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Novel Profiles of Family Media Use: Latent Profile Analysis

Nicole Hamp, Jenny Radesky, Heidi M Weeks, Alison L Miller, Niko Kaciroti

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Table of Contents

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Abstract

Background: Over the past three decades, digital and screen media have evolved from broadcast, stationary platforms to a complex environment of interactive, omnipresent, mobile media. Thus, clinical guidance centered around unidimensional concepts such as 'screen time' must be modernized to help families navigate the intricate digital ecosystems of readily available entertainment and information.

Objective: This study aimed to identify and examine distinct latent profiles of media use in families with young children. We hypothesized that latent profile analysis (LPA) would identify different media use profiles characterized by more heavy, reactive, individual, and permissive media use; and more intentional, regulated, and/or shared uses of media.

Methods: We analyzed data from 398 preschool-aged children. English-speaking parents were recruited through community settings. Participants completed surveys regarding several aspects of family media use: child device use/activities; parent concerns/attitudes; limit setting and mediation; parent media use; and technology interference; these were examined in a latent profile analysis (LPA). The number of latent media profiles was determined using Bayesian Information Criteria. Parents also completed validated scales of parenting stress, depression symptoms, parenting style, child behavior, child sleep, and household disorganization. Multivariable logistic regression was used to examine parent, child, and household predictors of group membership.

Results: The LPA yielded 2 distinct groups that differed in the duration of media used by parents and children, use to calm children, or help children fall asleep. Statistically significant differences between groups included: families in Group 1 (n=236, which we termed Media as Social-Emotional Buffer) had parents who preferred interactions via text or email to in-person (p=0.006) and were more likely to use media to calm their children (p=0.03). In contrast, Group 2 (n=162, Intentional Media) used more task-oriented media, including audio and non-game apps (p=0.01), had more concerns about effects of media on child language development (p=0.04), and used more media restrictions (p=0.01). In regression models, female sex of the parent respondent, greater number of siblings, and later child sleep period independently predicted Group 1 membership.

Conclusions: Findings suggest divergent family media use patterns that can be categorized into two main media user groups – those that use media to buffer social situations or regulate emotions and those that plan mobile device use around functional purposes and concerns around media exposure. Profiles associate with household size and child sleep. More research is needed to examine the impact of social and emotional uses of media on child outcomes. Clinical Trial: NICHD R21HD094051

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Novel Profiles of Family Media Use: Latent Profile Analysis

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Contributions:

Nicole Hamp conceptualized and contributed to the design the study, reviewed all data, participated in the statistical analysis, drafted the initial manuscript, and reviewed and revised the manuscript.

Jenny Radesky was the primary investigator on the grant award for the original study, contributed to the conceptualization of the current study, advised on study design, reviewed data, participated in the statistical analysis, and reviewed and revised the manuscript.

Heidi M Weeks advised on study design, conducted the statistical analysis, summarized the study data, developed related figures and tables, and contributed to, reviewed, and revised the manuscript.

Alison L Miller advised on study design, reviewed data and outcomes, reviewed and revised the manuscript.

Niko Kaciroti advised on study design, directed and oversaw the statistical analysis, reviewed study data, and reviewed and revised the manuscript.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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ABSTRACT

Background: Over the past three decades, digital and screen media have evolved from broadcast, stationary platforms to a complex environment of interactive, omnipresent, mobile media. Thus, clinical guidance centered around unidimensional concepts such as 'screen time' must be modernized to help families navigate the intricate digital ecosystems of readily available entertainment and information.

Objective: This study aimed to identify and examine distinct latent profiles of media use in families with young children. We hypothesized that latent profile analysis (LPA) would identify different media use profiles characterized by more heavy, reactive, individual, and permissive media use; and more intentional, regulated, and/or shared uses of media.

Methods: We analyzed data from 398 preschool-aged children. English-speaking parents were recruited through community settings. Participants completed surveys regarding several aspects of family media use: child device use/activities; parent concerns/attitudes; limit setting and mediation; parent media use; and technology interference; these were examined in a latent profile analysis (LPA). The number of latent media profiles was determined using Bayesian Information Criteria. Parents also completed validated scales of parenting stress, depression symptoms, parenting style, child behavior, child sleep, and household disorganization. Multivariable logistic regression was used to examine parent, child, and household predictors of group membership.

Results: The LPA yielded 2 distinct groups that differed in the duration of media used by parents and children, use to calm children, or help children fall asleep. Statistically significant differences between groups included: families in Group 1 (n=236, which we termed Media as Social-Emotional Buffer) had parents who preferred interactions via text or email to in-person (p=0.006) and were more likely to use media to calm their children (p=0.03). In contrast, Group 2 (n=162, Intentional Media) used more task-oriented media, including audio and non-game apps (p=0.01), had more concerns about effects of media on child language development (p=0.04), and used more media restrictions (p=0.01). In regression models, female sex of the parent respondent, greater number of siblings, and later child sleep period independently predicted Group 1 membership.

Conclusions: Findings suggest divergent family media use patterns that can be categorized into two main media user groups – those that use media to buffer social situations or regulate emotions and those that plan mobile device use around functional purposes and concerns around media exposure. Profiles associate with household size and child sleep. More research is needed to examine the impact of social and emotional uses of media on child outcomes.

Trial registration: NICHD R21HD094051

Keywords: *Preschool; Digital Media; Mobile Media; Media Use; Latent Profiles*

INTRODUCTION

Background: The landscape of digital technology use has changed dramatically over the past few decades. Digital and screen media have evolved from broadcast, stationary platforms – where screens stay put, plugged into the wall, and messages are transmitted broadly in a one-to-many model – to a world of interactive, mobile media, where screens can follow users wherever they go and interact in a bi-directional manner. For this reason, researchers have questioned whether clinical guidance centered around unidimensional concepts such as 'screen time' are helpful to parents trying to navigate digital ecosystems of readily available entertainment and information,[1] particularly in light of families' increased technologic dependence during and following the COVID-19 pandemic.

Distinctions between traditional (e.g., television [TV]) and mobile/interactive media are important for several reasons. First, the portability and easy accessibility of mobile media inherently allows for more spontaneous and reactive use patterns in which the technology becomes increasingly more integrated into daily routine and activities.[2,3] Second, small, handheld screens are more difficult for parents to monitor.[4] And third, mobile media use has rapidly become exceedingly common, even in infants and toddlers. As of 2017, 98% of homes of children 0-8 years old had a mobile device, and one third of all screen time in that same age group, who use on average almost 2.5 hours of screen media per day, was mobile.[5]

Prior work: In light of modern technologic advances, new ways of studying, conceptualizing, and framing media use guidance have been proposed. Young children's media use has been conceptualized as the "3 C's" – content, context, and the individual child – given the important role each of these factors plays in shaping child responses to media.[6] However, pervasive use of mobile media by families with young children requires new concepts such as use of devices for on-demand calming and keeping children occupied during daily activities.

To capture holistic patterns of family media use, it is also important to consider parents' mobile device use, which interrupts parent-child interaction[7] and is associated with less responsiveness,[8] but is an important part of parent social connection, work-life, and day-to-day functioning.[9] Parents' mediation behaviors – practices such as co-viewing, teaching children about media content, or setting limits – also shape children's responses to media.[10] Finally, child and parent media use are highly correlated,[11] yet are usually studied in isolation. One prior attempt to describe family-level media behaviors[12] primarily focused on viewing duration and type of media use, rather than the several contextual variables or social-emotional drivers of media use in the current digital environment.

Goal of This Study: The current study aims to identify patterns that include the aforementioned concepts, examined through latent profile analysis, to try to identify patterns and concepts that might generate insights for clinical guidance and future research. Specifically, we sought to identify novel patterns of family media use that take into account: child duration and frequency of media activities; child use to keep occupied, regulate behavior, or fall sleep; parent attitudes about child use; limit setting and mediation; parent media use; and "technoference" (i.e., technology interference in parent-child activities). We hypothesized that latent profile analysis (LPA) would identify different media use profiles characterized by more heavy, reactive, individual, and permissive media use; and more intentional, regulated, and/or shared uses of media. We examined these patterns and their associations with parent, child, and household characteristics within a large cohort of preschool-aged children, as early childhood is an important time of establishing media use habits.[13]

METHODS

Overall Study Design: We analyzed data from the Preschooler Tablet Study, a longitudinal cohort

study (NICHD R21HD094051) examining associations between early childhood digital media use and social-emotional development. The present analysis used online REDCap[14] and Qualtrics survey data from the baseline data collection wave (August 2018 - May 2019). The study was approved by the University of Michigan Institutional Review Board.

Participants: Parents of young children were recruited via flyers posted in community centers, preschools, childcare centers, and pediatric clinics in southeast Michigan, as well as our university's online participant registry and social media advertisements. Interested parents who contacted the study team were emailed a link to an eligibility questionnaire. Eligibility criteria included: (1) parent was legal guardian of a 3-4.99-year-old child; (2) parent lived with the child at least 5 days per week; (3) parent understood English sufficiently to complete questionnaires and provide consent; and (4) the family owned at least one Android or iOS tablet or smartphone. To improve generalizability, participating children did not need to regularly use mobile devices to be included in the study. Exclusion criteria included child developmental delays or use of psychotropic medication.

Survey Measures – Child, Parent, and Household Characteristics: After providing electronic informed consent, respondent parents completed online surveys with a variety of questionnaires to assess characteristics of the child, parent, and household, as well as family media use practices. Demographic characteristics were collected on child age, sex, race/ethnicity (investigator-defined categories shown in Table 2), daycare/preschool enrollment, average sleep pattern (sleep onset and wake time, from which duration and midpoint were calculated, as well as sleep latency and overnight awakenings), prematurity, and whether they were an only child; parent age, gender, educational attainment, marital status, and employment status. We also used validated questionnaires to assess parent depression symptoms (Centers for Epidemiologic Studies – Depression Scale),[15] parenting stress (Parenting Stress Index-Short Form),[16] and parenting styles (laxness and harshness subscales of

The Parenting Scale);[17] as well as household income, size, composition, and disorganization (Chaos, Hubbub, and Order Scale).[18] Child self-regulation abilities were assessed with the Emotional Reactivity subscale of the Child Behavior Checklist – Preschool,[19] the Surgency subscale of the Rothbart Child Behavior Questionnaire – Very Short Form,[20] and the Behavior Rating Inventory of Executive Function – Preschool.[21]

Survey Measures – Media Use: Parents also completed a 75-item questionnaire about family media use derived from the CAFE (Comprehensive Assessment of Family Exposure) Consortium Qualtrics Survey, which has been described elsewhere.[22] This survey asks about technology and device ownership, content and context of media use, parent media use, and mediation practices (see Table 1 for constructs assessed). Questions on the survey addressed types of devices in the home and locations of those devices, parent attitudes towards media and concerns regarding child use of media, duration of use on weekdays versus weekends, time of use and environmental context of use (for example while falling asleep or while in transit), usual content (for example streaming video versus playing games), family interactions around media, and media-use functions.

Table 1. Media-related constructs assessed via the CAFE questionnaire

A. Child Ownership/Frequency of Activities
A1. Child ownership of mobile media device A2. Child keeps device in bedroom Frequency of mobile device use for specific activities: (A3. Watch TV; A4. Watch movies; A5. Play games; A6. Use apps that are not games; A7. Read electronic books; A8. Listen to music or audiobooks; A8. Take photos; A10. view photos/videos)
B. Child Instrumental/Regulatory Uses of Media
B1. Use of media during travel in car or public transit B2. Use of TV to calm when upset B3. Use of mobile devices to calm when upset Use of all types of screen media by parent for specific purposes related to child: (B4. To educate child; B5. Calm child down; B6. Keep child busy; B7. Communicate with family and friends; B8. Because child enjoys it) B9. Use of devices at bedtime B10. Use of devices while falling asleep
C. Parent Media Knowledge and Attitudes
Parent concerns that child will: (C1. Be exposed to inappropriate content; C2. Become inattentive as a result of using screen media; C3. Become addicted to screen media; C4. Miss out on other important opportunities that are more valuable than screen media; C5. Be exposed to harmful electromagnetic waves; C6. Have poorer language development).
D. Mediation Strategies

Presence of media content limits: (D1. Parents blocks specific media content on TV/devices; D2. Parent uses web blockers/controls; D3. Parent only allows child to watch "child-friendly" content; D4. Parent uses ratings to decide what child will watch; D5. Child media use only allowed if parent is in the room). D6. Household has media time limits D7. Media time limits are consistently enforced D8. Media content limits are consistently enforced D9 – D24: Valkenburg Mediation Scale
E. Parent Media Use
Outside of work hours, parent feels: (E1. The need to stay connected to work almost constantly; E2. The need to stay connected to friends and social media almost constantly; E3. It is easy to multitask between children and using a phone or mobile device; E4. Sometimes overwhelmed by how much they have to do on their phone or mobile device; E5. That they prefer to interact with others via texting, email, or social media, rather than in person; E6. Using their phone or mobile device allows them to "escape" a little bit while they're with their children; E7. Sometimes "addicted" to mobile media like smartphones or tablet devices). Frequency of specific activities during a typical weekday (Monday-Friday): (E8. Watch TV; E9. Use the computer; E10. Read traditional books; E11. Read electronic books; E12. Play videogames on console game player; E13. Use an iPad, iTouch, or similar device (not including a smartphone); E14. Use a smartphone for things like texting, playing games, watching videos, checking email, or surfing the internet). Frequency of specific activities during a typical weekend day (Saturday-Sunday): (E15. Watch TV; E16. Use the computer; E17. Read traditional books; E18. Read electronic books; E19. Play videogames on console game player; E20. Use an iPad, iTouch, or similar device (not including a smartphone); E21. Use a smartphone for things like texting, playing games, watching videos, checking email, or surfing the internet).
F. Technoference
Frequency of parent phone use during specific activities: (F1. During meals; F2. While getting child(ren) ready for school; F3. During playtime; F4. During bedtime routine; F5. While driving child(ren) to or from activities or when riding on public transportation; F6. At the playground).

Data analysis: Of the 423 participants who provided consent and completed surveys, we excluded participants who did not complete (n=19) or had substantial missing data (n=6) on the media use questionnaire. This left 398 participants in our current study available for the LPA. All media variables were included in LPA, a person-centered statistical method to identify distinct groups of participants with similar median profiles within each group. Using Bayesian Information Criteria (BIC), the LPA with the lowest BIC value yielded 2 distinct groups.

Wilcoxon Mann-Whitney tests were used to compare media use questionnaire items between the groups identified by the LPA. Then separate multivariable logistic regression models were built to estimate the odds of being in Group 1 vs Group 2 for each set of parent (Model I), child (Model II), and household (Model III) predictors. As our approach was exploratory, we started with including all

parent, child, or household characteristics in each respective model and conducted backward elimination, resulting in the most parsimonious model that retained only variables showing significant associations at a p-value of < .05. For all characteristics significantly associated with group membership in Models I, II, or III, we built a combined Model IV to test which characteristics were independently associated with group membership.

RESULTS

Participant Demographics: Parents were 93.7% female, 34.0 (SD 4.7) years old, and 62.0% had a 4-year college degree or more; children were 3.8 (SD 0.54) years old, 76.3% white non-Hispanic and 82.7% had siblings in the household (Table 2).

Table 2. Participant sociodemographic characteristics

	Characteristic	Mean (SD) or n (%)
Parent		
	Age	34.0 (4.7)
	Sex	
	Female	373 (93.7)
	Male	25 (6.3)
	Education	
	<=High school/GED	25 (6.3)
	Some college/2-year degree	126 (31.7)
	4-year college degree	100 (25.1)
	Advanced degree	147 (36.9)
	Marital status	
	Married/partner	360 (90.9)
	Single/separated/divorced	36 (9.1)
	Employment	
	Unemployed	110 (27.6)
	Part-time	76 (19.1)
	Full-time	185 (46.5)
	Multiple jobs	27 (6.8)
	Depression Symptoms (CES-D score[a])	9.32 (8.87)
	Parenting Stress Index percentile	44.6 (32.9)
	Parenting Scale – Laxness Subscale	2.61 (0.76)
	Parenting Scale – Overreactivity Subscale	2.56 (0.74)
Child		
	Age	3.85 (0.54)
	Sex	
	Female	186 (46.7)
	Male	212 (53.3)

	Race/ethnicity	
	Asian or Pacific Islander	11 (2.8)
	Black/African American, non-Hispanic	20 (5.1)
	Hispanic, any race	26 (6.6)
	Multiple races, non-Hispanic	32 (8.1)
	Native American or Alaska Native	5 (1.3)
	White, non-Hispanic	302 (76.3)
	Only child	
	Yes	69 (17.3)
	No	329 (82.7)
	Child gestational age	
	< 37 weeks (premature)	32 (8.0)
	37 weeks or later	366 (92.0)
	Child preschool/child care	
	Center-based child care	250 (65.8)
	Home-based child care	30 (7.9)
	Stays home with parent/caregiver	100 (26.3)
	Sleep Duration	10.8 (0.8)
	Sleep Midpoint (# of hours after 12 a.m.)	1.87 (0.82)
	Sleep Latency > 30 min	106 (26.6)
	Overnight awakenings	226 (60.4)
	CBQ-VSF[b] Surgency Subscale	4.40 (0.86)
	BRIEF-P[c] General Executive Composite	49.2 (12.0)
	CBCL-P[d] – Emotional Reactivity Subscale	3.69 (2.82)
Household		
	Income-to-needs ratio	2.95 (1.71)
	CHAOS[e] score	3.29 (2.93)

[a]CES-D = Centers for Epidemiologic Studies – Depression
[b]CBQ-VSF = Child Behavior Questionnaire Very Short Form
[c]BRIEF-P = Behavior Rating Inventory of Executive Function – Preschool
[d]CBCL-P = Child Behavior Checklist – Preschool
[e]CHAOS = Chaos, Hubbub, and Organizational Scale

Evaluation Outcomes: Latent profile analysis yielded 2 distinct groups of media users (Figure 1). Families in Group 1 (n=236) were more likely to prefer interactions via text, email, or social media rather than those in person (p=0.006) and more likely to use TV shows or DVDs to calm their children (p=0.03). Parents in Group 1 used their mobile device more frequently during the week to read electronic books (p=0.04). In contrast, Group 2 (n=162) used more task-oriented media, including more audio and non-game apps (p=0.01), had more concerns about effects of media on language development (p=0.04), and used more media restrictions (p=0.01).

As shown in Figure 1, several additional variables approached significance (p<0.20) that warrant mention. Parents in Group 1 were more likely to feel overwhelmed by how much they have to do on

their phone or mobile device (p=0.12) and reported that using the phone or mobile device allowed them to “escape” a little bit while with their children (p=0.14). They were more likely to watch TV or DVDs (p=0.15) or use the computer (p=0.10) over the weekend than were families in Group 2. Group 1 families also reported using more content restrictions for what their children see in the media with Internet filters, parental controls, or apps to block certain websites (p=0.11) and/or parental media websites (e.g. Commonsensemedia.org) to decide what types of programs are appropriate for their child. Finally, Group 1 families were more likely to use their mobile device to take photos (p=0.11).

Group 2 families preferred using their mobile devices to view photos or home videos (p=0.13) in addition to the other task-oriented media described above. They also noted concerns that children will become inattentive as a result of using screen media (p=0.11) and more frequently restrict the amount of child viewing (p=0.06).

In logistic regression models (Table 3), the only parent characteristic that was significantly associated with Group 1 membership (vs. Group 2) in Model I was female parent sex. In Model II, children with longer duration of sleep had lower odds of Group 1 membership, while those with later sleep midpoint and prematurity showed increased odds of Group 1 membership. Households with more siblings had a borderline increased odds of Group 1 membership in Model III. With all characteristics considered in the same model (IV), independent associations remained for female parent sex, greater number of siblings, and later child sleep midpoint.

Table 3. Multivariable logistic regression models predicting group assignment

	Variable	**Group 1 (Media as Social-Emotional Buffer) vs Group 2 (Intentional Media) aOR (95%CI)**

Model I: Parent characteristics		
	Parent sex (male vs female)	0.36 (0.16, 0.84)
Model II: Child characteristics		
	Sleep duration (per 1 hr) Sleep midpoint (per 1 hr) Prematurity (no vs yes)	0.72 (0.55, 0.95) 1.50 (1.13, 1.98) 2.26 (1.06, 4.80)
Model III: Household characteristics		
	Number of siblings (per sibling)	1.23 (0.998, 1.50)
Model IV: All characteristics		
	Parent sex (male vs female) Number of siblings (per sibling) Sleep midpoint (per 1 hr)	0.30 (0.12, 0.76) 1.27 (1.02, 1.57) 1.51 (1.10, 2.07)

DISCUSSION

Principle Results: This study used a wide range of questions about child, parent, and household context of media use to identify coherent patterns of media use that are relevant to pediatric research or clinical intervention. Latent profile analysis results suggest that people may be predisposed to different media-use patterns based on individual motivations. Group 1 preferred text and email interactions to those in-person and used media to calm their children. These behaviors may be interpreted as use of media as a social-emotional buffer. In contrast, Group 2 used media for more functional purposes. This group preferred more non-game and audio applications. They seemed warier of media, placed more restrictions around child media use, and had more concerns about the effect of media on child development. Though these findings in some way confirmed our initial hypothesis – that some types of media users are predisposed to more reactive-use patterns (Group 1), while others are more predisposed to intentional and regulated uses of media (Group 2) – the tendency to use media as a social-emotional buffer was not a factor we considered in our initial hypothesis.

When examining the overall patterns of media use between groups, a few theoretically coherent concepts arise. In Group 1, described as using media as a social-emotional buffer, there appeared to be more parent use of media as an "escape" from childrearing demands, such as more parental media during the weekends, which is typically time families are together during the day. In prior qualitative work, parents have described using mobile devices and social media as a "virtual escape" when their child stresses them out,[9] when they want to avoid parenting tasks,[23] or when intentionally not wanting to engage with difficult child behavior.[24] Furthermore, compared to parents in Group 2 who were more likely to view, but not take, photos or home videos on a mobile device, Group 1 families took photos on their device more frequently, an action that by definition interrupts a social moment and introduces a physical barrier between the individual taking the photograph and the subjects.

In Group 2, parent media use appeared more goal-oriented, and more limits and restrictions were placed on child media use, which may be related to greater concerns about media's effects on child wellbeing. This pattern of device usage has been described as "instrumental" (i.e., goal-directed and purposeful) rather than "ritualistic" in prior work,[25] and is hypothesized to be related to the individual motivations for engaging with technology. In the current study, we describe this pattern of device usage as intentional, similarly noting that this type of media use is meant to fulfill a purpose rather than for pleasure or distraction. Though we did not observe increased odds of Group 2 membership based on measures of parental mental health or child behavior, a recent study using latent class analysis found stronger well-being indicators for "family-engaged adolescents" who live in families with family-owned devices, positive parent relationships, and lower parental social media use.[26] Higher wellbeing also occurred in teens who placed lower importance on technology and were expected to follow household technology rules. Future research may therefore examine the relationship between these multiple classes of media users in a longitudinal manner to determine if "intentional" media-use families who set early boundaries around child media use are more likely to

have “family-engaged adolescents” with better social-emotional outcomes.

It is surprising that socioeconomic status, parenting stress, household disorganization, and child behavioral difficulties were not associated with membership in Group 1. In prior research, longer screen time duration and higher parent technology interference have been linked with higher parenting stress.[27–29] Recent work has also suggested that children’s screen time is a marker of family distress due to multiple psychosocial factors.[30] However, these studies only examined the variable of screen time, while our approach identified larger family media use patterns that appear independent of socioeconomic factors in this cohort.

We did find that mothers are more likely to use media as a social-emotional buffer and that this type of media use is more common in larger families. It is possible that mothers or parents of larger families may experience higher caregiver burden and, as a result, are using media for more self-regulatory purposes and to calm or manage child behavior more frequently. Indeed, use of digital technology as a ‘babysitter’ – to provide caregiver respite or allow parents time to tend to other tasks – is a concept that is well-described in research literature and mainstream news, albeit with some differences in acceptance across cultures.[31–35] Evidence suggests that use of media to occupy children may be especially relevant in homes where children require more attention or behavioral management due to temperament differences,[36] or where there is limited support for the primary caregiver. One study found that parents who lack support from a partner or who are uncertain about their parenting skills were more likely to use media as a distractor and concluded that “media are thus especially used as a distractor in the family when parents feel that it is difficult to keep the household going by themselves.”[34]

Another correlate of group membership was later sleep midpoint (i.e., the calculated midpoint

between reported average sleep onset and wake time), with Group 1 having later sleep midpoints than Group 2. This may be explained by the fact that Group 2, despite any significant difference in overall parenting style, seemed more prone to limit setting. What is perhaps most surprising about our study findings are the variables that did not predict group membership including parent education, marital status, employment, and child behavior variables such as emotional reactivity and surgency. Although human-computer interaction research has identified individual predictors of smartphone usage habits such as personality,[37] attachment style,[38] and executive functioning,[39] we found no associations of parenting style (such as laxness versus harshness), parenting stress, or depression symptoms with group membership.

Limitations: Our study was limited in generalizability due to our study population which included mostly white non-Hispanic race/ethnicity, higher-educated, and female parent-responders. While our cohort reflected the racial and ethnic diversity of our local area, results may not be generalizable to other populations. Additionally, the data we analyzed on media use was all from self-report questions, which can lead to single-reporter bias. We also reported on several associations that did not achieve significance, but were near-significant, that we included in our results as we felt the data helped to demonstrate an overall trend. Greater insight into the reasons for media use may have been gleaned from a mixed-methods approach, where follow up semi-structured interviews could have explored themes related to media as a social-emotional buffer versus to fulfill a desired goal.

Conclusions: Results of our study suggest that people likely do have different motivations behind their use of digital media that may be reflected in their usage patterns. The significance of these different media usage patterns for the long-term outcomes of children and families is yet to be determined. It is possible, and in fact likely, that each pattern of media use may be considered adaptive in certain situations and maladaptive in others. By having a better understanding of why and

how different families use media in their daily lives, pediatric care providers can provide more individualized anticipatory guidance regarding technology use by the whole family, including limit setting, use of media for calming, and how devices impact family dynamics. For example, by understanding that a parent is more prone to using mobile media to calm their child, a pediatrician might suggest that such a parent reflect on the frequency with which they use such calming techniques in order to ensure that they are also providing their child opportunities to practice frustration tolerance using techniques that go beyond distraction with media.

The research implications of our study may allow us to classify the media use patterns of families to better examine the long-term effects of media use on child health and development. Follow up studies could examine trajectories of profiles over childhood to determine their stability and how they relate to child outcomes over time. Future research directions should also include nationally representative populations, objective device use data, or reports from multiple household members (e.g., parents and children).

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Contributions:
Nicole Hamp conceptualized and contributed to the design the study, reviewed all data, participated in the statistical analysis, drafted the initial manuscript, and reviewed and revised the manuscript.

Jenny Radesky was the primary investigator on the grant award for the original study, contributed to the conceptualization of the current study, advised on study design, reviewed data, participated in the statistical analysis, and reviewed and revised the manuscript.

Heidi M Weeks advised on study design, conducted the statistical analysis, summarized the study data, developed related figures and tables, and contributed to, reviewed, and revised the manuscript.

Alison L Miller advised on study design, reviewed data and outcomes, reviewed and revised the manuscript.

Niko Kaciroti advised on study design, directed and oversaw the statistical analysis, reviewed study data, and reviewed and revised the manuscript.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Abbreviations:

BIC: Bayesian Informed Criteria

CAFE: Comprehensive Assessment of Family Exposure

DVD: digital versatile disc

LPA: latent profile analysis

TV: television

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Figures

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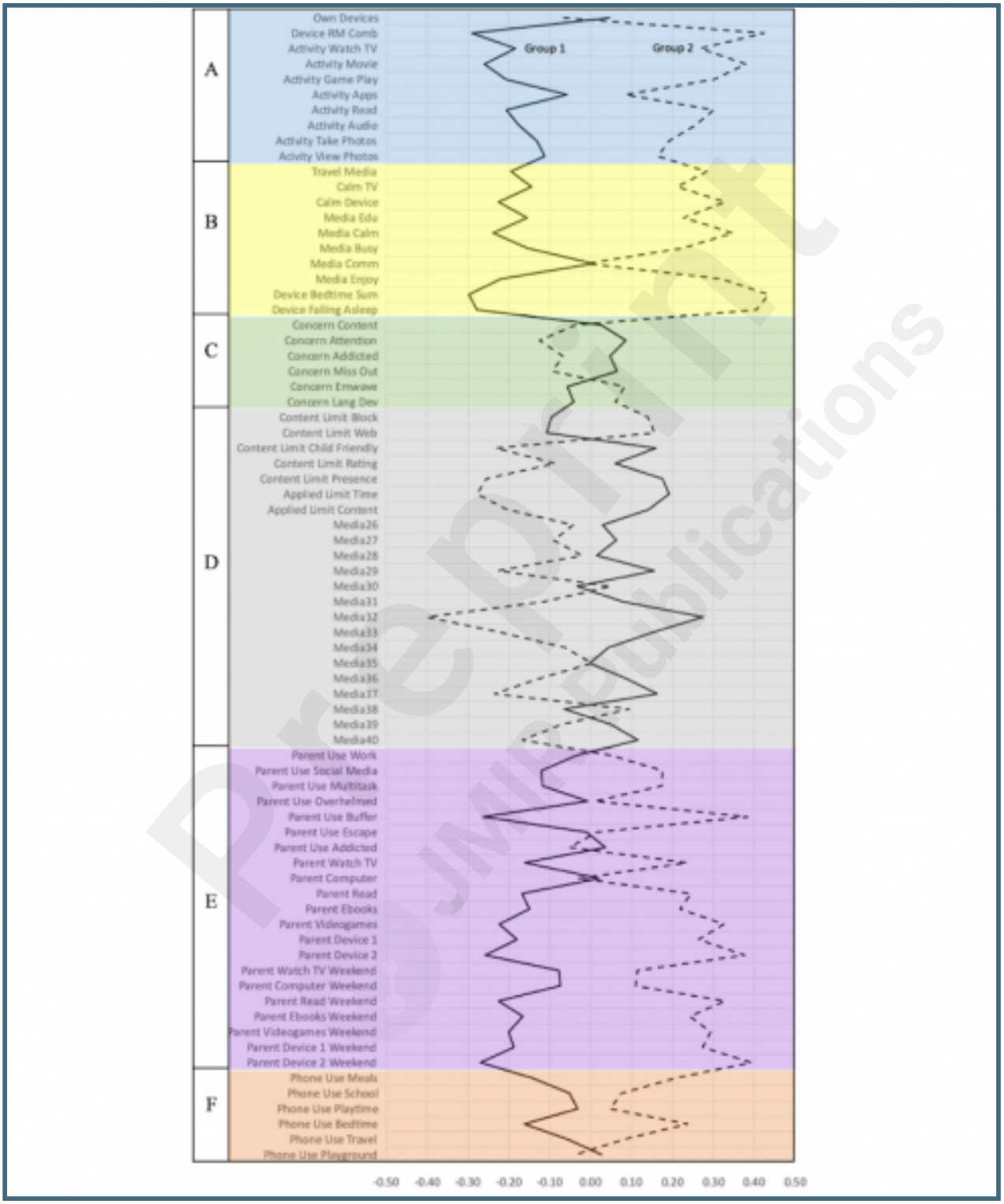
Latent Profile Analysis: Media Use Profiles. Standardized means by variable for Group 1 versus Group 2. Lettering (and color-coding) describes variable type. A (blue): Child Ownership/Frequency of Activities. B (yellow): Child Instrumental/Regulatory Uses. C (green): Concerns about child use. D (grey): Limit Setting and Mediation. E (purple): Parent Media Use. F (orange): Technoference.



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