Typical Phone Use Habits:
Intense Use Does Not Predict Negative Well-Being

Kleomenis Katevas, Ioannis Arapakis, Martin Pielot

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Barcelona, Spain
“Phone addiction is real, and so are its mental health risks”
Forbes, December 2017

“How phones are tearing us apart”
Psychology Today, June 2015
Research Question:

Is phone addiction something that stands out from normal use in terms of phone use patterns?

If yes, how does it differ?
Data Collection

• Study with 340 participants, collecting mobile sensor data for ~4 weeks.

• Experience sampling questionnaire (right), using 10-15 notifications per day.

• In addition, we collected:
  • Big Five Personality Test
  • Personal Health Questionnaire Depression Scale (PHQ-8)
  • Boredom Susceptibility Scale (SSS-BS)
Features

• Number of sessions (Day, Night)
• Duration of sessions (Day, Night)
• Number of Incoming / Outgoing calls (Day, Night)
• Duration of Incoming / Outgoing calls (Day, Night)
• Number of App Launches (Day, Night) for: Email, Messaging, Social and Game apps
• Total data usage (Rx)
• Photos taken
• Battery drain level
• Fraction of Ringer mode (Normal, Silent, Vibrate)
Unsupervised Learning

- **K-means** (#clusters)
- **Agglomerative** (#clusters, linkage type, affinity)
- **Spectral** (#clusters, kernel type)
- **DBScan** (neighbourhood size, min samples)
- **Mean-shift** (bandwidth)
- **Gaussian Mixtures** (#components, covariance type, convergence threshold)
Measuring Cluster Validity

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Rule</th>
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</thead>
<tbody>
<tr>
<td>Banfeld Raftery</td>
<td>min</td>
<td>Point Biserial</td>
<td>max</td>
</tr>
<tr>
<td>C index</td>
<td>min</td>
<td>Davies-Bouldin</td>
<td>min</td>
</tr>
<tr>
<td>Dunn</td>
<td>max</td>
<td>Ray-Turi</td>
<td>min</td>
</tr>
<tr>
<td>Gamma</td>
<td>max</td>
<td>SD-Scat</td>
<td>min</td>
</tr>
<tr>
<td>log(BGSS/WGSS)</td>
<td>min diff</td>
<td>Silhouette</td>
<td>max</td>
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<td>McClain-Rao</td>
<td>min</td>
<td>Xie-Beni</td>
<td>min</td>
</tr>
<tr>
<td>PBM</td>
<td>max</td>
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13 internal validity criteria used in a Rank Aggregation approach

Winning clustering configuration:
> Spectral, with ‘rbf’ kernel and k=5.
A Proposed Taxonomy of Mobile Phone Users

C1: Limited Use
C2: Business Use
C3: Power Use
C4: Personality-Induced Problematic Phone Use
C5: Externally-Induced Problematic Phone Use
C1: Limited Use

- Scored low in almost all usage categories.
- Ringer mode is set to normal.
- We used this cluster as a Baseline.
C2: Business Use

- Increased use of phone calls.
- Fewer nightly use sessions and app launches.
- Ringer mode is set to normal.
- Higher levels of boredom during weekend.
C3: Power Use

- Increased session duration, number of nightly sessions, battery use, and mobile data use.

- Increased app launches during the day (e-mail, game and social media apps).

- Decreased use of messaging apps during day.

- Highest use of email apps and increased use of messaging apps during night.

- Ringer mode is set to normal (high variance)
C3: Power Use

- No negative well-being related factors.
- More awake during weekend.
- Lower levels of boredom during the night.
- Lower levels of depression (PHQ-8) and neuroticism (Big5) compared to C4.
C4: Personality-Induced Problematic Phone Use

- Increased number and duration of sessions during night.
- Increased use of email and messaging apps during night.
- Ringer mode is set to silent.
C4: Personality-Induced Problematic Phone Use

- Higher levels of tense-arousal, boredom, lower valence.
- Effects of tense-arousal and valence disappeared when accounting night-time and non-working days.
- Boredom was lower during night-time.
- Members appeared to be more neurotic and less emotionally stable.
- Higher PHQ-8 compared to Limited (C1) and Power (C3) users.
C5: Externally-Induced Problematic Phone Use

- Very similar to C4.

- During night-time, only messaging apps is comparably higher and email apps is lower.

- Ringer mode is set to vibrate.
C5: Externally-Induced Problematic Phone Use

- Higher tense-arousal, lower energetic arousal, lower valence, and higher levels of boredom.

- Energetic arousal was lower during night.

- Tense-arousal was lower, valence was higher, and significant effects on energetic arousal and boredom disappeared during weekend.

- More emotionally stable compared to Limited (C1) and C4 users.

- Higher PHQ-8 compared to Limited (C1) users.
Conclusions

• Heavy phone use does not predict negative well-being.

• Typical habits such as nightly phone use sessions and not having the ringer mode in ‘normal’ are associated with problematic phone use and increase score in depression (PHQ-8) scale.

• Need for further research to study and understand the underlying mental problems without falling into the old moral “new technology is bad” panic.
“New tech 'addictions' are mostly just old moral panic”

Engadget UK, February 2018

Source: techdirt.com
Dominant Types of Mobile Phone Use

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For more details, please read:
“Typical Phone Use Habits: Intense Use Does Not Predict Negative Well-Being”
Kleomenis Katevas, Ioannis Arapakis and Martin Pielot
ACM MobileHCI '18, Barcelona, Spain, September 2018.

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