

A Comparative Study of the Temporal Accuracy of Stimulus Presentation

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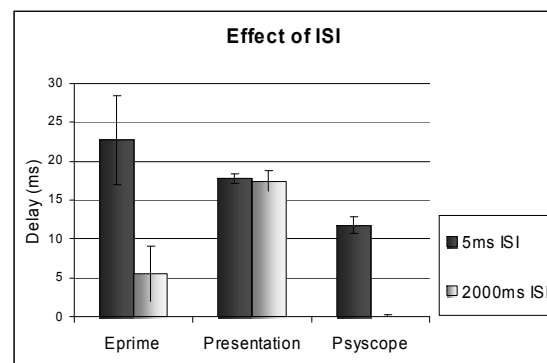
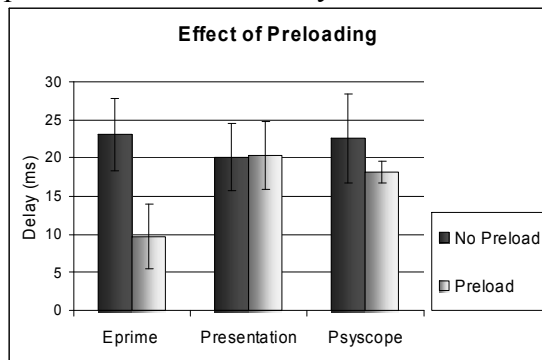
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Accurate timing of audio and visual stimuli presentation is critical in the neurological study of language perception to ensure correct interpretation of experimental results. This study is designed to analyze three software packages used for manipulating stimulus presentation: E-Prime Version 1.1 (Psychology Software Tools Inc., Pittsburg) Presentation Version 9.90 (Neurobehavioral Systems, Inc., Albany, CA) and PsyScope Version 1.2.5 (Dept. of Psychology, Carnegie Mellon University, Pittsburg). This study aims to identify factors relating to stimulus presentation delay and compare the accuracy of the three software packages.

A first paradigm is designed to test the effects of stimulus type (text, images, sounds), stimulus file size (2760KB and 240KB for images and 118KB and 11KB for sounds), and stimulus preloading (with, without). In this paradigm, a trial consists of an input signal, initiating the start of a 2000 ms pause period, followed by a stimulus period of 3000 ms. This trial is repeated for a total of 50 cycles, composing one test. Each test is run three times. Timing of stimulus presentation is recorded in each software system. The delay in stimulus presentation is computed as the difference between the reported and desired onset times. The mean and variance of stimulus delay across trials is estimated for each software and stimulus condition.

A second paradigm to test the effect of inter-stimulus interval (ISI) consists of a series of three preloaded audio files separated by an interval of time, either 5ms or 2000ms. This trial is repeated for a total of 20 cycles for each test, and each test is performed three times.



Results show a significant effect of file size in PsyScope for both audio and visual files ($p < 0.001$). However, this effect disappears with preloading ($p > 0.10$). Preloading of files made a significant change in delay in both Eprime ($p < 0.001$) and PsyScope ($p < 0.001$).

The ISI had a significant effect in Eprime ($p < 0.001$) and PsyScope ($p < 0.001$), even with preloading of the files.

This study is a preliminary step to compare stimulus presentation software systems and further research should be done. Based on these initial tests, we conclude that timing accuracy of stimulus presentation in PsyScope 1.2.5 and Eprime 1.1 can be improved by preloading stimulus files and by allowing for an adequate interval between stimuli. Further tests should include newer versions of the software systems, independent timing of stimulus presentation and response time measurement, and evaluation of a range of ISIs to assess whether there is a critical duration or a linear trend associated with the effects of this parameter.