

# Copy Task Construction

Luuk van Waes & Mariëlle Leijten

University of Antwerp

22 November 2015

update: 4 April 2016

update: 28 March 2018

update: August 4 2018

update: May 10, 2020

---

## Context

In the creation of digital texts, typing skills are a factor that could influence text production. Therefore, the current copy task is designed to create a set of measures that allows a fine grained analysis of low level typing and motor skills.

---

## Publications

For more information on the Inputlog copy task, we are happy to refer you to the following publications:

- Van Waes, L., Leijten, M., Pauwaert, T., & Van Horenbeeck, E. (2019). A multilingual copy task: Measuring typing and motor skills in Writing with Inputlog. *Journal of Open Research Software*, 7(1:30), 1-8. <https://doi.org/10.5334/jors.234> (open access)
  - Van Waes, L., Leijten, M., Roeser, J., Olive, T., & Grabowski, J. (underreview). Designing a Copy Task to Measure and Assess Typing Skills in Writing Research. *Journal of Writing research*, x(x).
  - Van Waes, L., Leijten, M., Mariën, P and Engelborghs, S. (2017). Typing competencies in Alzheimer's disease: An exploration of copy tasks. *Computers in Human Behavior*, 73, 311–319. DOI: <https://doi.org/10.1016/j.chb.2017.03.050>
  - Source code and technical documentation:
    - GitHub: <https://github.com/lvanwaes/Inputlog-Copy-Task>
    - Zenodo link: <https://doi.org/10.5281/zenodo.2908966>
- 

## Implementation

We have opted for a java based web interface that stepwise guides the participants through the different components of the copy task. A progress bar at the right of the screen indicates the task stages. The interface has been adapted for Chrome, Internet Explorer, Firefox and Safari.

The copy tasks are coded as XML-files and can be created by using the '*Inputlog copy task creator*'. It is our intention to develop a comparable copy task for different languages, based on the same underlying principles.

---

## Components

The copy task (e.g., English UK - Qwerty) consists of the following components:

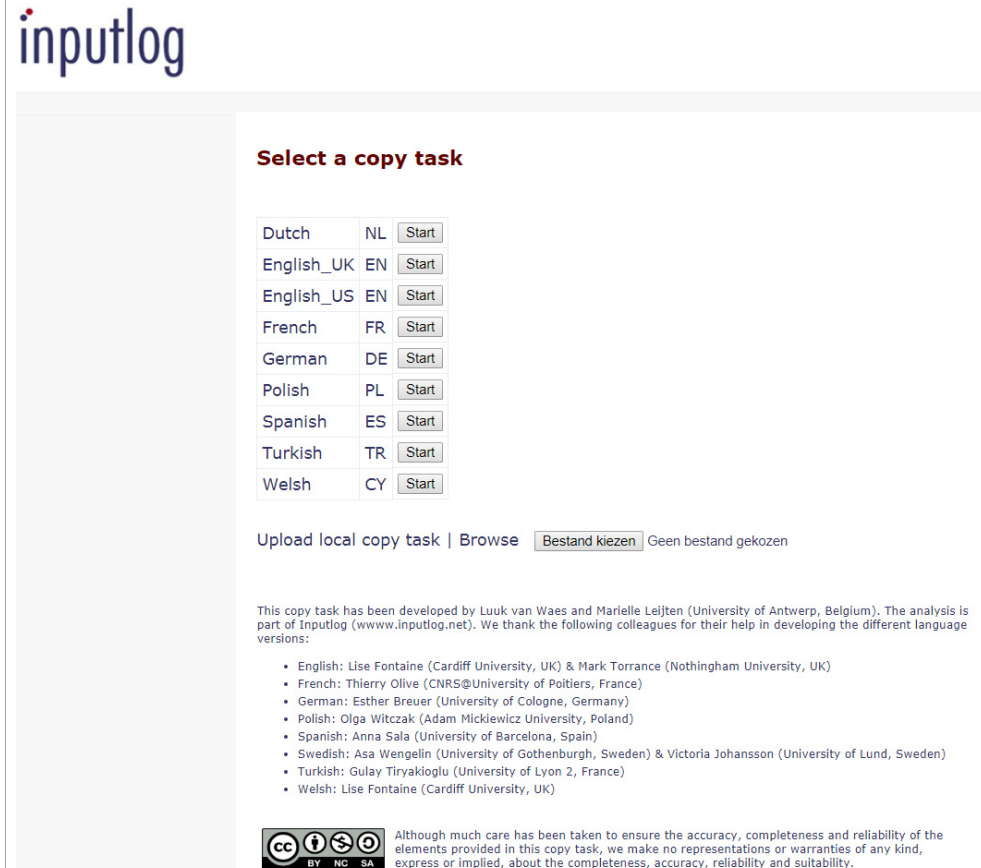
<b>Selection</b>	selection of copy task (language specific)
<b>Identification</b>	participant identification (name, age, gender, session, keyboard)
<b>Introduction</b>	general task instruction
<b>Tapping task</b>	press the 'd' and 'k' key alternatively during 15 s
<b>Sentence</b>	copy a sentence
<b>Example</b>	dummy item explaining word combination tasks
<b>Word combination 1</b>	copy a combination of three words seven times
<b>Word combination 2</b>	copy a combination of three words seven times
<b>Word combination 3</b>	copy a combination of three words seven times
<b>Word combination 4</b>	copy a combination of three words seven times
<b>Consonant groups</b>	copy four blocks of six consonants
<b>Extra information</b>	extra participant information (handedness, hard and software used, education, L1, learning disabilities)
<b>End</b>	thank you (and download)

---



## Language selection

The participants can select a predefined (default) copy task or can upload a specific task. The task can be accessed via the 'Record Tab' in Inputlog or via the following URL: <http://inputlog.ua.ac.be/WebSite/copytask/tasks.html>



The screenshot shows the 'inputlog' logo at the top left. Below it, the heading 'Select a copy task' is displayed. A table lists various languages with their corresponding country codes and a 'Start' button for each:

Dutch	NL	Start
English_UK	EN	Start
English_US	EN	Start
French	FR	Start
German	DE	Start
Polish	PL	Start
Spanish	ES	Start
Turkish	TR	Start
Welsh	CY	Start

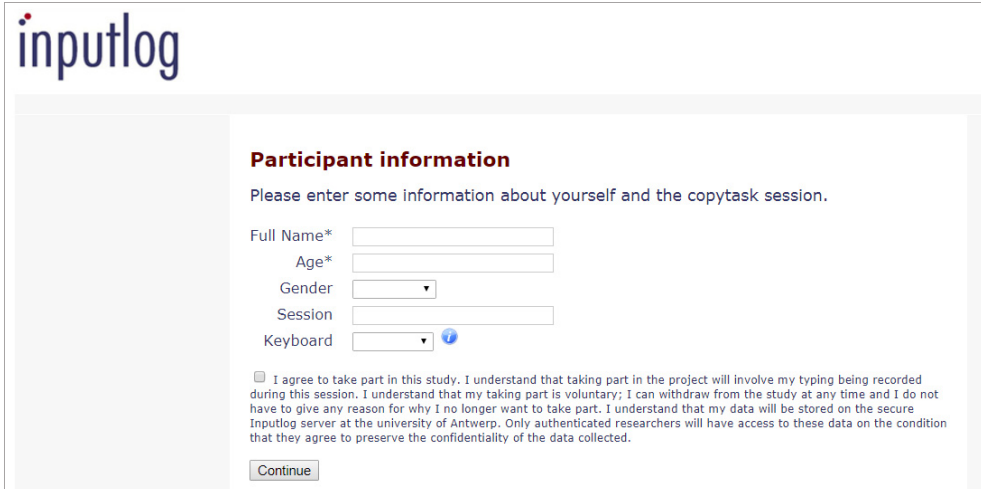
Below the table, there is a section for uploading a local copy task, with a 'Browse' button and a 'Bestand kiezen' button. A note states: 'This copy task has been developed by Luuk van Waes and Mariëlle Leijten (University of Antwerp, Belgium). The analysis is part of Inputlog (www.inputlog.net). We thank the following colleagues for their help in developing the different language versions:'

- English: Lise Fontaine (Cardiff University, UK) & Mark Torrance (Nottingham University, UK)
- French: Thierry Olive (CNRS@University of Poitiers, France)
- German: Esther Breuer (University of Cologne, Germany)
- Polish: Olga Witczak (Adam Mickiewicz University, Poland)
- Spanish: Anna Sala (University of Barcelona, Spain)
- Swedish: Asa Wengelin (University of Gothenburgh, Sweden) & Victoria Johansson (University of Lund, Sweden)
- Turkish: Gulay Tiryakioglu (University of Lyon 2, France)
- Welsh: Lise Fontaine (Cardiff University, UK)

At the bottom, there is a Creative Commons license logo (CC BY-NC-SA) and a disclaimer: 'Although much care has been taken to ensure the accuracy, completeness and reliability of the elements provided in this copy task, we make no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability and suitability.'

## Participant identification

The participants are invited to provide some basic identification information: Name, age, gender, session name (if applicable) and keyboard layout. We also included a privacy notice to obtain consent from the participant, in line with the privacy policy stated in the General Data Protection Regulation (GDPR) of the European Union.



The screenshot shows the 'inputlog' logo at the top left. Below it, the heading 'Participant information' is displayed. The text reads: 'Please enter some information about yourself and the copytask session.' The form contains the following fields:

- Full Name\* (text input)
- Age\* (text input)
- Gender (dropdown menu)
- Session (text input)
- Keyboard (dropdown menu)

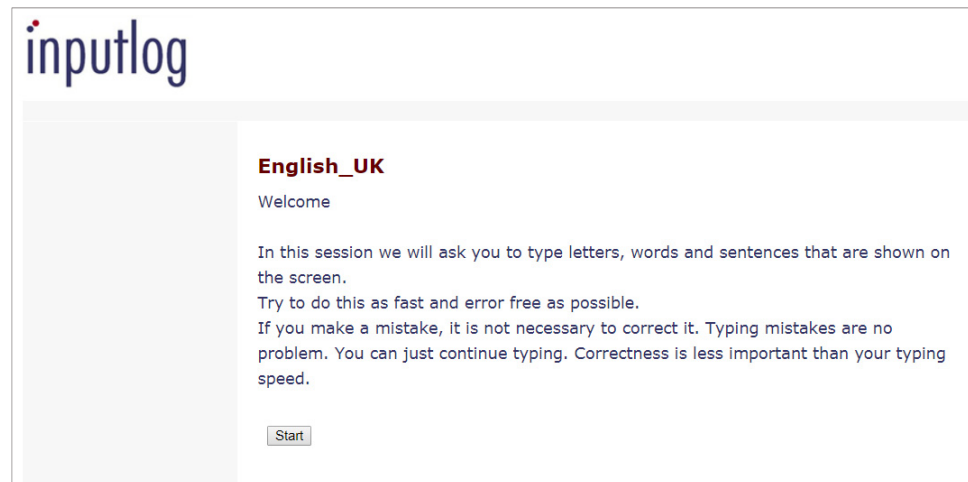
Below the form, there is a checkbox for consent: 'I agree to take part in this study. I understand that taking part in the project will involve my typing being recorded during this session. I understand that my taking part is voluntary; I can withdraw from the study at any time and I do not have to give any reason for why I no longer want to take part. I understand that my data will be stored on the secure Inputlog server at the university of Antwerp. Only authenticated researchers will have access to these data on the condition that they agree to preserve the confidentiality of the data collected.'

A 'Continue' button is located at the bottom of the form.

---

## Introduction

The copy task is explained in a few lines.



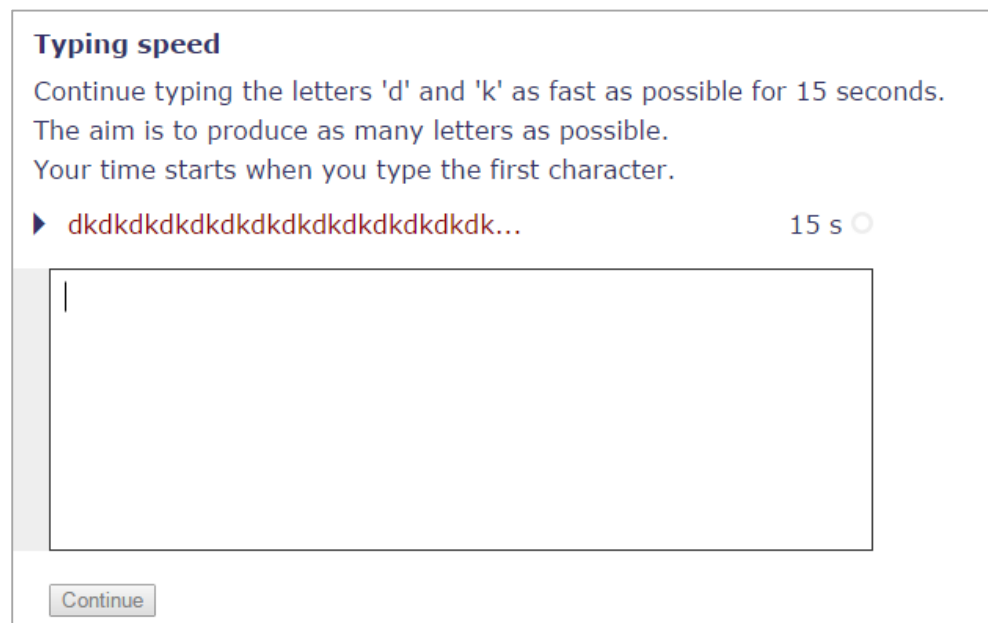
The screenshot shows the 'inputlog' interface. At the top left is the 'inputlog' logo. Below it, the text reads: 'English\_UK', 'Welcome', 'In this session we will ask you to type letters, words and sentences that are shown on the screen.', 'Try to do this as fast and error free as possible.', and 'If you make a mistake, it is not necessary to correct it. Typing mistakes are no problem. You can just continue typing. Correctness is less important than your typing speed.' At the bottom center is a 'Start' button.

---

## Tapping task

The tapping task intends to measure the fastest motor speed of pressing two keys with alternating hands (viz. 'd' and 'k', resp. a LeftRight and RightLeft hand combination). Finger-tapping tasks are commonly used to study the human motor system. Tapping tasks have the advantage of being simple enough to use in the study of both normal control subjects as well as those with neuropathologies affecting the motor system (Witt et al., 2008).

In this copy task a bimanual, self-paced tapping task is opted for. Participants are asked to type the 'd'-'k' key combination for 15 s. (Salthouse, T.A., 1984). A time circle at the top right corner is used as a time indicator.



The screenshot shows the 'Typing speed' task interface. The title is 'Typing speed'. The instructions are: 'Continue typing the letters 'd' and 'k' as fast as possible for 15 seconds. The aim is to produce as many letters as possible. Your time starts when you type the first character.' Below the instructions is a red arrow pointing to the text 'dkdkdkdkdkdkdkdkdkdkdkdkdkdk...'. To the right of this text is a timer showing '15 s' with a circular progress indicator. Below the text is a large empty text box with a vertical cursor at the beginning. At the bottom center is a 'Continue' button.

---

## Sentence task

The sentence copy task intends to measure the typing skills related to copying a series of - short high frequency - words in a sentence context. Participants are asked to repetitively type this sentence for 30 seconds.

---

---

**Sentence**

Type the sentence below as fast as possible for 30 seconds.  
Don't use capital letters or full stops: press 'Enter' after each sentence.

Your time will start after you have typed the first character. .

▶ the cat was sleeping under the apple tree 30 s ○

Continue

**Example**

An example is used to explain the next typing tasks, i.e. the repetitive (seven times) typing of a three word combinations.

---

**Example 1**

This is an example.  
In the following tasks we will ask you to type a series of three words seven times.  
In this example this was done for the words: 'a beautiful morning'.  
For this task there is no time limit.

▶ a beautiful morning

```
1 a beautiful morning
2 a beautiful morning
3 a beautiful morning
4 a beautiful morning
5 a beautiful morning
6 a beautiful morning
7 a beautiful morning
```

Continue

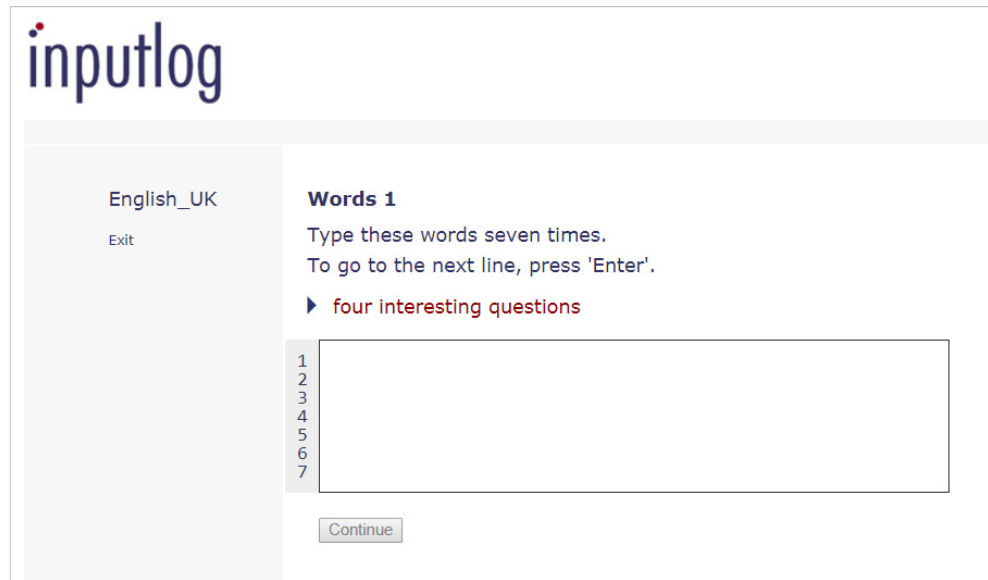
**Word combinations 1 to 3 (HF)**

Three sets of word combination are presented. In each word combinations high frequent bigrams are implemented spread over three words. Participants are asked to type these word combination seven times.

To create these word combinations we used the following criteria:

- three words per entry
- combination of a numeral + an adjective + a noun
- word length: between 19 and 24 characters in total - [3/4] + [10/12] + [8/10] characters (average number of characters per word combination: M: 22.3 (SD: 1.6)

- high frequency words (30% highest segment; lemma frequency)
- high frequency bigrams only highest 30 % percentile in CELEX/Subtlex or another comparable corpus based bigram frequency list)
- 18 to 20 high frequent bigrams in total (no LF bigrams)
- on average 3 to 5 bigrams for each hand combination (LL; LR; RL; RR)
- 5 to 7 keyboard adjacent bigrams
- no (or maximum one) repetitive keys



**Word combination 4 (LF)**

This word combination copy task intends to measure the typing skills related to low frequent bigrams in a three word noun phrase context. Participants are asked to type these word combination seven times.

To create word combination 4 we used the following criteria:

- three words entry
- combination of indefinite determiner/countable + adjective + noun
- word length: between 17 to 21 characters - [3/4] + [7/10] + [6/8] characters (average number of characters per word combination:  $M = 19.0$   $SD: 1.3$ )
- 3/4 low frequent bigrams (< 50% percentile in CELEX/SUBTLEX)
- no (or maximum 1) repetitive keys

**Example**

English_UK (Qwerty) "Copy task"	word combination 1	word combination 2	word combination 3	word combination 4
Word 1 (numerical)	four	seven	five	some
Word 2 (adjective)	interesting	wonderful	important	awkward
Word 3 (noun)	questions	surprises	behaviours	zigzags
#characters	24	23	23	18
Low Frequent bigrams (LF)	19	18	18	8
High Frequent bigrams (HF)	0	0	0	4
Left-Left (LL)	4	6	1	5
Left-Right (LR)	4	6	2	3
Right-Right (RR)	4	2	5	1
Right-Left (RL)	3	4	2	2
Adjacent keys	7	6	3	4
Repetitive keys	0	0	0	0

## Consonant groups

The consonant copy task intends to measure the typing skills in a non-word context. Participants are asked to copy four blocks of six consonants once.

**Consonants**

Finally, type these four blocks of consonants once.

▶ t j x g g l p g k f k q d t d r t t n p w d v f

## Extra information

We end the task flow with a final set of questions addresses respectively, handedness, hardware and software used, dominant language, reading or writing difficulties, and familiarity with this task.

**Final Questions**

Please indicate your preferences in the use of hands in the following activities:

	always left	usually left	no preference	usually right	always right
handwriting*	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
throwing*	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
brushing teeth*	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
eating with spoon*	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Computer used in this test?\*

Browser used in this test?\*

Keyboard used in this test?\*

Dominant languages\*

<input type="checkbox"/> Dutch	<input type="checkbox"/> Spanish
<input type="checkbox"/> English	<input type="checkbox"/> Swedish
<input type="checkbox"/> French	<input type="checkbox"/> Turkish
<input type="checkbox"/> German	<input type="checkbox"/> Welsh
<input type="checkbox"/> Polish	<input type="checkbox"/> other

Do you experience any language, reading, or writing difficulties? \*

What is your highest level of education?\*

Is this the first time that you performed this task?\*

## Data storage

The final screen shows the data storage: online transfer to web server is done automatically and the off-line storage is possible by selecting the 'download' button.

**Thanks for participating in this copy task**

You can download your idfx or finish to go back to the overview.

## Tools

- **CELEX bigram frequency**  
<https://catalog ldc.upenn.edu/LDC96L14>  
Baayen, R, R Piepenbrock, and L Gulikers. CELEX2 LDC96L14. Web Download. Philadelphia: Linguistic Data Consortium, 1995.
- **Subtlex word frequency**  
<http://crr.ugent.be/programs-data/subtitle-frequencies>  
Walter J. B. van Heuven, Pawel Mandera, Emmanuel Keuleers & Marc Brysbaert (2014) SUBTLEX-UK: A new and improved word frequency database for British English, The Quarterly Journal of Experimental Psychology, 67:6, 1176-1190,

---

DOI:10.1080/17470218.2013.850521

- **WordGen**  
http://users.ugent.be/~wduyck/wwgman.htm  
Duyck, W., Desmet, T., Verbeke, L., & Brysbaert, M. (2004). WordGen: A Tool for Word Selection and Non-Word Generation in Dutch, German, English, and French. *Behavior Research Methods, Instruments & Computers*, 36(3), 488-499. (full text available [here](#))
- **Coded Excel file:** Excel constructed to design a language specific copy task based on the criteria described above (contains frequency list, finger combinations, adjacency).  
Bigram\_"Language"\_coded\_hand\_freq\_item construction.xlsx
- **Inputlog Copy task Creator**  
Part of the 'Service' menu in Inputlog 7.1 + manual
- **Inputlog: copy task analysis**  
Part of the 'Record' and 'Analysis' tab in Inputlog 7.1  
URL: <http://inputlog.ua.ac.be/WebSite/copytask/tasks.html>
- **Keyboard lay-out**  
AdjacentCharacters.exe (Eric Van Horenbeeck)  
Script that identifies hand combination, repetition and key adjacency on a keyboard
- **Python scripts to extract bigram frequency**
  - count\_char\_bigrams.py (by Maximiliana Behnke <maximiliana.behnke@ed.ac.uk>)  
A small python script that extracts frequency of character bigrams in sublex corpora.
  - bigram\_extraction\_output.py (by Mike Kestemont)  
A small python script that extracts frequency of character bigrams in UTF8 csv word frequency lists.
- **Handedness test**  
Veale, JF. (2014). Edinburgh handedness inventory – short form: a revised version based on confirmatory factor analysis. *Laterality*. 19(2),164–177

#### References

- Salthouse, T. A., Rogan, J. D., & Prill, K. A. (1984). Division of attention: Age differences on a visually presented memory task. *Memory & Cognition*, 12(6), 613-620. doi:10.3758/bf03213350
- Witt, S. T., Laird, A. R., & Meyerand, M. E. (2008). Functional neuroimaging correlates of finger-tapping task variations: an ALE meta-analysis. *Neuroimage*, 42(1), 343-356.
-