abbreviations: GED, General Education Development; PHQ-8, 8-item Patient Health Questionnaire.

<sup>a</sup> Based on the t test or  $\chi^2$  test of association.

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**Published Online:** February 29, 2016. doi:10.1001/jamapediatrics.2015.4260.

**Author Contributions:** Drs Radesky and Peacock-Chambers had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

*Study concept and design:* All authors.

*Acquisition, analysis, or interpretation of data:* All authors.

*Drafting of the manuscript:* Radesky.

**Table 2. Bivariate and Adjusted Associations Between Social-Emotional Difficulties and Likelihood of Mobile Media Use During Different Daily Situations<sup>a</sup>**

Response	Social-Emotional Difficulties on B/P-PSC, No./Total No. (%)	AOR (95% CI)
To calm down when upset		
Not at all/not too likely	21/73 (28.8)	1 [Reference]
Somewhat/very likely	34/66 (51.5)	2.67 (1.26-5.67)
For peace and quiet in the house		
Not at all/not too likely	17/58 (29.3)	1 [Reference]
Somewhat/very likely	39/82 (47.6)	3.63 (1.52-8.66)
While eating		
Not at all/not too likely	46/113 (40.7)	1 [Reference]
Somewhat/very likely	10/25 (40.0)	0.92 (0.36-2.38)
While in public (eg, riding on public transit)		
Not at all/not too likely	34/82 (41.5)	1 [Reference]
Somewhat/very likely	21/54 (38.9)	0.81 (0.37-1.75)
To keep occupied while parent does chores		
Not at all/not too likely	18/47 (38.3)	1 [Reference]
Somewhat/very likely	38/94 (40.4)	1.40 (0.60-3.27)
At bedtime		
Not at all/not too likely	46/115 (40.0)	1 [Reference]
Somewhat/very likely	11/26 (42.3)	1.04 (0.41-2.62)

Abbreviations: AOR, adjusted odds ratio; B/P-PSC, Baby or Preschool Pediatric Symptom Checklist.

<sup>a</sup> Adjusted for parent's language (English/non-English speaking), education level (college or more/high school or General Education Development/elementary school), race/ethnicity (White non-Hispanic/black/Hispanic/other), and child prematurity.

*Critical revision of the manuscript for important intellectual content:*

Peacock-Chambers, Zuckerman, Silverstein.

*Statistical analysis:* Radesky, Peacock-Chambers, Silverstein.

*Obtained funding:* Peacock-Chambers.

*Administrative, technical, or material support:* Silverstein.

*Study supervision:* Zuckerman, Silverstein.

**Conflict of Interest Disclosures:** None reported.

**Funding/Support:** This study was funded by the Academic Pediatric Association Maternal and Child Health Bureau Bright Futures Young Investigator Award UO4MCO7853 (Dr Peacock-Chambers).

**Role of the Funder/Sponsor:** The funder had no role in the design and conduct of the study; collection, management, analysis, or interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

- Radesky JS, Silverstein M, Zuckerman B, Christakis DA. Infant self-regulation and early childhood media exposure. *Pediatrics*. 2014;133(5):e1172-e1178.
- Radesky JS, Kistin C, Eisenberg S, Zuckerman B, Silverstein M. Parent views about mobile device use around and by young children: implications for anticipatory guidance. Abstract presented at: Annual Meeting of the Pediatric Academic Societies; April 25-28, 2015; San Diego, CA.
- Guzell JR, Vernon-Feagans L. Parental perceived control over caregiving and its relationship to parent-infant interaction. *Child Dev*. 2004;75(1):134-146.
- Sheldrick RC, Henson BS, Neger EN, Merchant S, Murphy JM, Perrin EC. The baby pediatric symptom checklist: development and initial validation of a new social/emotional screening instrument for very young children. *Acad Pediatr*. 2013;13(1):72-80.
- Sheldrick RC, Henson BS, Merchant S, Neger EN, Murphy JM, Perrin EC. The Preschool Pediatric Symptom Checklist (PPSC): development and initial validation of a new social/emotional screening instrument. *Acad Pediatr*. 2012;12(5):456-467.
- Wartella E, Rideout V, Lauricella AR, Connell SL. Parenting in the age of digital technology: a national survey. [http://web5.soc.northwestern.edu/cmhd/wp-content/uploads/2014/03/ParentingAgeDigitalTechnology.REVISED.FINAL\\_2014.pdf](http://web5.soc.northwestern.edu/cmhd/wp-content/uploads/2014/03/ParentingAgeDigitalTechnology.REVISED.FINAL_2014.pdf). Revised June 2014. Accessed July 28, 2015.
- Machida S, Taylor AR, Kim J. The role of maternal beliefs in predicting home learning activities in Head Start families. *Fam Relat*. 2002;51(2):176-184. doi:10.1111/j.1741-3729.2002.00176.x.

## COMMENT & RESPONSE

### Attribution of Concussion-Like Symptoms and History of Collision Sports Exposure

**To the Editor** It has become fashionable to posit that concussion-like symptoms result from preexisting mood and behavioral disorders instead of traumatic brain injury. Iverson et al<sup>1</sup> have produced a study of impressive size, scope, and statistical depth supporting this thesis. While it goes to great lengths to establish factors such as substance abuse, attention-deficit/hyperactivity disorder, psychiatric conditions, and migraines as primary predictors of reporting of concussion-like symptoms in the high school population, it fails to investigate whether these factors are the result of concussions and/or repetitive head trauma earlier in childhood.<sup>2,3</sup> A sample of high school athletes, particularly those participating in collision sports such as football, includes those who may have started organized play as early as 4 years of age. It would imply that some participants in the Iverson et al sample may have been exposed to more than a decade of repetitive head trauma before inclusion in this study. The study does attempt to account for those with a history of concussion, but it is well recognized that most concussions in youth league sports are neither well detected nor documented.<sup>4</sup> This study and numerous previous studies<sup>5</sup> have demonstrated that those who have had documented concussions are more likely to have future concussions. In that light, clinicians must document not only sex and preexisting conditions of the patient but also whether he or she has a history of participating in collision sports. Until sufficient data are gathered, it would be irresponsible to attribute symptoms to conditions that may have been acquired as the result of mechanical insults to the brain.