

Identifying Sources of Variance in Everyday Prospective Memory Performance

Jon Holbrook

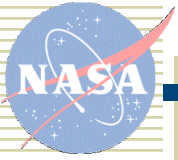
Key Dismukes

Jessica Nowinski

NASA Ames Research Center

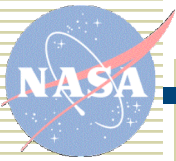
Moffett Field, CA





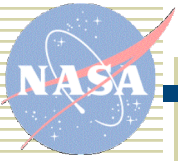
Prospective memory

- ◆ What is prospective memory (PM)?
 - Memory for intentions
- ◆ Why is the study of PM important?



PM failures can have serious consequences in aviation

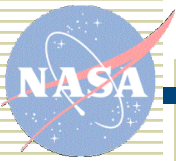




Operational consequences of PM failures

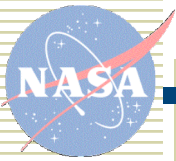
- ◆ **Detroit (1987): DC-9 crashed shortly after take-off**
 - Crew failed to set flaps/slats to take-off position
- ◆ **Dallas (1988): B-727 crashed shortly after take-off**
 - Crew failed to set flaps/slats to take-off position
- ◆ **Los Angeles (1991): B-737 cleared to land on runway occupied by Metroliner**
 - Controller forgot to release Metroliner to take-off after series of delays
- ◆ **La Guardia (1994): MD-82 ran off runway end after high-speed rejected take-off**
 - Crew failed to turn on pitot heat
- ◆ **Houston (1996): DC-9 landed gear up**
 - Crew failed to set hydraulic boost pump to high position



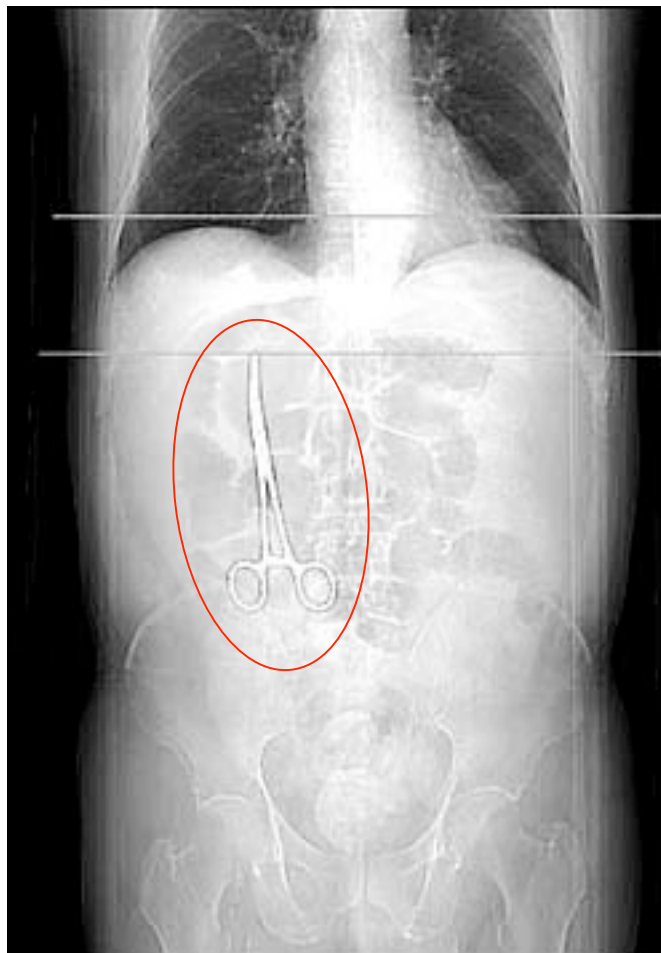


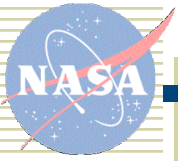
PM failures can have serious consequences in medicine





PM failures can have serious consequences in medicine

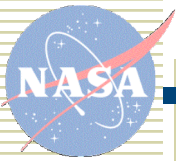




Why do PM errors occur?

- ◆ Why are even highly experienced and conscientious experts vulnerable to forgetting familiar procedural steps?
- ◆ To develop countermeasures, we must understand the cognitive demands these situations impose

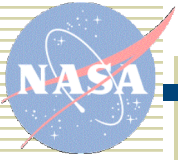




PM in the laboratory

- ◆ An assumption: Ideally, when it is necessary to defer a task, an individual will
 - Recognize that the task is to be deferred
 - Decide when the task will be resumed
 - Identify or create environmental cues associated with the intention
- ◆ How has PM been studied?
 - Early naturalistic studies
 - Typical laboratory paradigms
- ◆ Are there important sources of variance in real-world PM performance that have not been addressed?

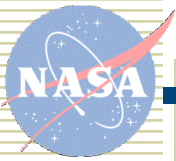




Method

- ◆ Gathered examples of real-world PM events
 - Successes and failures in our everyday lives
 - Airline pilot reports of incidents involving memory failures
- ◆ Categorized events based on situational factors that may have contributed to success/failure
 - Not mutually exclusive categories
 - Identified prototypical situations with both overlapping and distinct features

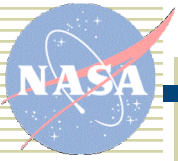




Everyday PM

- ◆ 8 participants tracked over 7 days
 - Asked to record any PM successes or failures that occurred during this time
 - Portable digital recorder available to help keep track of events throughout day
 - Completed a questionnaire for each event

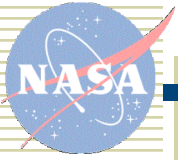




Dataset

- ◆ Everyday PM
 - 40 PM failures
 - 29 PM successes
- ◆ Aviation memory errors
 - 75 memory errors by airline pilots
 - 1 retrospective memory failure
 - 74 PM failures
- ◆ Very likely to be underestimates of actual rates of occurrence

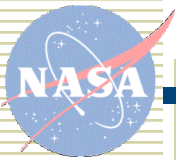




Sources of variance in real-world PM

- ◆ Intention was not explicitly specified
- ◆ Intention was poorly specified
- ◆ Cue did not activate intention
- ◆ Failure to update situation model
- ◆ Habit capture

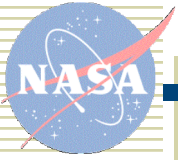




Intention not explicitly specified (Implicit intention)

- ◆ Failures to perform habitual tasks
 - Habitual tasks rely on automatic processing
 - Habitual tasks usually triggered by external events and/or previous actions that co-occur with the habitual intention
 - Failures may be more likely in the absence of normal triggers
- ◆ Interruptions
 - Individual must either suspend ongoing task to address interruption, or defer interrupting task
 - Abrupt-onset interruptions may not allow for elaborative encoding, or even be recognized as PM tasks at all

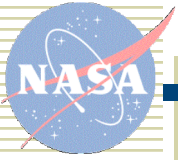




Intention was poorly specified

- ◆ Failures to identify cue, window for execution, or both
 - Individuals often just assume they will remember (and they are often right!)
 - Longer/more forgiving windows for execution
 - Rich environments provide multitude of happenstance cues
- ◆ Partial completion errors
 - Encode general goal, but fail to identify all steps in achieving that goal

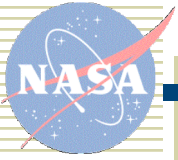




Cue did not activate intention

- ◆ Poor choice of cue
 - Habituated to presence of cue
 - Cue has too many other associations
 - Cue is insufficiently associated with the intention
 - Cue does not draw attention during window for execution
- ◆ Cuing has been well studied in laboratory
 - Usually experimenter-provided rather than subject-generated
 - Often pre-existing association between cue and intention





Failure to update situation model

- ◆ Cue established at encoding is not encountered at retrieval because of unanticipated events during retention
 - Longer retention intervals in real-world situations
 - Real world is dynamic and full of uncertainties, making identifying cues a challenge
 - Success often depends on happenstance encounters with associated cues

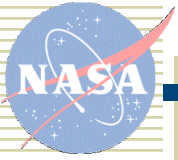




Habit capture

- ◆ Failure to perform an intended (often atypical) action in place of an habitual one
 - Intended action must compete with habitual intention for retrieval
 - Cues for habitual tasks are so effective that they often initiate behavior automatically unless deliberate effort is made to inhibit the habitual response





Conclusions

- ◆ Many sources of variance in real-world PM performance have not been addressed in laboratory studies
- ◆ New laboratory paradigms are needed to study sources of variance in real-world PM performance that are controlled or eliminated in existing paradigms

