

Impact of Age on SSVEP-based BCIs

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Introduction A Brain-Computer Interface (BCI) [3] is a technology that can help people of advanced age or with severe disability to communicate or use modern equipment without any additional help. In this study, the previously developed [1] SSVEP-based [2, 3] BCI spelling interface was evaluated with older subjects.

Methods and Materials Twelve subjects divided into two age groups of six: *GroupA* (mean 22.6) and *GroupB* (mean 68) years old participated in the study. Each subject used a *3-steps GUI* user interface layout (with small changes: the boxes were bigger (200%), they didn't change position, and the time segments were extended) which is presented in [1]; a description of the hardware used can also be found in [1]. The SSVEP classification was performed online every 13 samples (ca. 100ms) on the basis of extended adaptive time segment lengths of the acquired EEG data presented in [2]. Each subject started with a familiarization run (two short words, and one random word e.g. their name) and the experimenters used the collected data to adjust the individual parameters. Next, each subject used the *3-steps GUI* to spell the phrase "ZWEI BOXKAEMPFER JAGEN EVA QUER DURCH SYLT", when the word was spelled correctly the program ended automatically. Spelling errors were corrected via the implemented Löschen (german for "Delete") button. Data needed for the analysis was stored anonymously during the experiment.

Results BCI performance for each subject was evaluated by calculating the information transfer rate (ITR) in bit/min, employing the formula discussed in [3]. The accuracy (%) was calculated based on the number of correct command classifications divided by the total number of classified commands.

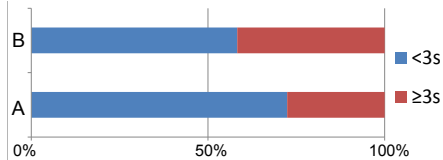


Figure 1: Time for selection for *GroupA* (A) and *GroupB* (B)

	GroupA	GroupB
time	616.93 (258.98)	1053.31 (434.13)
Acc	97.29 (3.15)	89.12 (6.28)
ITR	27.18 (8.82)	14.42 (6.29)

Table 1: Mean (SD) results

Discussion All subjects were able to complete the spelling task. Older subjects (*GroupB*) needed considerably more time for classification (3 seconds and more, see **Fig. 1**) and achieved lower ITR (see **Tab. 1**). User age has to be considered when designing a BCI.

References

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