Managing Multiple Tasks: Reducing the Resumption Time of the Primary Task

Jonathan D. Clifford (cliffo44@msu.edu)
Erik M. Altmann (ema@msu.edu)
Department of Psychology
Michigan State University
East Lansing, MI 48824 USA

The instinctive way in which people use notes to augment their memory suggests one way in which they might manage the disruptive effects of multi-tasking. In this study we investigated whether mental notes and/or physical notes taken before an interruption would reduce time to resume the interrupted task afterwards. Imagine that you are writing email to a colleague when the telephone rings. The *interruption lag* – the time from when the ringing starts until you pick up the phone – is an opportunity to make notes that might help shorten the *resumption lag* – the time from when the phone call ends until you resume the preexisting cognitive state required to compose the email message. A physical note would be some contextual information recorded on a physical medium, whereas a "mental note" would be such contextual information encoded in memory. The current study indicates that resumption lag is indeed reduced by having cues available during the interruption lag (to facilitate mental note taking), but is *increased* by requiring participants to take physical notes.

Participants

Participants were 48 undergraduate psychology students.

Task and Materials

Two tasks were used in the experiment. The *tank task* was a complex resource-allocation task that involved planning simulated missions to defeat targets using tanks (Brock and Trafton, 1999; Trafton, Altmann, Brock, and Mintz, 2003). The *radar task* was a simulated tactical assessment task that involved classifying "tracks" on a radar screen (Ballas, Kieras et al. 1999; Brock, Ballas et al. 2002; Brock, Stroup et al. 2002; as cited in Trafton, Altmann et al. 2003).

Design and Procedure

Participants performed the tank task for three blocks of 20 minutes each. At 12 random points during each block, a visual alert would appear indicating that the secondary task was about to start. The interruption lag following this alert lasted six seconds, during which input to the tank-task interface was frozen (meaning that no actions were possible). After the interruption lag, the tank task display was replaced by the radar task display. The radar task lasted 30 to 45 seconds, after which the tank task display was immediately restored.

There were two between-participants factors: Cue or No Cue, and Record or No Record. The Cue/No Cue variable probed mental note taking, on the assumption that mental notes are easier to make when cues from the interrupted task are perceptually available. In the Cued condition, the tank task display was preserved throughout the interruption lag, whereas in the No Cue condition the tank task display was erased at the start of the interruption lag, so that participants saw a blank screen for six seconds until the start of the radar task. In the Record condition, participants were instructed to use the interruption lag to record data on a prepared form positioned next to the keyboard.

Measures

The resumption lag was computed as the interval from the moment the tank task interface was restored following the interruption to the first mouse click or key press a participant make to resume the primary task.

Results

Each participant's 36 individual resumption lags were extracted from the log files, and the medians entered into an analysis of variance (ANOVA). There was a significant increase in resumption lag for participants in the No Cue condition, $F(1,44)=6.551$, $p=.014$. In the No Record condition the resumption lag was significantly lower than the participants in the Record condition, $F(1,44)=8.332$, $p=.006$. There was no significant interaction between the Cue and Record manipulations, $F(1,44)=1.238$, $p=.272$. The first finding was that visual cues available in the brief transitional period before an interruption speeded resumption of the primary task afterwards. The second finding was that the act of writing contextual information on a form hindered the resumption of the primary task.

Acknowledgements

This work was funded by ONR grant N00014-03-1-0063.

References

Brock, D., Trafton, J.G. (1999). Cognitive representation of common ground in user interfaces. *User Modeling: Proceedings of the Seventh International Conference*. J. Kay. New York, NY, Springer-Wien.

Trafton, J. G., Altmann, E. M., Brock, D. P., Mintz, F. E. (2003). Preparing to resume an interrupted task: effects of prospective goal encoding and retrospective rehearsal" *International Journal of Human-Computer Studies 58,* 583-603.