Introduction. The aim of our research was to investigate the modality effect in more detail by measuring it in a direct way. Two studies were conducted using the same subject and material. Method. Computer-based learning material was presented on several screens, each containing a short text and a picture. Modality was varied by presenting written versus oral text. Presentation time was system-paced and matched the time for oral text presentation. Based on the dual-task approach cognitive load was measured directly in terms of response time towards a stimulus. In study 1, we used a between-subjects design. Participants got the learning material (all screens) either presented visually (picture + written text, N = 24) or audiovisually in a combination of picture and oral text (N = 24). In study 2, we used the same learning material and cognitive load measurements as in study 1. However, instead of a between-subjects design, we varied text modality within participants (N = 34) in such a way that each participant received screens with text presented alternately in written and oral form. Starting modality was counterbalanced.

Results. In study 1, we found no modality effect with respect to response time and learning outcome whereas in study 2, we found a significant difference in response times between screens with visually and orally presented text in the direction of the modality effect. Conclusion. The results are discussed with regard to error variance in different experimental designs and effect size of the modality effect as well as with regard to capabilities of participants to strategically adjust to disadvantageous instructional conditions.

Keywords
Multimedia learning, cognitive load, modality effect, dual task methodology.