SCIENTIFIC MEETING

Radiofrequencies and health: research in a fast-moving environment

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Espace Diderot - Paris

#RadiofrequencesRS
The association between real-life markers of phone use and cognitive performance, health-related quality of life and sleep

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Background

**SPUTNIC**: Study Panel on Upcoming Technologies to study Non-Ionizing radiation and Cognition

Real-life short-term effects of RF-EMF on cognition and HRQoL have not been well studied. Inconclusive results from previous study in Swiss adolescents (Foerster et al., 2019):

- **Left-side** users scored lower on verbal memory (which challenges the left side of the brain)
- **Right-side** users scored lower on figural memory (which challenges the right side of the brain)
Project Goal

Study 3 Markers of RF-EMF exposure:
1. Cordless phone call duration
2. Mobile phone call duration
3. Screen time

And 3 Markers of health:
1. Cognitive performance
2. Sleep quality and quantity
3. Health-related quality of life
Recruitment of study population

Followed 121 smartphone users for 10 days each
- 58 from Basel, Switzerland
- 63 from Besancon, France
Study Population
Followed 121 smartphone users
- 58 from Basel, Switzerland
- 63 from Besancon, France

<table>
<thead>
<tr>
<th>Characteristics of the study population by study center</th>
<th>Total</th>
<th>Besancon, FR</th>
<th>Basel, CH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean (SD))</td>
<td>34.3 (15.5)</td>
<td>31.4 (13.4)</td>
<td>37.4 (17.0)</td>
</tr>
<tr>
<td>Male sex (n (%))</td>
<td>36 (30)</td>
<td>15 (24.2)</td>
<td>21 (36.2)</td>
</tr>
<tr>
<td>Education status (n (%)) *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower secondary</td>
<td>1 (0.8)</td>
<td>0 (0)</td>
<td>1 (1.7)</td>
</tr>
<tr>
<td>Higher secondary / Grammar</td>
<td>33 (27.3)</td>
<td>11 (17.5)</td>
<td>22 (37.9)</td>
</tr>
<tr>
<td>Post-secondary, non-tertiary</td>
<td>16 (13.2)</td>
<td>12 (19.0)</td>
<td>4 (6.9)</td>
</tr>
<tr>
<td>Bachelor / teacher’s college</td>
<td>38 (31.4)</td>
<td>20 (31.7)</td>
<td>18 (31.0)</td>
</tr>
<tr>
<td>Master University</td>
<td>28 (23.1)</td>
<td>18 (28.6)</td>
<td>10 (17.2)</td>
</tr>
<tr>
<td>Doctorate University</td>
<td>5 (4.1)</td>
<td>2 (3.2)</td>
<td>3 (5.2)</td>
</tr>
<tr>
<td>Employment status (n (%))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>50 (41.3)</td>
<td>29 (46.0)</td>
<td>21 (36.2)</td>
</tr>
<tr>
<td>Student</td>
<td>46 (38.0)</td>
<td>21 (33.3)</td>
<td>25 (43.1)</td>
</tr>
<tr>
<td>Pensioner</td>
<td>13 (10.7)</td>
<td>4 (6.3)</td>
<td>9 (15.5)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>9 (7.4)</td>
<td>7 (11.1)</td>
<td>2 (3.4)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (2.5)</td>
<td>2 (3.2)</td>
<td>1 (1.7)</td>
</tr>
<tr>
<td>Right-handed (n (%))</td>
<td>106 (87.6)</td>
<td>55 (87.3)</td>
<td>51 (87.9)</td>
</tr>
<tr>
<td>Hand phone use (n (%))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both (n (%))</td>
<td>50 (41.3)</td>
<td>25 (39.7)</td>
<td>25 (43.1)</td>
</tr>
<tr>
<td>Left (n (%))</td>
<td>21 (17.4)</td>
<td>9 (14.3)</td>
<td>12 (20.7)</td>
</tr>
<tr>
<td>Right (n (%))</td>
<td>50 (41.3)</td>
<td>29 (46.0)</td>
<td>21 (36.2)</td>
</tr>
</tbody>
</table>
Methods (study design)

**Setup home visit / video call:**
- Study information
- Informed consent

**10-day follow-up:**
- Mobile phone use & EMF (smartphone app)
- Physical activity & sleep measurements (Fitbit)
- Daily HRQoL (mini-questionnaire)
- Daily Cognitive function (online tests)

**Collection visit:**
- Check-up
- Collect materials

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*METHODS*

**Study design**

10-day follow-up:

**Setup home visit / video call:**
- Study information
- Informed consent

**Collection visit:**
- Check-up
- Collect materials
Methods (exposure and health assessments)

3 Markers of RF-EMF exposure:
1. Cordless phone call duration
2. Mobile phone call duration
3. Screen time

3 Markers of health:
1. Cognitive performance
2. Sleep quality and quantity
3. Health-related quality of life

Daily online questionnaire (4hrs prior to cognitive tests)

Cognitive tests | Fitness Tracker (Fitbit) | Questionnaire
--- | --- | ---
| Likert scale |  | 1 2 3 4 5 6 7 8 9 10

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Statistical analysis

Confounders

- Time-variant confounders (time spent outdoors, medication, coffee and alcohol intake) were assessed daily by online questionnaire.

Statistical modelling

- Data from all participants who completed at least 3 assessments
- Software: R version 4.0.3
- Mixed models (R lme4 package) with random intercepts for each study participant (considering systematic differences between individuals in cognition, HRQoL & sleep)
Associations with cognitive performance

- 24 statistical tests / 2 significant associations
- 10-min increase in cordless calls → -0.149 (95% CI: -0.292, -0.007) decrease “Rotations” score
- 10-min increase in mobile calls → -0.041 (95% CI: 0.006, 0.076) increase in “Spatial Span” score
- Lack of a pattern
- Compatible with chance findings
- Similar for laterality-specific associations
Associations with sleep duration & quality

- No significant associations at all, no patterns
Associations with Health-Related Quality of Life

• No associations between cordless or mobile phone calls and any of the HRQoL indicators
• 10-min increase in screen time →
  -0.03 (95% CI: -0.07, 0.00) decrease in fatigue
  -0.03 (95% CI: -0.06, 0.00) decrease in mood
  0.03 (95% CI: 0.00, 0.06) increase in stress
Conclusion

- Inconsistent associations between phone use and cognition
- No associations for sleep duration or quality
- Adverse effects of screen time on HRQoL have previously been indicated
- Screen time is likely to be a more critical exposure than call time
Thank you! Questions?
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Ethics:
Ethical permission for the Swiss part of the panel study was granted by the Ethical Commission Northwest/Central Switzerland on 25 March 2019 (EKNZ number 2019-00466). The French study protocol was written in accordance with reference methodology MR004 (Outside the Jardé law).