

How fast do university students type?

An innovative online experiment using jsPsych library

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Context and objectives

Typing expertise has been characterized in the 70's and 80's on professionals, formally trained to the touch-typing method. Since then, keyboards have become the primary interface for written communication in the general population. Our objectives are to analyze the distribution of typing performance (Fig.1) in the current population of university students in order to update the definition of typing expertise. This is a mandatory step in the perspective of cognitive studies of typewritten language production with carefully selected participants. Data will be gathered online in a large-scale study.

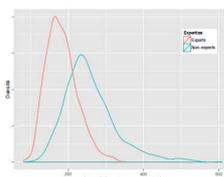


Figure 1. Distribution of interkeystroke intervals in expert and non-expert typists defined according to usual criteria

Development of the online experiment

The online experiment consists of a set of HTML, JavaScript and PHP files (Fig. 2). JavaScript library jsPsych [1] is used to manage the experiment front end that participants will see and respond to. JavaScript is a language that browsers such as Firefox or Chrome interpret: a script is able to modify the content of a web page without reloading it, in response to the user actions or as a function of a predefined timeline. The back end is composed of several components including PHP that manages the hidden part of the experiment (data recording).

A simplified example: written picture naming with recording of the typing times

The online experiment starts with a welcome screen (web page mainly in HTML) that should be as attractive as possible and contain concise explanations. Within this page, a button only visible to a computer-based browser (WURFL tool [2]) allows the participant to go further (tablets or smartphones are excluded from the experimental design). A second web page is then loaded, which embeds the javascripts (jQuery, JQueryUI, jsPsych core script and plugins) necessary to launch the experiment in a full-size window.

jsPsych core functions handle timing control, block sequences, event listeners and response collection while associated plugins manage the displays of the stimuli to the screen. 18 plugins are available in jsPsych library so far, which enable the execution of various common tasks such as reading instructions, responding as quickly as possible to a stimulus, categorizing a stimulus and receiving feedback, sorting images by clicking and dragging. For example, we make use of a plugin that describes the process for one trial (audio and/or visual stimulus presentations, expected user actions, potential feedback to display). Each plugin has a different set of parameters (such as the duration of the presentation, the expected response keys, the interstimulus interval duration).

For specific needs, new plugins can easily be conceived, by adapting an actual one or by starting from a template file. A new plugin named "jspsych-img-typing.js" has been set up to display images of the naming task and to record the corresponding typing times.

An example of a javascript along with some experimental parameters can be found in Fig. 3 (left panel). Right panel shows part of the stimulation material (image/audio file paths list, text or list of words to display...) and the structure of the output text file.

Figure 2. Structure of an online experiment

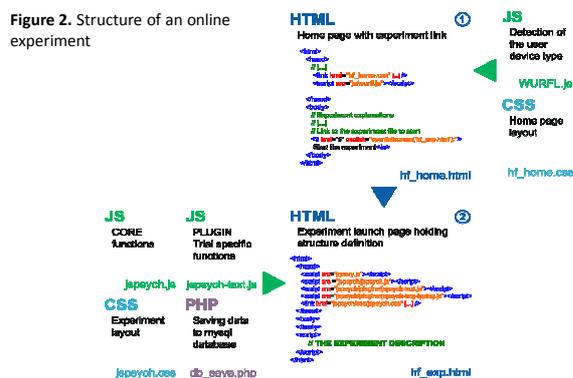
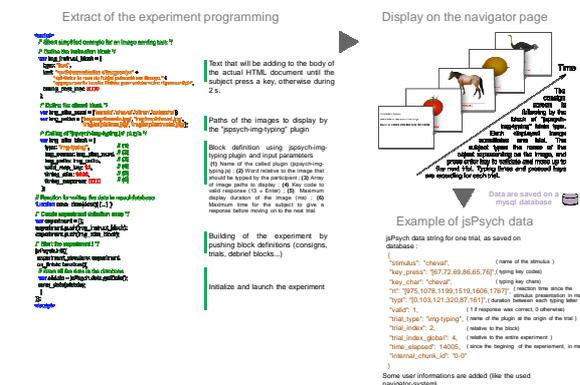


Fig. 3. Application to typewritten picture naming



In-lab validation of keystrokes timing: step 1

Innovative experimental design, such as the one described above, needs to be thoroughly tested before publishing the experiment online. To this end, the timing accuracy of keystrokes will be assessed.

We will first use a device called BlackBox that automates keyboard responses in order to know how reliable responses times are. We expect to have as little variance and lag in RT measurements as possible. Actually, response times depend mainly on three factors: the browser the experiment is loaded on (Firefox, Chrome), the operating system the browser runs on (Windows, Linux), and the actual keyboard where the keystrokes are made.

We will also develop an additional experiment involving finger movement sequences for which an effect on the recorded reaction times is expected. The task is taken from Rosenbaum et al., (1984; experiment 3, conditions 4 and 6). It requires pretrained sequences of 3 consecutive finger responses on the standard AZERTY keyboard. We aim at reproducing the effect of incertitude of one of the responses on the corresponding IKI. This task will be tested online within the community of the Pole 3C (Marseille).



Megastudy of typing performance in the student population: step 2

The online megastudy will focus on the measurement of reaction times and interkeystroke intervals in 3 typing tasks. Necessary javascript plugins have been prepared (image naming task, text copying), as well as the home page and data management.

Online form (bio, writing habits, presence of learning disabilities/?? A completer//)

Text transcription (administrative text)

Copy (40 words) and Picture naming (40 pictures). Words have been selected as a function of the distribution of their letters on the keyboard, the frequency of their constituent bigrams, letters frequency //other ???

Responses are anonymous //pbs ethiques// The estimated time required to complete the experiment is between X and Y minutes.

The experiment will be submitted to the Ethical committee of Aix-Marseille University.

References

- [1] jsPsych - <http://www.jspsych.org/>
de Leeuw, J. R. (2015). jsPsych: A JavaScript library for creating behavioral experiments in a web browser. Behavior Research Methods, 47(1), 1-12.
- [2] WURFL device detection - <http://web.wurfl.io/>