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Permalink
https://escholarship.org/uc/item/9fn1k02r

Journal
Proceedings of the Annual Meeting of the Cognitive Science Society, 29(29)

ISSN
1069-7977

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Publication Date
2007

Peer reviewed

Beyond the Time Cost of Interruptions on Primary Task Performance: Understanding Errors

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Keywords: Interruptions; Task Switching; Errors

Introduction

A large part of the research examining the influence of interruptions on primary task performance has focused on the time cost associated with recovering from an interruption (cites). Several empirical papers in this area have been grounded in the Altmann and Trafton (2002) Memory for Goals model. While this activation based theory is not specific to interruptions, the predictions made about goal suspension and retrieval fit well with the interruptions paradigm. The research described here is also grounded in the Altmann & Trafton theory; however, the focus is on errors in the primary task as a result of interruptions. The central question is how interruptions affect error rates in the primary task and what processes lead to these errors.

Experiment

Twenty-seven participants were asked to fill orders on a navy ship production task (primary task) as they were periodically interrupted. The primary task was rather complex and had a hierarchical goal structure with a very specific correct procedure required to successfully complete the task. This structure allowed for the logging of errors. Eye track data and reaction time data were collected as participants completed six control trials and six interruption trials. Each interruption trial had two interruptions each lasting 15 seconds; the interrupting task was mental addition.

The error rates for the control trials were compared to the error rates from the interruption trials. In the interruption trials, the focus was on errors that occurred immediately after the interruption. The error rates were calculated as percentages (# of errors/# of opportunities for errors). There were fewer errors in the control trials (m = .04) as compared to the interruption trials (m = .17), $F(1,26) = 13.8$, $MSE = .02$, $p<.001$. Participant's made substantially more errors following the interruption (~17%) as compared to the control condition (~4%).

The amount of time from the completion of the interruption to the first action back on task was examined as well; this is often referred to as the resumption lag. In order to gauge whether participant's errors after the interruption were quick responses reflecting a belief that they knew exactly where they were in task, the resumption lags from correct first actions was compared to the resumption lags from incorrect first actions. The correct action resumption lag (m = 4441.1 ms) was significantly shorter than the incorrect first action resumption lag (5702.7 ms), $F(1,21) = 12.5$, $MSE = 1403309.9$, $p<.05$. This suggests when participants made an error they were unsure about what the next correct action should be, thus, they spent more time deciding what action to make next as compared to the correct action resumption lag cases.

The eye track data from this experiment is yet to be analyzed.

Discussion

The Altmann and Trafton Memory for Goals theory suggests three constraints involved in the resumption of a suspended goal: interference, strengthening, and priming. The interference level is a critical component that can be used to explain the increased error rate associated with the first action after the interruption. Interference refers to the difficulty in retrieving the suspended goal due to the noise of previous goals. The interruption forces one to suspend the current goal and this goal begins to decay during the length of the interruption. Upon resumption one must attempt to retrieve the correct goal, however, because this goal has decayed and due to the interference level there is an increased likelihood that a different goal is selected to direct behavior resulting in an error. The error rates and longer incorrect resumption lags observed in this study reflect that process.

Acknowledgments

We thank Simon Li for allowing us to base our primary task off of a task he developed. This work was supported by a grant from the Office of Naval Research to Greg Trafton.

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