Introduction

The goal of this experiment is to detect, whether there is a difference in the speed with which the users can press keys on a keyboard when given either attentive or pre-attentive tasks. This experiment also should reveal if the speed varies if there are other distracting factors or not.

We think that subjects may react faster to preattentive stimuli and that distractions generally slowers reactions to either kind of stimuli. But of course it is still possible, that there is no difference at all or things are the other way round. Therefor we have chosen two nondirectional pairs of hypotheses for this experiment:

H0: Concerning the reaction speed to stimuli, there is NO difference between pre-attentive and attentive stimuli.

H1: Concerning the reaction speed to stimuli, there is A difference between pre-attentive and attentive stimuli.

and

H0: As users are reacting to attentive and pre-attentive stimuli, there is NO difference in reaction speed if they are presented visual distractions or aren't.

H1: As users are reacting to attentive and pre-attentive stimuli, there is A difference in reaction speed if they are presented visual distractions or aren't.

Experimental setup

Factors

To test our hypotheses, we developed a python program logging the speed of button presses. This opens up the possibility of simple and effective reaction tests under consistent conditions.

The program presents subjects with several screens containing either words or arrows. If a word is shown, a user has to decide if the named "thing" does usually fly or not. If it does, a user has to press the "Arrow Key_UP", otherwise the user has to press the "Arrow Key_Down". As there is a process of active thinking involved ("can it fly?"), these words a attentive stimluli.

As preattentive stimuli the user is presented arrows facing up or down. Depending on their direction a user has to press the corresponding arrow key. These are simple shapes and their call for action can be interpreted by the user without a real thought process.

Additionally the user sometimes is distracted by visual patterns, containing of other arrows. These are chosen to mess with the users mind, and to confuse the user, which button should be pressed.

To cover all these different stimuli, the experiment is divided in 4 sections. There is a section with attentive stimuli with distraction (AD), one without distraction (AN) and a section with pre-attentive stimuli with distraction (PD) and one without (PN). These sections are pseudo-randomized through the use of a balanced latin-square. In each section a subject is confronted with 11 repetitions of the same condition. Stimuli are shown in a predetermined time intervall (500ms). Tests are conducted on the keyboard of a late 2013 Macbook Pro 13 inch, with standard german laptop keyboard layout.

	Conditions			
Subject 1	AD	AN	PD	PN
Subject 2	PN	PD	AN	AD
Subject 3	AN	PN	AD	PD
Subject 4	PD	AD	PN	AN

Variables

Defined by our hypotheses we have the following variables:
Dependent: reaction speed
Independent: either type of stimuli (attentive/preattentive) or distraction (yes/no)

As part of the experiment we all identified the following other variables:
Controlled: Same Keyboard used for all subjects (see above, Macbook Pro 13)
Same testing environment for all subjects (Small quiet niche desk near UR Zentralbibliothek)
Confounding: learning effects and fatigue (tests are done in less than a minute, so both effects should be eliminated)

Subjects

All four Subjects of the experiment are students between 22 and 30 of age. Two of them are female, two male. All four subjects are media informatics students. As Hornbæk stated in his text „Some Whys and Hows of Experiments in HCI" students can be used as subjects in experiments because "they have stronger cognitive skills, have developed less strong attitudes and are more likely to follow authority" (Hornbæk, S.27, 2011). Media informatics students are familiar with the keyboard setup and (mostly) have good typing skills. This may influence the results because other people may be not so familiar and therefore type slower. But as we want to detect whether there is a difference in the speed of reaction to stimuli and not typing speed in general, and because the keys are given beforehand and are easy to find and clearly positioned this is acceptable.

Preliminary Results

After explaining the procedure, subject had the opportunity to ask questions for clarifications. If everything was understood, we started the application, which gives an in-detail explanation. Subjects started the experiment themselves by pressing space. After that the experiment described above was conducted. Subjects got noticed that the experiment was finished by a corresponding screen.

All subjects successfully finished the experiment.

subject	avg att	sd att	median att	avg pre	sd pre	median pre	avg distr	sd distr	median distr	avg non	sd non	median non
s1	637,55	122,81	621,00	460,86	100,80	434,00	562,68	129,92	578,50	535,73	155,99	530,50
s2	842,36	436,64	738,00	469,54	61,72	461,5	728,55	452,31	573,5	583,36	227,27	486,00
s3	723,55	149,51	693,00	562,09	154,27	509,00	723,64	173,10	701,50	562,00	127,12	569,50
s4	571,86	73,63	562,00	482,32	175,00	454,00	569,54	167,53	540,50	484,64	91,67	501,00
all	693,83	258,32	636,50	456,86	79,62	449,50	646,10	271,93	596,00	541,43	160,14	506

The table shows average (avg), standard deviation(sd) and median for attentive (att) and pre-attentive (pre) task, as well es for distractions (distr) and non-distracted (non) sections for each subject and overall. These preliminary results show that distractions slow down reaction speed and the reaction to preattentive tasks is faster than to attentive. Both H0 in our experiment would therefore be discarded and H1 accepted, if only looking at preliminary results.