4. Comparing Parent Report and Telemetry Measures of Child Media Use

CLAIRE CHRISTENSEN, MEGAN SILANDER, TODD GRINDAL, ALEXANDRA ADAIR, ELISA GARCIA, PHIL VAHEY, AND NAOMI HUPERT

Abstract: Accurate measurement of children's media use is critical for understanding media effects on child outcomes. Researchers commonly rely on parent-reported media use despite well-known methodological drawbacks (e.g., Robinson et al., 2006). An alternative method that may be more accurate is tracking usage via data drawn from tracking software. However, telemetry-tracked data do not capture rich qualitative information on how users engage with media. This study compares these 2 approaches for measuring usage of a media-based intervention. Data were drawn from a study of an 8-week digital media intervention for 4- and 5-year-old children from low-income families in 5 U.S. states (N = 216). As part of the intervention, participants were given a tablet computer with educational game and video apps installed. Parents reported children's usage of the intervention materials via a weekly online survey. Researchers collected telemetry data from tracking software installed on tablets. Parent-reported and telemetry-tracked information on use of intervention materials were moderately correlated (r = 0.35). On average, parents reported that children used the intervention digital media materials more often than the telemetry data indicated. This pattern was consistent across each of the 7 weeks during which we collected these data. Findings suggest that parent report is not a reliable substitute for telemetry data when measuring time spent with media. However, telemetry data cannot describe child affective engagement with the media and the social context within which children use media. Researchers must therefore be mindful in selecting measures to accurately describe distinct dimensions of media usage.

Introduction

The growing ubiquity of technology in young children's lives has raised concerns about the relationship between the amount of media a child uses and the extent of positive or negative effects on children's development. To answer such questions, researchers need accurate measures of child media usage. This study compares two approaches to measuring use of a child-focused media-based intervention: parent weekly surveys and usage data extracted from computer tracking software.

Studies of children's media use, including national surveys (e.g., Rideout, 2017), often use parent report because it is noninvasive and fairly simple to collect. Although parent media logs are straightforward to develop and administer relative to telemetry data, they can be resource intensive to collect, as incentives are often necessary to combat declining completion rates through time. As with other forms of self-report, parent-reported child media use is subject to flawed recall and understanding, as well as to social desirability bias, which could result in either over- or underreporting children's media use. Social desirability regarding screen-time limitations may motivate parents to underreport their child's media use, just as they overestimate their own role in mediating their child's media use, compared with child reports (Gentile, Nathanson, Rasmussen, Reimer, & Walsh, 2012). Parents may also underreport media use that they do not observe. For example, evidence indicates that parents of 4- to 7-year-olds underreport the child's media use when a television is present in the child's bedroom (Robinson, Winiewicz, Fuerch, Roemmich, & Epstein, 2006). Similarly, parents may underreport children's use of portable devices because children may use them out of view.

Several factors may lead parents to *over*report their child's media use. For example, studies using similar self-report

measures have found that adults tend to overreport their own media use (Scharkow, 2016; Sewall, Rosen, & Bear, 2019). They may similarly overreport their children's media use. Participant characteristics, such as well-being, may influence rates of overreporting (Sewall et al., 2019). Further research is needed to determine whether parent characteristics affect reporting of child media use. Additionally, intervention study participants may feel social pressure to report that their child complied with the study by using the intervention media.

Some prior studies have tracked media use via telemetry data, captured by software embedded in the media intervention or mobile device (e.g., Roberts, Chung, & Parks, 2016). The primary reason to use telemetry data is its apparent objectivity—automatic usage tracking is not subject to recall or social desirability biases. Further, telemetry data may reduce participant burden because they are collected automatically rather than through written surveys. However, telemetry data may not provide an accurate representation of media use by an individual or family. Unless telemetry software is installed on every device in the home, it can capture only device-specific media use, thus potentially underreporting total media usage. In addition, telemetry data may attribute usage to the focal child when in fact others were using the device, resulting in overreporting of the child's usage. Telemetry methods may also overreport usage because they cannot distinguish instances of engaged usage from instances when a child opens a video or game and becomes distracted. Further, tracking software may not always be reliable. Some parental control software is incompatible with tracking software and can disrupt its data collection. Participants or their parents may also intentionally or unintentionally disable the tracking software.

The present study compares parent-reported and telemetry-tracked child media use to provide insight into the biases or possible error inherent in both approaches. Our research questions are:

1. How do parent reports and telemetry-tracked estimates of child media use correlate? How do they differ?
2. How does the relationship between parent-reported and telemetry-tracked data change through time?
3. How does the relationship between parent-reported and telemetry-tracked data differ by parent characteristics?

Method

Sample

The data examined in this study are from an eight-week randomized controlled trial conducted during the winter and spring of 2019. Participants were 454 families with four- and five-year-old children in five locations across the United States: Boston, Massachusetts; Minneapolis, Minnesota; New York, New York; Phoenix, Arizona; and San Francisco, California. Children were all English-speaking and from low-income households where parents spoke either English or Spanish (Grindal et al., 2019). This study examines data from the 216 families in the treatment group for whom at least one week of both telemetry and parent-reported usage data is available. The data set includes weekly measures of parent-reported and telemetry-tracked usage for each of the first seven weeks of the study. Parent-reported usage was not collected in the eighth week of the study.

Telemetry Tracking

To track use of the intervention games and videos, researchers provided each treatment-group family with a tablet that included an intervention video player app to watch the intervention videos, as well as an intervention games

app. Researchers developed the video player app in collaboration with a third-party developer. The video app logged which videos were watched, the date, and the number of minutes the video played. To track children's use of the intervention game app, intervention producers developed a research version of the intervention app, identical to the publicly available app except that it logged the games each treatment-assigned child played, his or her use time and date, and the actions he or she took within the games.

Weekly Parent Surveys

Researchers texted parents during study weeks 1–7 with a link to complete a short (five-minute) online survey with several questions about the child's use of the intervention media in the prior week. Participants who did not complete the weekly media log within three days received an additional text message reminder to do so. Families received an incentive to complete the study, but incentives were not tied to weekly survey completion. The item used for this study asked parents how much time their child spent watching or playing the intervention videos and games over the last seven days. The question phrasing did not limit media usage to the study-provided tablet.

Results

Media log response rates ranged from 74% to 88% across the seven weeks. Rates of nonmissing telemetry data ranged from 63% to 98% (see Table 1). Missing telemetry data include weeks in which the child did not use the tablet computer. The data do not allow us to separate zero-usage weeks from truly missing data. We are aware of one instance in which the telemetry tracking software did not send video tracking data. In five other cases, the telemetry tracking software malfunctioned so that it prevented children from using the tablet (once families reported the problem, researchers replaced them with tablets that did function). Analyses for this paper include only data points for which both parent-reported and telemetry-tracked data are available for the same participant in the same week; weekly rates of usable data range from 45% to 77%.

Week	Number of Participant Media Logs Submitted	Number of Participants with Telemetry Data	Number of Participants with Media Log and Telemetry Data
1	176 (77%)	224 (98%)	164 (72%)
2	201 (88%)	209 (91%)	176 (77%)
3	184 (80%)	192 (84%)	153 (67%)
4	170 (74%)	180 (79%)	134 (59%)
5	179 (78%)	161 (70%)	127 (55%)
6	171 (75%)	144 (63%)	111 (48%)
7	164 (72%)	131 (57%)	102 (45%)

Note. Total N = 229 families in the treatment group. Subsequent analyses include only the 216 families in the treatment group for whom at least one week of both telemetry and parent-reported usage data is available.

Table 1. Data availability rates by source.

How Do Parent Reports and Telemetry-Tracked Estimates of Child Media Use Correlate? How Do They Differ?

Parent-reported and telemetry-tracked usage data were moderately correlated at $r = .35$ ($p < .001$). For 41% of our data points, parent-reported usage was within one hour of telemetry-reported usage (see Figure 1). Parents tended to report their child's media usage as higher than telemetry data indicated.

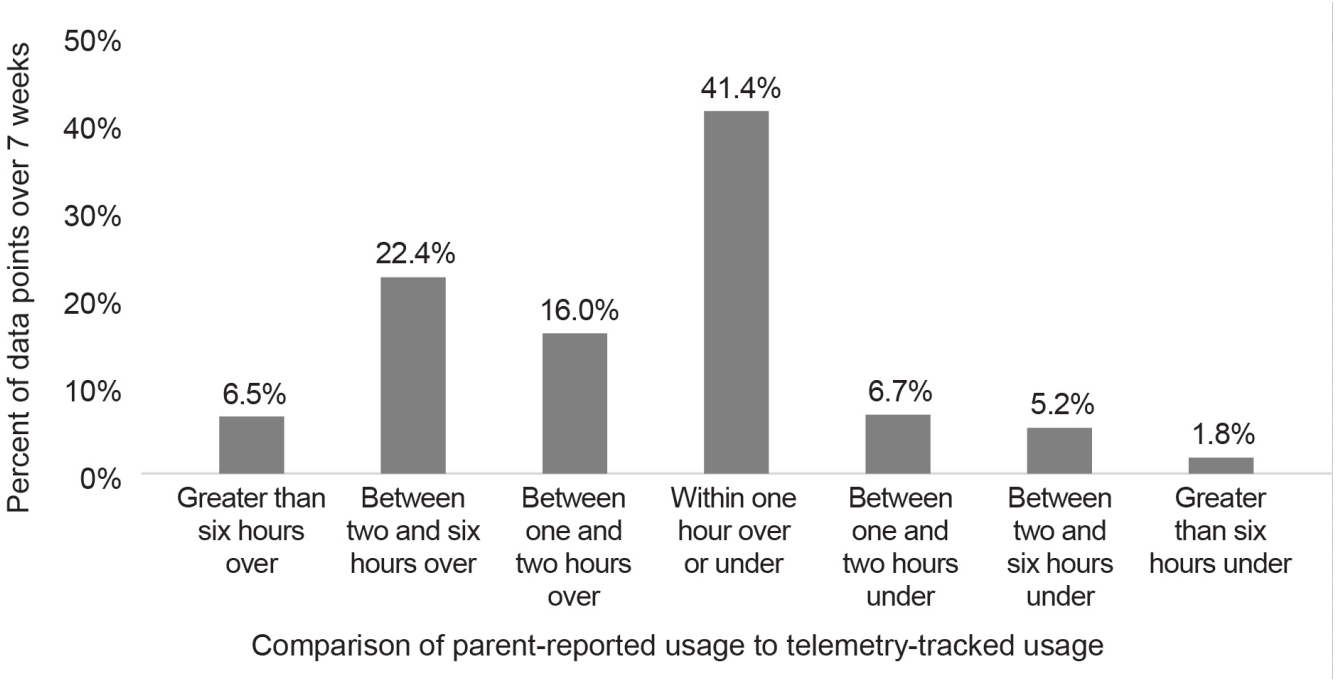

Figure 1. Differences between parent-reported media usage and telemetry-tracked media usage.

Median parent-reported usage was double the median telemetry-tracked usage (two hours compared to one hour in a week; see Table 2). Similarly, maximum parent-reported usage (60.5 hours in one week) was about double the maximum telemetry-tracked usage (27.7 hours in one week). Minimum telemetry-tracked usage was above zero because zero-usage weeks appear as missing data.

Descriptive	Telemetry-Tracked Usage	Parent-Reported Usage
Number of weekly telemetry reports or parent media logs	1,233	1,190
Median minutes (*SD*)	61 (197)	120 (293)
Maximum minutes	1667	3630
Minimum minutes	0.004	0

Note. Parent-reported usage is reported in integers because parents were only asked to report in whole numbers. For telemetry data, weeks with 0 minutes of usage are treated as missing.

Table 2. Descriptive statistics for weekly telemetry-tracked and parent-reported usage.

How Does the Relationship Between Parent-Reported and Telemetry-Tracked Data Change Through Time?

Telemetry-tracked and parent-reported usage was, on average, nearly identical in the first week. However, as telemetry-tracked media usage declined in subsequent weeks, parents consistently reported more media usage than telemetry data suggest (see Figure 2).

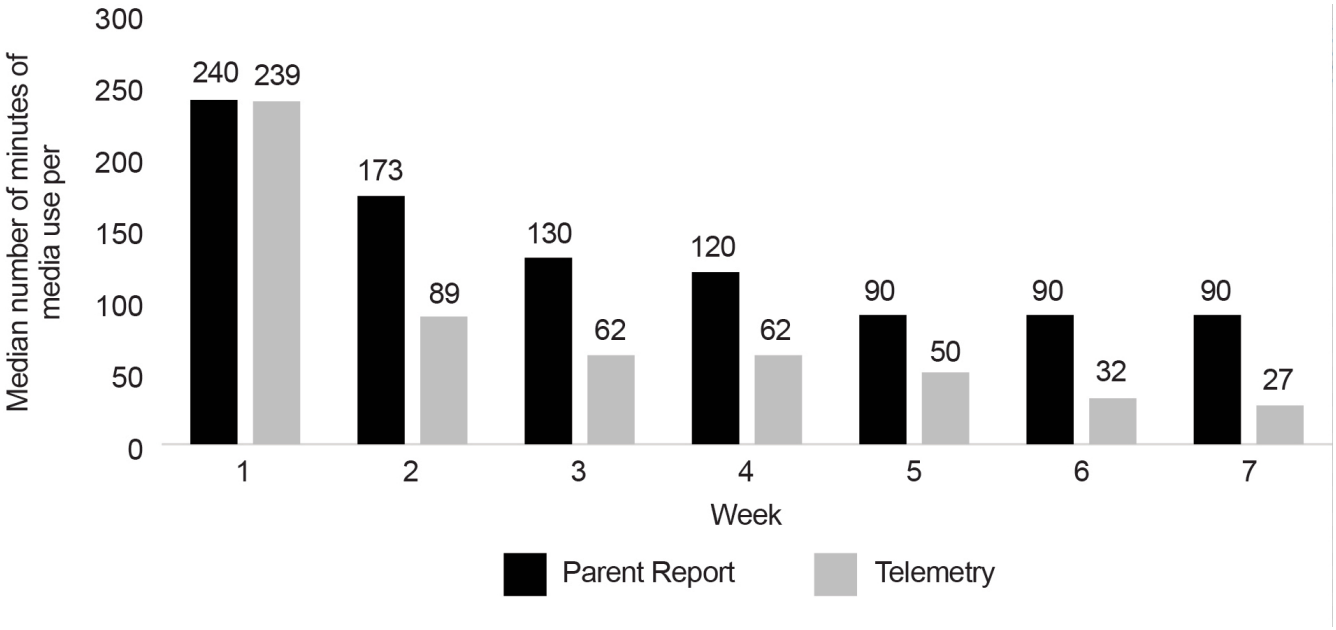

Figure 2. Parent-reported versus telemetry-tracked media usage by week.

How Does the Relationship Between Parent-Reported and Telemetry-Tracked Data Differ by Parent Characteristics?

Table 3 presents parent-telemetry concordance by parent characteristics. To test the statistical significance of these differences we conducted a mixed model regression, clustered by child, with a fixed effect for week. We did not identify statistically significant ($p < .10$) differences in the concordance between parent-reported and telemetry-tracked usage by parental education, parent income, or whether the child's home language was English.

Participant Characteristic	*N* Observations	Median Difference in Minutes (*SD*)
Parental education: High school or less (40 children)	185	40.4 (353)
Parental education: Greater than high school (158 children)	782	48.9 (279)
Parental annual income: Less than $50K (95 children)	460	53.2 (342)
Parental annual income: Greater than $50K (98 children)	484	40.4 (244)
Home language: Not English (47 children)	228	65.9 (413)
Home language: English (151 children)	739	40.2 (244)

Note. Medians indicate the number of minutes, on average, by which parent report exceeds telemetry report. Positive medians indicate greater parent-reported use than telemetry-tracked use. Negative medians indicate greater telemetry-tracked use than parent-reported use. Medians reported in this table do not account for the clustering of data points within child – that is, the fact that most children contributed multiple data points. All differences are not statistically significant; statistical analyses did account for the clustering of observations within child.

Table 3. Difference (in minutes) between parent-and tablet-reported child media usage by parent characteristics.

Discussion

This study examined concordance between parent-reported and telemetry-tracked tablet use among 4- and 5-year-old children. We found that these two media-use tracking methods are significantly positively correlated, and their estimates of child media use were within one hour of one another for 41% of the data points in this study. These findings are consistent with prior television-viewing studies (Anderson, Field, Collins, Lorch, & Nathan, 1985; Robinson et al., 2006), and extend their findings to tablet computer usage.

Yet these two sources of data do not concur perfectly. In study week 1 parent-reported media usage was nearly identical to telemetry-tracked media usage. In subsequent weeks telemetry-tracked usage declined more sharply than parent-reported usage. We interpret these findings to indicate that parents overreported their child's media use. As their child's media usage declined, parents may have felt pressure to report that their child was still using the intervention media for the recommended duration of one hour or longer. This finding may also be explained by self-selection bias. As parent media survey response rates declined over seven weeks, it is possible that those who continued to complete surveys were systematically different—for example, more conscientious—in a way that biased them toward overreporting.

Some potential explanations for these findings seem less plausible because they do not account for the contrast in parent-telemetry concordance between week 1 and all subsequent weeks. For example, this pattern is not consistent with a general trend toward overreporting observed media use (Robinson et al., 2006; Sewall et al., 2019). It is also possible that some parents may have misunderstood the survey question, which asked for hours and minutes of media usage. Perhaps they assumed that the minutes field required a conversion of weekly hours into minutes. This would explain higher parent-reported than telemetry-reported usage, but it would not explain the concordance gap between week 1 and subsequent weeks.

It is also possible that the telemetry data underreported children's media use. Telemetry recorded usage on only one device per participant, whereas parents had the opportunity to report on usage across devices. We think this explanation is unlikely for two reasons. First, we would expect such a trend to be consistent across weeks, whereas we found a sharp contrast between week 1 and weeks 2 through 7. Second, it is unlikely that children were using

the intervention media on other devices because the intervention videos were not publicly available, although the intervention games were. In addition, parents were told that the study-provided tablet should be the primary way the child accessed the treatment media during the study.

For both data-collection methods, it is possible that media usage may have been affected by the parents' knowledge that it was being tracked, or that they were in a study that was asking them to use media, rather than in a naturalistic environment.

Researchers planning future studies using parent-reported child media usage measures might consider ways to improve parent-reporting methods to reduce memory and recall effects. For example, experience sampling may provide more accurate data (Csikszentmihalyi & Larson, 2014). Studies using telemetry usage data might devise ways to track who is using the tablet, such as with a log-in screen, and to track whether the user is engaged, such as requiring a periodic screen tap during video play.

These findings suggest that parent report is not a reliable substitute for telemetry data when measuring time spent using a media-based intervention. Parent report may diverge from telemetry data, subject to the most salient social pressures and the observability of the child's media use. Our findings suggest that when parent reports and telemetry data differ, parents may tend to overreport their child's media usage. Despite its limitations, parent-reported media usage may be preferable to telemetry data when measuring other aspects of media use, particularly how media are being used, such as questions of joint media engagement or attention while watching videos. Using both parent report and telemetry data together may provide the most comprehensive description of children's media use.

References

Anderson, D. R., Field, D. E., Collins, P. A., Lorch, E. P., & Nathan, J. G. (1985). Estimates of young children's time with television: A methodological comparison of parent reports with time-lapse video home observation. *Child Development*, 56(5),1345–1357.

Csikszentmihalyi, M., & Larson, R. (2014). Validity and reliability of the experience-sampling method. In *Flow and the foundations of positive psychology: The collected works of Mihaly Csikszentmihalyi* (pp. 35–54). Dordrecht, The Netherlands: Springer.

Gentile, D. A., Nathanson, A. I., Rasmussen, E. E., Reimer, R. A., & Walsh, D. A. (2012). Do you see what I see? Parent and child reports of parental monitoring of media. *Family Relations*, 61(3), 470–487.

Grindal, T., Silander, M., Gerard, S., Maxon, T., Garcia, E., Hupert, N., Vahey, P., & Pasnik, S. (2019). *Early science and engineering: The impact of The Cat in the Hat Knows a Lot About That! on learning*. New York, NY, & Menlo Park, CA: Education Development Center& SRI International. Retrieved from https://files.eric.ed.gov/fulltext/ED603162.pdf

Rideout, V. (2017). *The Common Sense census: Media use by kids age zero to eight*. San Francisco, CA: Common Sense Media.

Roberts, J. D., Chung, G. K. W. K., & Parks, C. B. (2016). Supporting children's progress through the PBS KIDS learning analytics platform. *Journal of Children and Media*, 10(2), 257–266. https://doi.org/10.1080/17482798.2016.1140489

Robinson, J. L., Winiewicz, D. D., Fuerch, J. H., Roemmich, J. N., & Epstein, L. H. (2006). Relationship between parental estimate and an objective measure of child television watching. *International Journal of Behavioral Nutrition and Physical Activity*, 3(1), 43.

Scharkow, M. (2016). The accuracy of self-reported Internet use—A validation study using client log data. *Communication Methods and Measures*, 10(1), 13–27.

Sewall, C., Rosen, D., & Bear, T. M. (2019, April 12). *Examining the accuracy of estimated smartphone use: How well-being and usage level predict discrepancies between estimated and actual use*. https://doi.org/10.31234/osf.io/3sju4