Understanding cognitive processing in smartphone writing

Smartphones were thought to be used for talking, but many people prefer to text or email rather than call. This research project aims at getting insight on the cognitive processing involved in writing on a smartphone. This constitutes a scientific, theoretical and methodological challenge because the spelling and motor processes are very different from the ones involved in traditional writing like handwriting or typing on a desktop keyboard. The first difference with traditional writing concerns the *medium*. Unlike handwriting or typing on a computer, we phonewrite on a small virtual touch keyboard. This changes the role our thumbs have with respect to other ways of writing and requires more precise movement control. Apart from these obvious differences in motor processing, there are also significant divergences in orthographic processing. Smartphones integrate Intelligent Text Entry (ITE). When writing on a smartphone, word suggestions appear on top of the virtual keyboard as spelling choices before we finish writing the word. If we want to write the word *thought*, while producing letters T, H and O, the smartphone will suggest THOUSAND, THOUGH, THOROUGH. Once THOU is written, THOUSAND, THOUGH, THOUGHT will appear until we select THOUGHT: we pressed five keys (T, H, O, U, and THOUGHT) instead of seven (T, H, O, U, G, H, and T)! Phonewriting therefore involves an alternation of keystroke pressing, reading and choice selection processes that transforms the orthographic retrieval procedure with respect to traditional ways of writing. This has a dramatic impact on writing processes and renders their study extremely complex from a cognitive processing perspective. In addition, word suggestions in most smartphones are regulated by an Artificial Intelligence (AI) system that learns the vocabulary that is frequently adopted by its user and suggests the most probable next word (Yu et al, 2018). Several studies indicated however, that the frequency parameter is not enough for limiting the cognitive cost because phonewriters use suggestions for writing specific types of words. This indicates that other factors, apart from probability, should be considered in the design of word suggestion algorithms to increase keystroke saving and text entry speed.

We are a multidisciplinary team from two CNRS research laboratories in Grenoble, GIPSA lab (https://www.gipsa-lab.grenoble-inp.fr/) and LIG (https://www.liglab.fr/fr). We collaborate for the understanding of the cognitive processing in new technological devices related to human communication. At GIPSA-lab (CNRS UMR 5216) Sonia Kandel investigates the cognitive aspects of writing processes and Nathalie Guyader is an expert in eye-movement studies for the study of cognitive processing. Quentin Roy from LIG (CNRS UMR 5217), is an expert in human-computer interaction with virtual keyboards (https://quentinroy.fr/publications).

The Master 2 internship, will consist of carring out an experiment to investigate the impact of selecting word choices during smartphone writing. More precisely, we will add eye-tracking measures in a previous experiment developed by our team. First, we need to test two possible settings, one with a fixed eye-tracker and a chin rest and another another experimental device giving participants greater freedom of movement with mobile eye-tracker.
The intership will consist of five steps:

- State of the art
- Develop and test the experimental set-up
- Record participants
- Analyse data
- Write report

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