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# Extreme mediation: Observing mental and physical health in everyday life

**Anthony Faiola**

Indiana University School of  
Informatics & Computing, IUPUI  
535 W. Michigan Street  
Indianapolis, IN 46202-3103 USA  
[faiola@iupui.edu](mailto:faiola@iupui.edu)

**Preethi Srinivas**

Indiana University School of  
Informatics & Computing, IUPUI  
535 W. Michigan Street  
Indianapolis, IN 46202-3103 USA  
[presrini@umail.iu.edu](mailto:presrini@umail.iu.edu)

**Abstract**

The excessive use of smartphones resulting in extreme mediation has been identified to result in psychological problems including anxiety, depression, and an overall neural change that is impacting people of all ages on many levels. An exploratory study using Experience Sampling Method (ESM) concluded a significant increase in positive mood, conscious awareness of the surrounding environment, and an increased number of participants self-reporting physical activity lasting 15 minutes on days without smartphone use. Results suggest the need to avoid increased use of non-invasive technology such as smartphones resulting in deterioration of mental and physical health.

**Author Keywords**

Extreme mediation, smartphone overuse, mental health, physical activity, conscious awareness

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation

**Introduction**

Smartphone overuse in young adults has been increasingly identified to lead to negative consequences such as sleep deprivation [1] and obesity [2]. Using or sleeping next to a smartphone has been found to affect the length and quality of sleep: the incandescent glow of phone screen and the

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Questions on mood	
mood1	Sad-Happy
mood2	Passive-Active
mood3	Ashamed-Proud
mood4	Worried-Relaxed
mood5	Weak-Strong
mood6	Lonely-Sociable
mood7	Bored-Excited
mood8	Unfriendly-Friendly
mood9	Angry-Calm

Questions on conscious awareness	
cons1	How conscious were you of your surroundings?
cons2	How conscious were you of the persons around you?
cons3	How conscious were you of time passing by?
cons4	How conscious were of personal problems?

**Figure 1.** ESM questions on mood and conscious awareness.

**Table 1.** Factor loadings and communalities based on principal components analysis with varimax rotation for 9 items on mood.

Rotated Component Matrix <sup>a</sup>			
	Component		
	Emotion	Action	Social
mood5	0.82	0.25	0.18
mood3	0.79	0.17	0.32
mood2	0.76	0.36	0.02
mood6	0.28	0.83	0.18
mood8	0.23	0.82	0.29
mood7	0.48	0.63	0.26
mood4	0.21	0.14	0.86
mood9	0.09	0.29	0.80
mood1	0.41	0.50	0.54

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.

radiation emitted by smartphones have been found to inhibit the production of melatonin, a critical hormone required for sleep [1]. Smartphones are increasingly replacing physical activities due to the introduction of games and social media. Related to these negative effects and in conjunction, neural changes in cognitive [3], emotional [4], social [5], and conscious awareness of world [6] resulting from excessive use of smartphones are being increasingly recognized recently. Studies confirm a range of psychiatric disorders that have been correlated to excessive use of smartphones, including: ADHD, weakening of cognitive focus and shallower thinking skills, reduction of creativity and problem solving skills, a lowered ability to filter out extraneous information, adverse effects upon psychosocial development, hyperactivity and behavioral problems, feelings of isolation, depression, anxiety and restlessness, and an inability to form meaningful and long-lasting relationships, leading to abnormal or anti-sociopsychology [7].

Researchers have also identified increased smartphone adoption [8] and dependence [9] and its related neuro-psychological and neuro-social effects on users. There is, however little known information about smartphone overuse and its effect on mood, physical activity and transformation of human consciousness. Further, while psychologists propose possible reasons for smartphone addiction owing to its ability to alter mood and trigger enjoyable feelings [10], it is not fully known if repetition of use is correlated to other areas of development. This emerging issue motivated us to address the effects of smartphone dependency on the mood and physical activity of youth. We also investigated the potential of smartphone use in altering human consciousness in everyday life.

We define consciousness as the inner state of being and intrinsic governing structures of human awareness.

Chalmers [11] refers to it as self-inwardness, self-awareness, and attention, voluntary control, knowledge, introspection, reportability, and awakeness. For centuries, human artifacts of cultural mediation, such as tools for work, have evolved from clubs to hammers to machines of the industrial age. Electronic tools/technologies, however, have never become so indistinguishably interwoven and prevalingly rooted within the development of our consciousness. Specifically, smartphones have become psychological tools that extend the conscious mind in the way we distribute thoughts, memories, exchange information and ideas, and fortify our personal relationships.

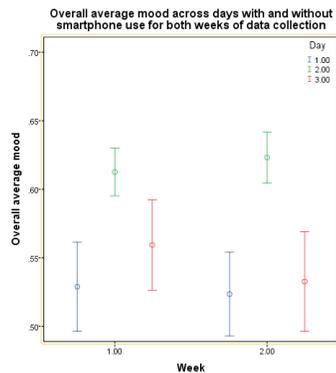
In this paper, we investigated the relationship between the self-reported subjective measures of mood, amount of physical activity, and conscious awareness of surrounding environment by college students using the Experience Sampling Method (ESM).

### Methodology

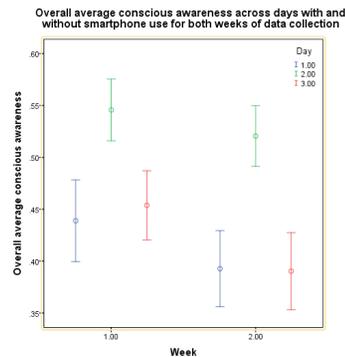
**Procedure.** 24 graduate students (63/36% male/female) logged their subjective experience using either iOS or Android phone seven times per day throughout three consecutive days for two weeks. Participants<sup>1</sup> were allowed normal use of their smartphone on days 1 and 3 while they had no smartphone with them (or their smartphone was switched off) on day 2, i.e., from midnight of day 1 until 6:00 am of day 3. Also, they were not allowed to use social media of any kind with any technology on day 2.

**Data collection and analysis.** We designed a survey questionnaire component of pre-programmed application services native to iOS and Android devices for data collection. For days 1 and 3, the pre-programmed

<sup>1</sup> Email was allowed only on computer. Participants reported moderate amount of texting and minimal usage of smartphone to make phone calls and had at least 3-4 years of smartphone usage.



**Figure 2.** Overall mood across days with and without smartphone use. Error bars in this and following figures indicate 95% CI.



**Figure 3.** Overall conscious awareness for days with and without smartphone use.

application automatically alerted participants to respond to the survey questions at seven preset times. Participants were contacted through email on the second day, where upon they filled out the same survey questionnaire using Google Docs. The survey took approximately 4 to 6 minutes to fill out and consisted of Likert-type questions (with continuous value ranging from 0 to 1) regarding participant mood, subjective feelings, conscious awareness of surrounding environment, and who they were with at that moment in time. The survey also included questions on the number of hours of physical activity (such as sports, walking, or exercising) between alerts (0, .25, .50, .75, 1, 1.25, 1.50, 1.75, 2, and 2+ hours). Data was analyzed using SPSS v21.

## Results

**Mood.** Overall, self-reported mood of participants was significantly higher on the day without smartphone use as compared with the days with smartphone use ( $\chi^2 = 132.94$ ,  $p < .001$ ). A principal components analysis with varimax rotation provided the best-defined factor structure with all the items in the analysis having primary loadings over 0.5 (Table 1). Based on the analysis, overall mood was broken into three factors: (1) mood resulting from emotions – due to conscious experiences of a physiological, psychological, and/or psychophysiological nature, (2) mood resulting from action performed, perceived, or reflected upon, and (3) mood resulting from a willingness to engage with others. Internal consistency of each of the three factors was examined using Cronbach's alpha ( $\alpha_{\text{Emotion}} = .787$ ,  $\alpha_{\text{Action}} = .820$ ,  $\alpha_{\text{Engage}} = .838$ ). No substantial increases in alpha for any of the scales was achieved by eliminating items. Composite scores were created for each of the three mood factors based on the mean of the items, which had their primary loadings on each factor. Higher scores indicated better corresponding mood. Although the participants were

instructed not to use social media on day 2, the composite factor  $M_{\text{Social}}$  was significantly high as compared with days 1 and 3 ( $Z = 8.16$ ,  $p < .001$ ). One possible reason for this outcome might be the willingness in participants to talk with or engage in activities with others rather than preoccupation with their smartphone or other interactive technologies.

**Number of hours of physical activity.** The number of reported hours of physical activity was split into three time zones: morning, afternoon, and evening. The number of participants reporting no physical activity in the morning decreased on the day without smartphone use as compared with days 1 and 3. Further, the count of participants reporting physical activity for 15 minutes in the morning increased significantly on the day without smartphone use ( $t(23) = .51$ ,  $p < .05$ ). No significant difference in number of hours of physical activity was noticed on comparing days with and without smartphone use for other durations in the morning, afternoon, or night.

**Conscious awareness of surrounding environment.** Overall, there was a significant increase in conscious awareness of the surrounding environment on the day without smartphone as compared with the days with smartphone use ( $Z = 11.22$ ,  $p < .001$ ).

**Relating mood and number of hours of physical activity.** The composite mood corresponding to participants perceived, performed, or reflected upon action ( $M_{\text{Action}}$ ) was found to be significantly correlated ( $r = -.072$ ,  $p < .001$ ) with overall self-reported time of physical activity performed by the participants. Although there was an increase in the composite factor  $M_{\text{Action}}$  for participants who reported 15 minutes of physical activity in the morning, it was not significant. One possible reason may be the influence of the other two composite factors on overall mood and its interrelationship to the number of physical activities.

**Relating mood and conscious awareness.** The overall mood and composite factors ( $M_{\text{Action}}$  and  $M_{\text{Social}}$ ) were not significantly correlated with conscious awareness. However, the composite factor on emotion ( $M_{\text{Emotion}}$ ) was significantly

correlated ( $r = -.09, p < .01$ ) with conscious awareness, thus supporting existing research on relating emotion to subjective conscious experience [12]. Thus, it is possible that users' (of smartphones) subjective emotions are influenced by conscious awareness of their general surrounding and specific contextual or environmental factors, including persons, places, ambience, and time. Hence, the excessive usage presence or possession of a smartphone by users may suggest that they are less mindful of their true emotions at the moment, having further influence on their interpersonal communication and interaction with others.

### Discussion and conclusion

We used an exploratory analysis that identified participants to have a positive mood, be consciously aware of their surroundings, and self-report at least 15 minutes of physical activity in the morning discrete time zone on days without smartphone usage. Our study is however limited by a small sample and its short duration. Future longitudinal studies spanning over several weeks or months with more participants will further validate our findings.

The results from this study provides implications for smartphone design and the HCI community. In particular, the notion of social consciousness and related cognitive processes associated with pervasive technology are ubiquitously transforming individuals and disrupting sociocultural structures at a profound rate. Although smartphones are perceived as tools that empower through augmenting cognitive proficiency, enhancing conscious acuity by distributing psychological functions, and off-loading cognitive capabilities, they may also negatively affect mental, physical, and social health.

How we learn and develop psychologically through the influence of mediational technologies is quite different than the technical tools of the past. It is this mediational dialectic

that we must confront, while identifying alternatives that can shape lives that are productive and social in nature. Future innovation in smartphone design must be visionary by providing users creative alternatives that motivate them to not seek excessive use. Rather, the use of smartphones and other foreseeable communication technologies should result in experiences that encourage positive social engagement and an increased sense of responsibility to self and others, both near and far.

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