Smart Phone Dependency and the Transformation of Consciousness in Everyday Life

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1. Introduction

Flow or optimal experience as described by Csikszentmihalyi[1], is a mental state of intrinsically rewarding concentration that is experienced between between frustration and boredom. If the challenge offered by the task is greater than the ability of the person, then performing the task causes frustration but if it lesser, it results in boredom. The other factors causing flow are clear goals, immediate feedback and merged action and awareness resulting in disappearing distractions from consciousness, no worry of failure, disappearance of self-consciousness and distorted sense of time[1].

There have been several studies investigating the usage of flow construct in information technologies in various domains like education, gaming, marketing etc. which direct to the possibility of the occurrence of flow in all kinds of interactions involving a digital device[2]. Chen et al. investigated the occurrence of flow experiences while using the World Wide Web and concluded that the platform would be especially suited for flow experiences[3] [4]. Finneran et al. studied flow experiences in computer-mediated environments[5] [6] while Ghani et al. studied the structure of flow experiences in information technology use[7]. Studies on flow in commercial websites suggest that it would be critical to facilitate flow experiences[8] to increase conversion rates. In case of ubiquitous computing, content and services are even more personalized to absorb the user's attention. It is therefore critical to examine how they affect flow experience of a user.

2. Problem and Question

In addition to the aforementioned technologies, an increased dependence on mobile technology (e.g., smartphones) has created an even greater neuro-psychological and neuro-social effect on users[8] [9] [10] [11] [12] [13] in the context of human-computer interaction (HCI). Our HCI research addresses the effects of smartphone use and its potential for altering human consciousness in everyday life. We define consciousness as the inner state of being and intrinsic governing structures of human awareness. Chalmers refers to it as self-inwardness, self-awareness, and attention, voluntary control, knowledge, introspection, and awakeness[14]. Humans uniquely utilize artifacts as tools to work: as forms of cultural mediation. Unlike the past use of clubs, hammers, or machines of the industrial age, today's technologies have become indistinguishably interwoven within the development of consciousness.

The prevailing use of smartphones is an advanced form of psychological tool that extend the conscious mind in the distribution of our thoughts and memories, in the exchange of information and ideas, and to fortify our personal relationships [ix]. The aim of this study is to observe the impact of flow on smart phone dependency and subsequent transformation of consciousness in everyday life.

As such, two questions arise from this aim: (1) Does smartphone use create dependency and in what way and to what degree is flow a factor? (2) Does smartphone use alter human consciousness?

3. Hypotheses

For purposes of testing these questions four hypotheses were devised. The hypotheses are:

H1 Participants with regular smartphone use will show significant differences in flow between day 1 (with smartphone use) and day 2 (with no smartphone use).

H2 Participants with regular smart phone use will show significant differences in flow between day 2 (with no smart phone use) and day 3 (with smart phone use).
H3 Participants with regular smart phone use will show a slight increase in flow between day 1 (smart use before no smart day) and day 3 (post no smart use day)
H4 Participants with regular smart phone use will show significant differences in their level of consciousness between days 1 and 3 (with smart phone use) and day 2 (with smart phone use).

4. Method

Most of the traditional flow studies depended on self-reported data. In this study, the popular Experience Sampling Method was used to examine the experiences of one graduate student with a smart phone in everyday life.

The participant reported current activity and subjective experience at the time when she was beeped. The research design required six days of data collection spread across two weeks, i.e., three days each week with abstinence from smart phone, instant messengers and social networks on the second day. The participant answered various questions regarding flow strength, consciousness and mood seven times per day. On the first and third days of the week, the participant used a mobile application while on the second day, the participant used a web application for data collection.

5. Data Analysis

The raw data was divided into subsets based on days (1, 2, and 3) and further into sets of responses for flow strength (questions numbered 5 to 14), consciousness (questions numbered 15 to 18) and mood (questions numbered 19 to 27). These datasets were used for the plot of means for each category. The responses for questions based on consciousness reported on days 1 & 3 were combined to generate a scatterplot showing correlation between the days with and without smart phone usage. Also, a scatterplot illustrating the correlational relationships between flow strength, consciousness, and mood for days 1 and 2 was generated. Hypotheses were analyzed using a t-test and correlation test.

The t-test will:

1. Compare means of Day 1 (both weeks) to Day 2 (both weeks) to identify any significant differences.
2. Compare means of Day 2 (both weeks) to Day 3 (both weeks) to identify any significant differences.
3. Compare means of Days 1 and 3 (both weeks) to Day 2 (both weeks) to identify any significant differences.
4. Compare means of the four survey questions on consciousness (1.F, O, P, Q, R) of Days 1 and 3 (both weeks) to Day 2 (both weeks)

The correlation will:

1. Identify the degree of correlational relationship between the flow variables of strength, consciousness and mood for day 1 and day 2.
2. Identify the degree of correlational relationship between the flow variables of strength, consciousness and mood for day 2 and day 3.
3. Identify the degree of correlational relationship between the flow variables of strength, consciousness and mood for day 1 and day 3.
4. Identify the degree of correlational relationship between the four survey questions on consciousness (1.F, O, P, Q, R) of Days 1 and 3 (both weeks) to Day 2 (both weeks)

6. Results

Overview

Data was analyzed using R. For the purposes of this class paper, the data to questions numbered 5-27 was assumed to be normal and used for the analysis. Outliers and missing values were excluded from the analysis. Mean of response values to questions numbered 5-14 were considered as flow strength, questions numbered 15-18 as consciousness, and the remaining as mood.

T-Test

Paired-t test identified a significant increase in flow strength ($t(69)=-3.86$, $p<0.05$) and a significant decrease in mood ($t(62)=2.75$ $p<0.05$) between days 1 and 2 with data from both the weeks combined. On the contrary, a significant decrease was noticed in flow strength ($t(69)=3.48$, $p<0.05$) and a significant increase in mood ($t(62)=-2.26$, $p<0.05$) between days 2 and 3 with both the weeks combined.

Overall, a significant increase in consciousness ($t(160) = -2.47$, $p < .05$) was identified for both the days(1&3) with smartphone use combined and the day(2) without smartphone use.

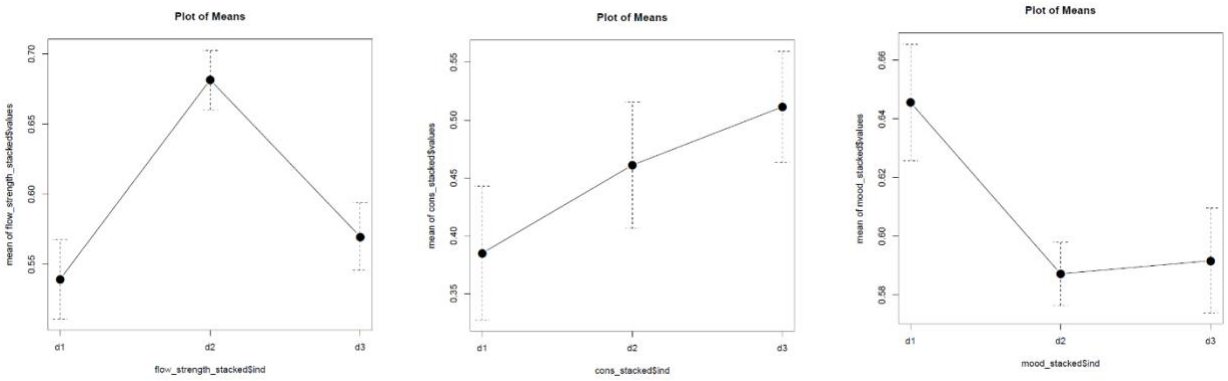

Figure 1. Plot illustrating mean flow strength for days 1, 2, and 3 with both the weeks combined.
Figure 2. Plot illustrating mean consciousness for days 1, 2, and 3 with both the weeks combined. Overall, a significant increase in consciousness was identified for both the days (1&3) with smartphone use combined and the day (2) without smartphone use.
Figure 3. Plot illustrating mean mood for days 1, 2, and 3 with both the weeks combined.

Correlation

Correlational relationship between flow strength, consciousness, and mood was computed for days 1 and 2 (Table 1). No significant correlations were found between any of the measures.

Table 1. Correlational relationship between flow strength, consciousness, and mood for days 1 and 2

Correlation between	Day 1	Day 2
Flow Strength & Consciousness	t(5)=0.67 p=0.54	t(5)=-0.79 p=0.47
Flow Strength & Mood	t(5)=1.31 p=2.5	t(5)=1.36 p=0.23
Consciousness & Mood	t(5)=-1.17 p=0.3	t(5)=0.53 p=0.62

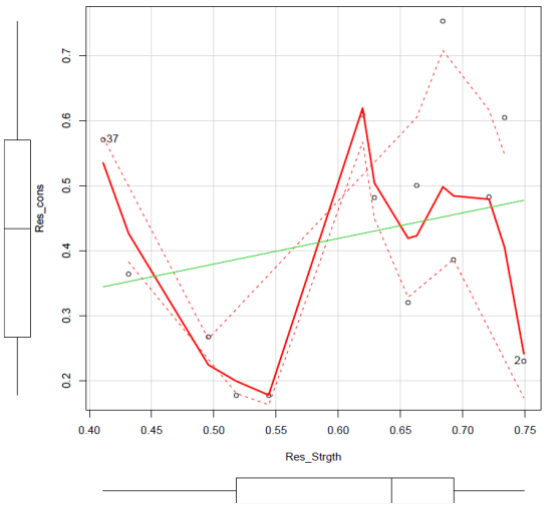

Figure 4. Scatter plot illustrating consciousness measures for days 1 and 3 combined and day 2. No significant correlational relationship was identified in consciousness between the days with and without smartphone use.

7. Discussion and Conclusion

The aim of this study is to observe for the existence of smartphone dependency and its relationship to 1) flow, 2) mood, and 3) the transformation (altering) of consciousness in everyday life. This study used ESM to collect subjective experiences of participants on items related to these three measures. Collecting and analyzing participant experiences at an immediate context as compared with a long-term context helped avoid participants recalling or framing experiences based on the information retrieved from their memory.

Overall, consciousness was found to be significantly more on the days with smartphone as compared with the day without. This effect was found to be consistent across both the weeks of data collection. Flow increased from day 1 to day 2 and decreased from day 2 to day 3. Although a significant decrease in mood is noticed from day 1 to day 2, nothing could be inferred due to the small sample size. Also, no significant increase in mood was found from day 2 to day 3.

These results suggest that smartphone usage has the tendency to result in disrupted flow in an ongoing activity, which in turn can also result in decreased ability or transformation of individuals in being consciously aware of their surrounding environment.

This result may be explained with an example. Assuming a participant uses a mobile application to schedule her day, alerts from the phone to switch tasks or reminders for meetings might have resulted in interrupted flow in writing the paper and accessing the phone. Increased consciousness of time, deadlines or persons might have resulted in decreased flow in the current task.

The results have important implications for smartphone dependency. Although smartphone may be considered as a tool that can mediate psychological functions (for instance, extended memory in storing other contact numbers), its excessive usage can alter the neural synapses in human brain, thus altering human consciousness in everyday life. Vygotskyx argued that consciousness results when humans perpetually construct their sociocultural environment by engaging in activity. In the analysis of the social mind, he suggested that through the use of tools during activity the natural psychological functions of the mind are re-structured and distributed. Technologies such as smartphones are engendering a new kind of psychological tool that is radically transforming consciousness.

Appendix

1. As you were beeped ... (be specific)
a) Where were you?
b) What were you thinking about?
c) What was the main thing you were doing?
d) What else were you doing?

NOT AT ALL……VERY MUCH
a) Did you enjoy what you were doing?
b) How well were you concentrating?
c) Did you feel good about yourself?
d) Did you have some choice in picking this activity?
e) Was the activity important to you?
f) How challenging was it?
g) How skilled are you at it?
h) Did you wish you had been doing something else?
i) Was this activity interesting?
j) How important was it to your future goals?
k) How conscious were you of your surroundings?
l) How conscious were you of the persons around you?
m) How conscious were you of time passing by?
n) How conscious were you of any problems you facing?

2. Describe your mood as you were beeped:
VERY QUITE SOME NEITHER SOME QUITE VERY
a) Happy 3 2 1 0 1 2 3 Sad
b) Passive 3 2 1 0 1 2 3 Active
c) Ashamed 3 2 1 0 1 2 3 Proud
d) Worried 3 2 1 0 1 2 3 Relaxed
e) Weak 3 2 1 0 1 2 3 Strong
f) Lonely 3 2 1 0 1 2 3 Sociable
g) Excited 3 2 1 0 1 2 3 Bored
h) Angry 3 2 1 0 1 2 3 Friendly

3. Who were you with? (Check all that apply)
a. ( ) alone
b. ( ) mother
c. ( ) father
d. ( ) sister(s) or brother(s)
e. ( ) other relatives
b) ( ) teacher(s)
c) ( ) classmates, peers ()other adult (coach, etc.)
d) ( ) friend(s) I low many? females males
e) ( ) others (who?

4. Since you were last beeped, estimate how much time you spent:
a) Hanging out with friends 0 ¼ ½ ¾ 1 1¼ 1½ 1¾ 2 2+ Hours
b) Chores, errands 0 ¼ ½ ¾ 1 1¼ 1½ 1¾ 2 2+ Hours
c) Playing/practicing sports 0 ¼ ½ ¾ 1 1¼ 1½ 1¾ 2 2+ Hours
d) Email on the computer 0 ¼ ½ ¾ 1 1¼ 1½ 1¾ 2 2+ Hours
e) Social media on the computer* 0 ¼ ½ ¾ 1 1¼ 1½ 1¾ 2 2+ Hours
(*Facebook, texting, tweeting)

f) Using your smartphone for any activity 0 ¼ ½ ¾ 1 1¼ 1½ 1¾ 2 2+ Hours
g) After-school program/club/religious activity 0 ¼ ½ ¾ 1 1¼ 1½ 1¾ 2 2+ Hours
h) Doing homework 0 ¼ ½ ¾ 1 1¼ 1½ 1¾ 2 2+ Hours
i) Resting 0 ¼ ½ ¾ 1 1¼ 1½ 1¾ 2 2+ Hours
j) Walking or Driving 0 ¼ ½ ¾ 1 1¼ 1½ 1¾ 2 2+ Hours

5. If you had strong feelings about something, why did you feel that way?

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