

Lo, C.K.M. et al.: Parents' negative emotional states and adolescents' gaming duration: A dyadic ecological momentary assessment study

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Supplementary Table S1. Checklist for Reporting EMA Studies (CREMAS).

Section	Topic	Item #	Checklist item	Page number reported
Title		1	Include ecological momentary assessment in title and key words Parents' negative emotional states and adolescents' gaming duration: A dyadic ecological momentary assessment study	1
Introduction	Rationale	2	Briefly introduce the concept of EMA and provide reasons for utilizing EMA for this study or topic of interests (eg, to examine time-varying predictors of unhealthy eating occasions in children's daily lives) "Despite such theoretical insights, methodological limitations in existing studies have hindered a nuanced understanding of the parent-child dynamics in GD. Cross-sectional and retrospective designs often fail to capture day-to-day and within-day variability in subjects' emotions and behaviors, thus exposing the study results to recall bias (Trull, Ebner-Priemer, Trull, Ebner-Priemer, & Strauss, 2009). The ecological momentary assessment (EMA) method addresses these limitations by collecting real-time data on emotions and behaviors in naturalistic settings, through use of mobile devices (Shiffman, Stone, & Hufford, 2008; Stone & Shiffman, 1994). The EMA approach minimizes recall bias, enhances ecological validity, and is well-suited for examining transient affective states."	4
Methods	Training	3	Indicate if, and by what methods, training of participants for EMA protocol was used Participants were asked to sign up for one of the available time slots for the briefing session, and they were given choice to participate online via Zoom or in-person at the university the first author affiliated. Each briefing session consisted of 15-20 participants, and was conducted by the first author and a research staff member. During the briefing session, participants were introduced the purpose and procedures of the study and asked to download and set up an account for the in-house	eTable1

			EMA app, which was available for the Android and iOS platforms. Participants were instructed to sign up for an app account, navigate the app, and provided sufficient time to ask questions about it. Participants were asked to behave as usual during the study period. To minimize potential social desirability responses, participants were reassured that the research team will not reveal anything they reported in the surveys to anyone, including their parents and teachers. A major disadvantage of EMA is the potential risk to personal information privacy, particularly related to collection of passive data such as participant location. To protect participants' privacy, our EMA app did not collect participants' personal identifiers or passive data. After the briefing session, participants were given one day to trial run the app before the commencement of the 14-day EMA.	
	Technology	4	Describe what technology, if any, was used. Include the following information: device (eg, mobile phone, portable computer), model (eg, Nexus 4, iPod), operating system (eg, Android, Windows), and EMA program name An EMA smartphone app called “Longitudinax Pro” was developed by the research team to collect momentary data before the commencement of the study. Prior to the 14-day EMA, eligible participants were asked to complete the pre-EMA survey online and underwent training for the EMA app at a briefing session either online or in person.	6
	Wave duration	5	State the number of waves for the study (eg, 2 monitoring periods over the course of 1 year) Three waves of data collection over the course of approximately one month: one pre-EMA session, 14-day EMA period, one post-EMA session	6
	Monitoring period	6	State the number of days each wave of the study lasted, and how many weekdays versus weekend days The entire EMA period lasted for 14 consecutive days total, with maximum two weekends	6
	Prompting design	7	Indicate the prompting strategy used for the study (eg, event-based, interval-based, or a combination of the two). If using interval-based strategy, indicate what type of schedule is used (eg, fixed, random, or hybrid interval) The current study adopted the interval-based EMA approach. During the EMA period, the app sent push notifications to participants daily at four randomized times during four pre-determined periods (between 11am and 12pm, 2pm–3pm, 5pm–6pm, and 8pm–9pm) for a total of 14 consecutive days (56 surveys in total).	6, 7

			Participants were required to complete the survey within 20 minutes of the first notification. After the last day of EMA, participants were asked to complete the post-EMA survey online within 7 days.	
	Prompt frequency	8	Intended frequency of prompts per day. Break down by weekdays and weekend days if applicable During the EMA period, the app sent push notifications to participants daily at four randomized times during four pre-determined periods (between 11am and 12pm, 2pm–3pm, 5pm–6pm, and 8pm–9pm) for a total of 14 consecutive days (56 surveys in total). Participants were required to complete the survey within 20 minutes of the first notification. After the last day of EMA, participants were asked to complete the post-EMA survey online within 7 days.	6, 7
	Design features	9	Describe any design feature to address potential sources of bias (eg, reactivity) or participant burden (eg, EMA questions appearing in different orders) We deliberately shortened the EMA survey so that each entry should only take no more than two minutes to complete. This was reflected in the embedded data of the app.	NA
Results	Attrition	10	Indicate participant attrition throughout the study; report attrition rates both by monitoring days and waves, if applicable No attrition was observed in the study. A total of 70 parent-child dyads were recruited; 64 were matched for analysis of Hypothesis 1 and 63 were matched for analysis of Hypothesis 2.	10
	Prompt delivery	11	Report number of EMA prompts that were planned to be delivered. If possible, also report the number of EMA prompts that were actually received by participants and indicate reasons for why prompts were not sent out (eg, technical issues or participant noncompliance reason such as phone was powered off) To our knowledge, we did not receive any report of failed EMA prompt.	NA
	Latency	12	Report the amount of time from prompt signal to answering of prompt Our embedded/cached data indicated that participants took in average less than two minutes to start answering an EMA survey.	NA
	Compliance rate	13	Report total answered EMA prompts across all subjects and the average number of EMA prompts answered per	Table 3

			person. Report compliance rate both by monitoring days and waves, if applicable. Indicate reasons for noncompliance, if known The number of total answered EMA prompts for children was 3050 and that for parents was 3037. The average number of EMA prompts answered was 48.4 and 48.2 for children and parents respectively. Time-related compliance rates are tabulated in Table 3 of the manuscript. See item 14 for reasons for noncompliance.	
	Missing data	14	Report whether EMA compliance is related to demographic or time-varying variables The children were more likely to participate when their parents also participated in the same time slot and they were less likely to fill out the survey when they were not at home, were by themselves, or were playing games. The children's positive affect significantly predicted their compliance, thus illustrating that the children's momentary participation tended to go away when they were experiencing intense emotions. Similar results for momentary affect were observed in the parents' responses. The parents' positive affect significantly predicted their compliance with the EMA prompts, whereas their negative affect predicted their compliance at the within-person level only. Parents were more likely to participate if their child also participated, and they were less likely to respond when they were alone. Nonetheless, unlike the children, the parents' locations (while receiving the EMA notifications) did not seem to influence their level of compliance.	12, 13, Table 4, Table 5
Discussion	Limitations	15	Discuss limitations of the study, taking into account sources of potential bias when using EMA methods (eg, reactivity, use of technology) Caution is needed when interpreting the results of this pilot study. First, it was limited by the overrepresentation of mothers in the sample. Future research could explore whether the associations between parents' negative affect and emotion regulation and their adolescent children's gaming behaviors differ on the basis of the parents' sex or caregiving role. Second, the study was conducted with a small sample of Chinese adolescents from Hong Kong, thus the generalizability of the findings to adolescents in other cultural or geographic contexts is uncertain. Third, the use of the short form of the PANAS, in order to reduce respondent burden, might have failed to capture the full spectrum of emotional states experienced by the participants. Future research would therefore benefit both from replicating this pilot study in more diverse and representative samples, and from incorporating comprehensive affective measures, and methodologies designed to minimize reporting biases.	16

	Conclusions	16	Provide a general interpretation of results and discuss the benefits of using EMA (eg, improving understanding of daily behaviors) The major benefit of using EMA is it allows us to capture momentary psychological state, such as affect and emotion, intensively within a relatively short period of time, hence provides sufficient data points to analyze trajectory of variables of interest and perform more robust analyses such as mixed-effects models.	NA
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Table S2. Overview of All Study Measures.

	Pre-EMA	EMA	Post-EMA
Parent-reported	Parent's sex	Positive PANAS	Nil
	Parent's age	Negative PANAS	
	Education attainment	Current location	
	Employment status	Solitary status	
	Marital status	With-child status	
	Parent's chronic conditions		
	Child's chronic conditions		
	Household size		
	Household income		
	CSSA status		
	DERS		
	DASS		
Child-reported	Child's sex	Positive PANAS	IGDS9-SF
	Child's age	Negative PANAS	
	IGDS9-SF	Current location	
		Solitary status	
		With-parent status	
		Total game time (once a day)	

Note. EMA = Ecological momentary assessment. PANAS = Positive and Negative Affect Scales. CSSA = Comprehensive Social Security Assistance. DERS = Difficulties in Emotion Regulation Scale. DASS = Depression, Anxiety, and Stress Scale. IGDS9-SF = Internet Gaming Disorder Scale – Short Form.