Validation of a Smartphone Psychomotor Vigilance Application: Preliminary data

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INTRODUCTION

- The PVT-192, is a reaction time (RT) test that is the gold standard in sleep research and has been shown to be sensitive to both the homeostatic and circadian components of sleep. [1,2,3,5]
- However, for some experimental and clinical settings, its duration of 10 minutes has been found too long and its cost too expensive. [2,3,5]
- Recent studies have shown that shorter PVTs may be reliable, but few alternatives are available. [1,2,3,5]
- Sleep-2-Peak (S2P) is a PVT type application developed for smartphones. This tool was demonstrated to be a shorter and more accessible alternative for repeated measures of sleep in clinical and research settings. [4]

OBJECTIVE

- To validate the capacity of S2P to accurately measure sleep variations in a 3 minute task.

METHOD

Participants

- 6 women, 4 men; 18 to 23 years old

Procedure

- A baseline (1 day) + 35 hours of total sleep deprivation.
- At every even hour, participants completed three subjective sleepiness tests (KSS, SSS, VAS), and two reaction time (RT) tests (S2P and PVT-192; counterbalanced).

Dependent variables (DV)

- Mean RT (mRT), reciprocal of the mRT (1/RT), number of lapses and errors of commissions.

Analysis

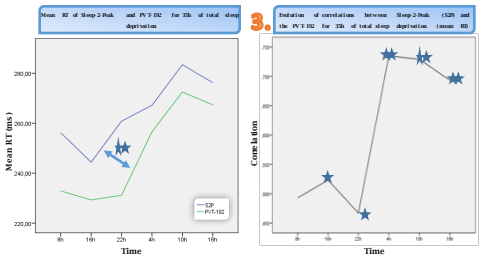
1. *t* tests on each mean DV (35 hours total) of each RT test.
2. Correlations between each DV (35 hours total) of each RT test.
3. Correlations between DV on each RT test, for 6 different time frame (8AM-12PM; 2-6PM; 8PM-12AM; 1-6AM; 8AM-12PM; 2-6PM).
4. Correlations between DV on each RT test and the KSS, SSS and VAS.
5. *t* tests on the significant correlations obtained in analysis #4, for 6 different time frames.

RESULTS

1.

S2P vs PVT-192	Mean RT	Reciprocal (1/mean RT)	Lapses	Errors of commission
t tests	7.498*	-7.203*	0.220*	-0.678
2. Correlations	0.67*	0.59*	0.42	0.13

3.

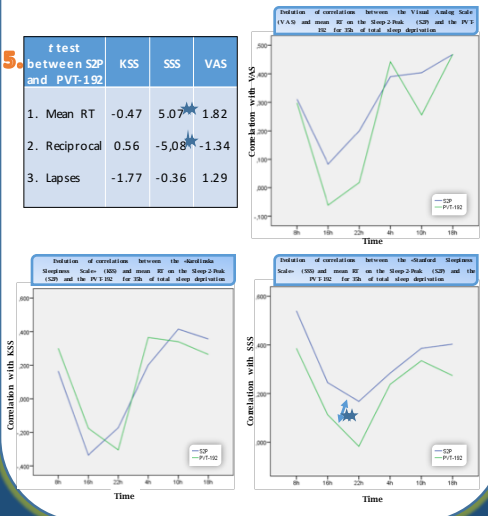


4.

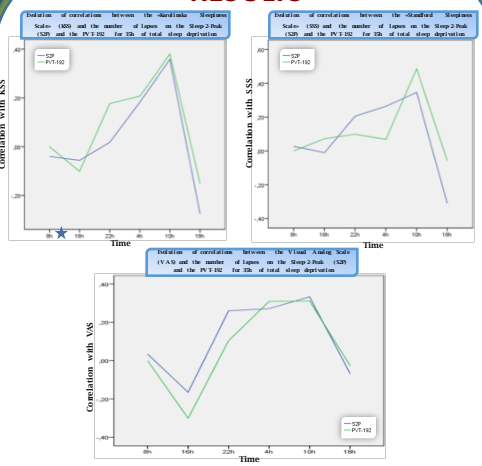
Correlations	KSS	SSS	VAS
S2P			
1. Mean RT	0.36*	0.42*	0.41*
2. Reciprocal	-0.32*	-0.39*	-0.38*
3. Lapses	0.25*	0.26*	0.27*
4. Errors of commission	0.06	0.03	0.07
PVT-192			
1. Mean RT	0.45*	0.47*	0.47*
2. Reciprocal	-0.43*	-0.46*	-0.45*
3. Lapses	0.35*	0.37*	0.34*
4. Errors of commission	-0.08	-0.03	0.01

5.

t test between S2P and PVT-192	KSS	SSS	VAS
1. Mean RT	-0.47	5.07*	1.82
2. Reciprocal	0.56	-5,08*	-1.34
3. Lapses	-1.77	-0.36	1.29



RESULTS



DISCUSSION

- Overall, these results show that both RT tests measure fatigue. Indeed, both tests vary similarly during the 35 hours of sleep deprivation.
- However, these results also show that performance on both RT tests are more strongly correlated during the night, while the subjects are sleep deprived, than during the preceding day, when they are alert.
- Technical differences (i.e. response button vs touch screen) and/or psychological differences (i.e. immediate performance feedback on each trial on the PVT-192 vs no feedback on S2P) may explain this phenomenon.
- We are currently doing further analyses to verify this hypothesis.
- In conclusion, even if preliminary, our data suggest that Sleep-2-Peak may become a good alternative for the PVT-192.

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