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BRIEF REPORT

Maternal nighttime phone use and impacts on daily happiness and exhaustion

Experts recommend avoiding mobile phone use (MPU) before bed to promote optimal sleep hygiene.¹ Yet, MPU at bedtime is common and associated with shorter sleep duration, lower sleep quality, depressive symptoms and worse daytime functioning and tiredness.² Most studies that examine MPU and mental health involve children and adolescents, using questionnaires subject to response biases. Objective assessments (e.g., passive sensing of phone use) are needed to obtain more accurate measures.³ Further, examinations of MPU patterns have rarely been extended into the parenting context. The aims of this study were to (1) quantify mothers' bedtime MPU via objective phone measures and (2) examine within-person associations of mothers' bedtime MPU with happiness and exhaustion the following day. We hypothesised greater bedtime MPU would be associated with lower daytime happiness and greater exhaustion the next day.

Participants included 42 U.S. mothers with a child 5 years old or younger (52% female) recruited with flyers distributed via daycares, preschools and online parenting groups. Mothers were 31.50 years old (SD = 4.16), and children were 2.34 years old (SD = 1.62). Median household income was \$95,000 (SD = \$45,834; Range = \$25,000–\$250,000). Most were Caucasian (93%) and had a Bachelor's degree or higher (76%). Data collection occurred from May 2020 to March 2021. Study procedures were approved by the Parkview Health review board.

Mothers completed consent, followed by a baseline online survey on demographic characteristics, technology use, and well-being. About 8.05 days later (SD = 3.37), they began 5 days of MPU tracking and nightly surveys. The RescueTime app was installed on participants' smartphones and continuously tracked MPU across 5 days. Data were downloaded via the RescueTime API, which presented the number of seconds of MPU binned into 5-min intervals across the study period. Only eight nights of data were missing, leaving 202 nights of MPU data. Each night before bed, participants completed a brief online survey (taken on their computer) where they reported daily bedtimes, happiness and exhaustion. Participants completed 201 total daily surveys. After matching daily surveys with the phone tracking data, there were a total of 193 matched days, equating to an average of 4.59 days (SD = 0.94) completed per participant.

Each night, mothers reported the time they had gone to bed the night before. The researchers indicated each participants' bedtimes

in the appropriate places on the phone data in a spreadsheet, and then a MATLAB script calculated the MPU hours during the hour before and the two hours after the participant's bedtime each night—given recommendations to not use screens before bed¹ and evidence that phones are often used after going to bed.⁴ Each night, mothers responded to the item 'How happy are you with your life right now?' on a 10-point scale, 1 (Extremely unhappy) to 10 (Extremely happy). Mothers also responded each night to the question 'How much of the time TODAY have you felt the following emotions?' and within this question one item was 'Worn out or Exhausted'. Mothers rated this item on a 5-point scale, 0 (None of the time) to 4 (All of the time).

Analyses were conducted in SAS 9.4. Descriptives and correlations were first examined. Then, two multilevel models were run, one with each daily outcome variable (i.e., happiness and exhaustion). Multilevel modelling was utilized to properly account for the nesting in the daily data (assessments within individuals across days). Bedtime MPU (from the previous night) was split into its between-person and within-person portions before being entered into the models. In this paper, we focus on the within-person associations (e.g., on nights when a participant engages in phone use that is greater than their personal average, does the participant report worse feelings the next day?). Covariates included mother age, child age, income, race, education, and number of children.

During the hour before and two hours after their reported bedtimes, mothers showed 0.59 h of MPU on average across all days of data (SD = 0.62; Range = 0–2.83); 90.4% of all days showed bedtime MPU, and 88% of mothers had bedtime MPU on 80%–100% of days. On average across all days, mothers were moderately happy ($M = 7.89$, $SD = 1.53$; Range = 3–10) and were exhausted 'a little of the time' ($M = 1.26$, $SD = 0.97$; Range = 0–4). At the within-person level, bedtime MPU correlated with lower next-day happiness ($r = -0.21$, $p < 0.01$) and greater next-day exhaustion ($r = 0.18$, $p = 0.03$), and daily happiness and exhaustion were negatively correlated ($r = -0.39$, $p < 0.001$). The unstandardized multilevel model estimates are presented in Table 1. Significant within-person effects emerged. Mothers rated less happiness ($b = -0.37$, $p = 0.03$) and greater exhaustion ($b = 0.32$, $p = 0.03$) on days after they used their phone at bedtime for more time than their typical bedtime MPU.

These findings suggest that maternal bedtime MPU is common and influences their next-day happiness and exhaustion. These

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TABLE 1 Unstandardized estimates for the multilevel models of maternal bedtime phone use on the next day's happiness and exhaustion

Fixed effects	Model 1: Daily happiness		Model 2: Daily exhaustion	
	<i>b</i>	SE	<i>b</i>	SE
Intercept	7.80***	0.48	1.53***	0.25
Day	-0.08	0.05	-0.09*	0.04
Weekend day	0.26	0.15	-0.11	0.12
Control variables				
Maternal age	-0.06	0.07	-0.03	0.03
Child age	0.02	0.15	-0.01	0.07
Family income	0.003	0.006	0.004	0.003
Ethnic minority	-0.004	0.86	-0.55	0.43
No bachelor's degree	-0.22	0.56	0.13	0.28
Multiple child family	0.30	0.57	-0.05	0.28
Nightly phone use around bedtime				
BP bedtime phone use	0.03	0.49	0.31	0.24
WP bedtime phone use	-0.37*	0.17	0.32*	0.14

Note: ****p* < 0.001, ***p* < 0.01, **p* < 0.05. Day is centered on day 1. Variables were coded as follows: weekend day (0 = weekday, 1 = weekend day), ethnic minority (0 = Caucasian, 1 = other race), no bachelor's degree (0 = bachelor's degree or higher, 1 = less than bachelor's degree) and multiple child family (1 = multiple children, 0 = only one child in family). Except for the above-mentioned variables, all other variables were grand mean centred. Family income was in \$1000 units. Daily bedtime phone use was split into between-person (BP) and within-person (WP) portions, and both portions were included in the model.

results coincide with literature on bedtime MPU and poorer sleep and greater fatigue.² This study differs from previous investigations as it focuses on mothers of young children. Previous studies on parental MPU have reported adverse effects of MPU on parenting practices and child behaviour, but these have focused on MPU during parent-child interactions.⁵ Less is known about how parental MPU in other contexts, such as at bedtime when not around their children, may impact parents and subsequent parenting. The associations between maternal bedtime MPU and next-day exhaustion and mood may have implications for maternal and child outcomes, as parental cognitive resources could become depleted and thus negative parenting behaviors ensue. Future research should examine how maternal bedtime MPU relates to next-day parenting, and whether effects on parenting are mediated by changes in maternal fatigue or mood due to bedtime MPU.

Data were collected during the COVID-19 pandemic; future work should examine results post-pandemic. Limitations include a largely Caucasian, higher socioeconomic status sample and the potential influence on bedtime routines of completing brief, nightly surveys on a computer. Future research could benefit from objective measurement

of sleep onset. Child night waking may also be important to control. Strengths of this research include the objective measurement of MPU and links with daily assessments of well-being, allowing for an examination of within-person experiences and changes from day to day.

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CONFLICTS OF INTEREST

None.

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