Vigilance decrement: When does it happen and what might be done?

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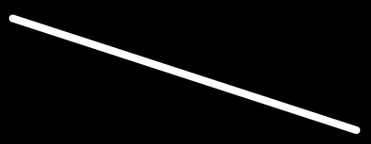
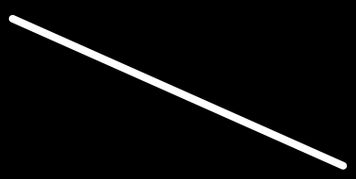
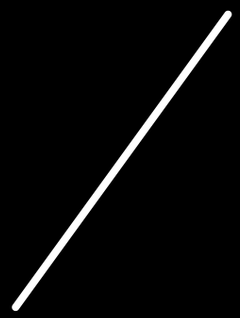
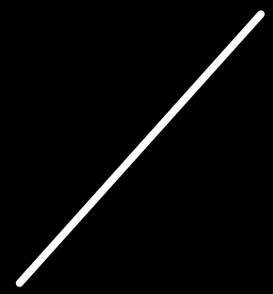
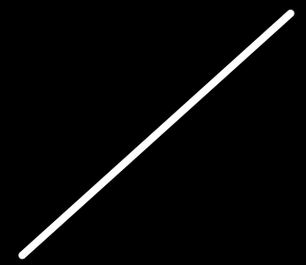
Brigham & Women’s Hospital
Harvard Medical School

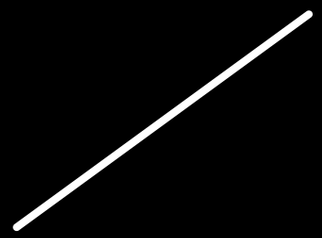


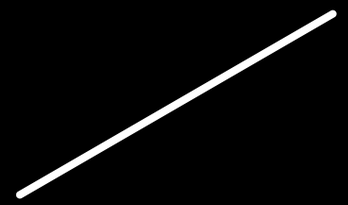


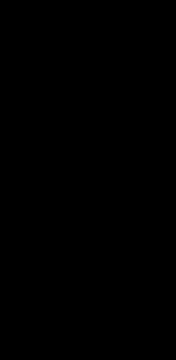


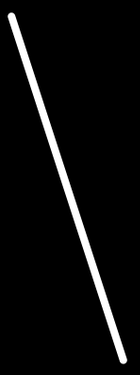


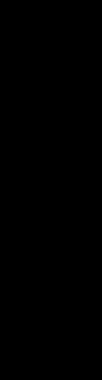


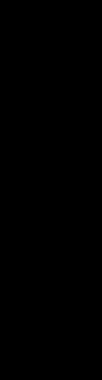


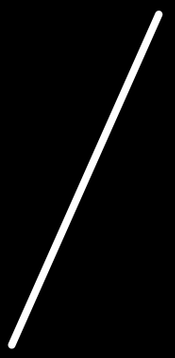


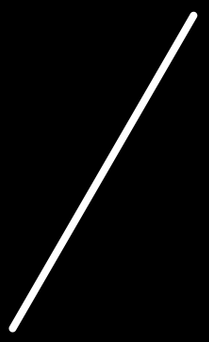


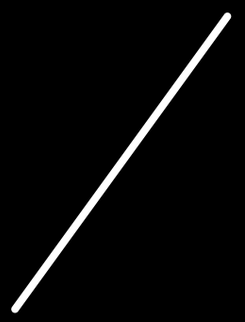


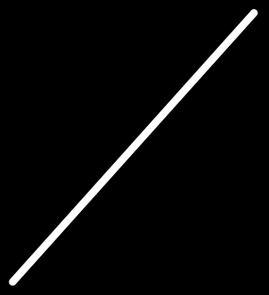


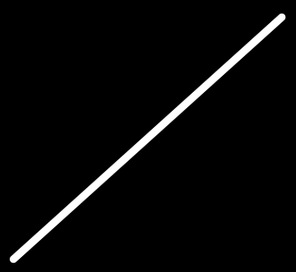


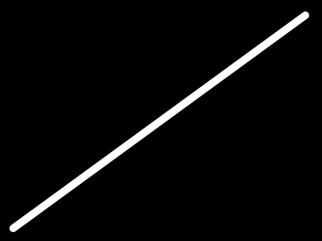


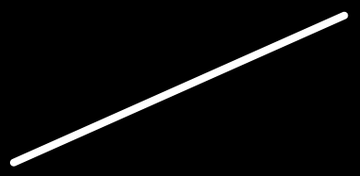




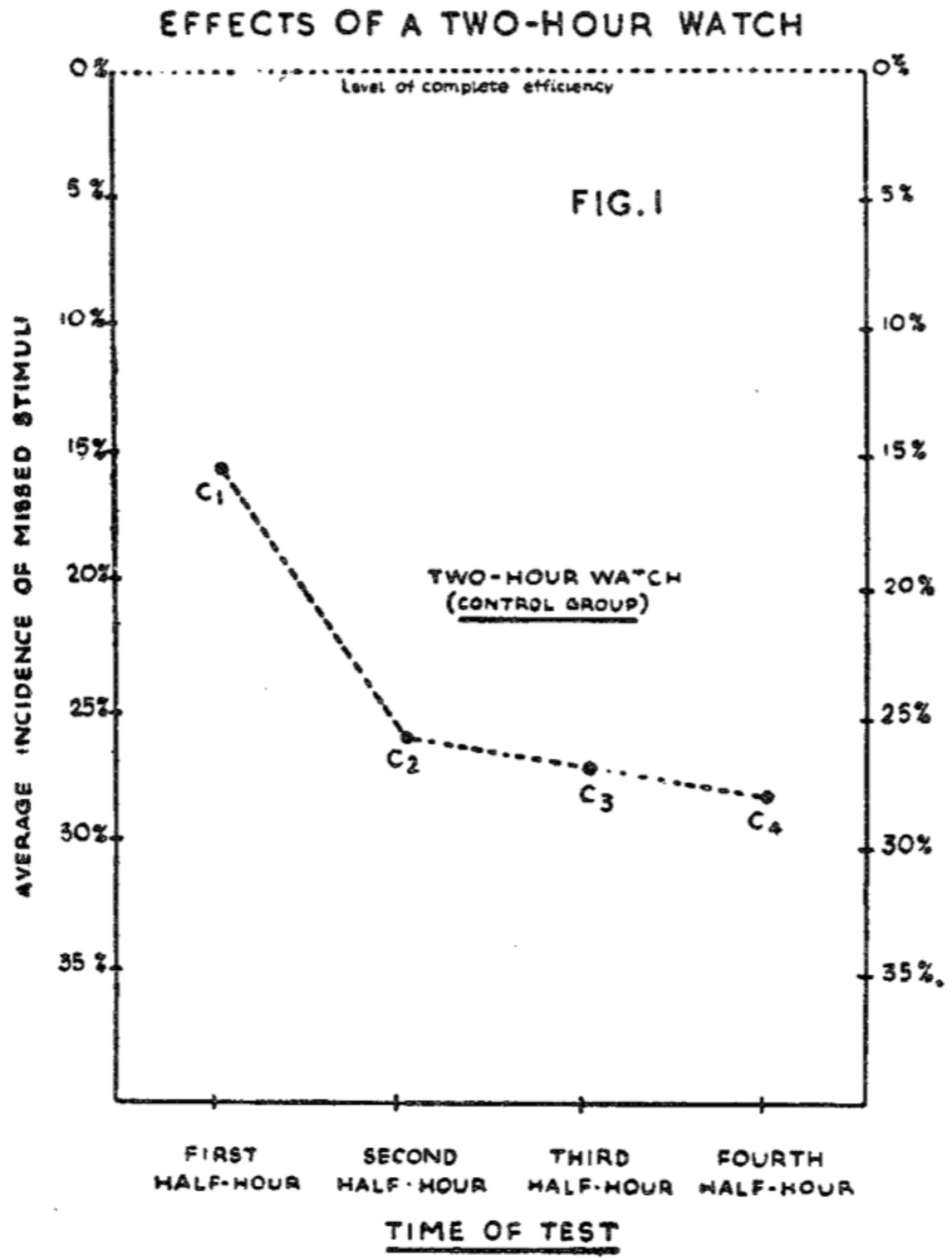








Early Vigilance Research



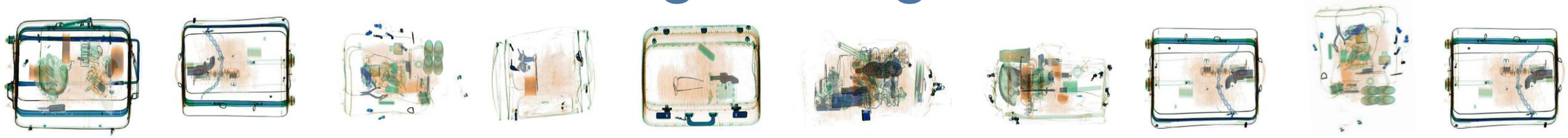
Mackworth, 1948, QJEP

Conclusions

- Vigilance Decrement is a long-studied problem endemic to boring tasks
  - Leads to an increase in ‘default’ responses
    - Affected by prevalence
- What’s to be done?
  - Give frequent breaks
  - Give adequate, individualized handling time
  - Encourage consistent handling

Does Prevalence Matter?

Let's take 20 bags with guns and knives



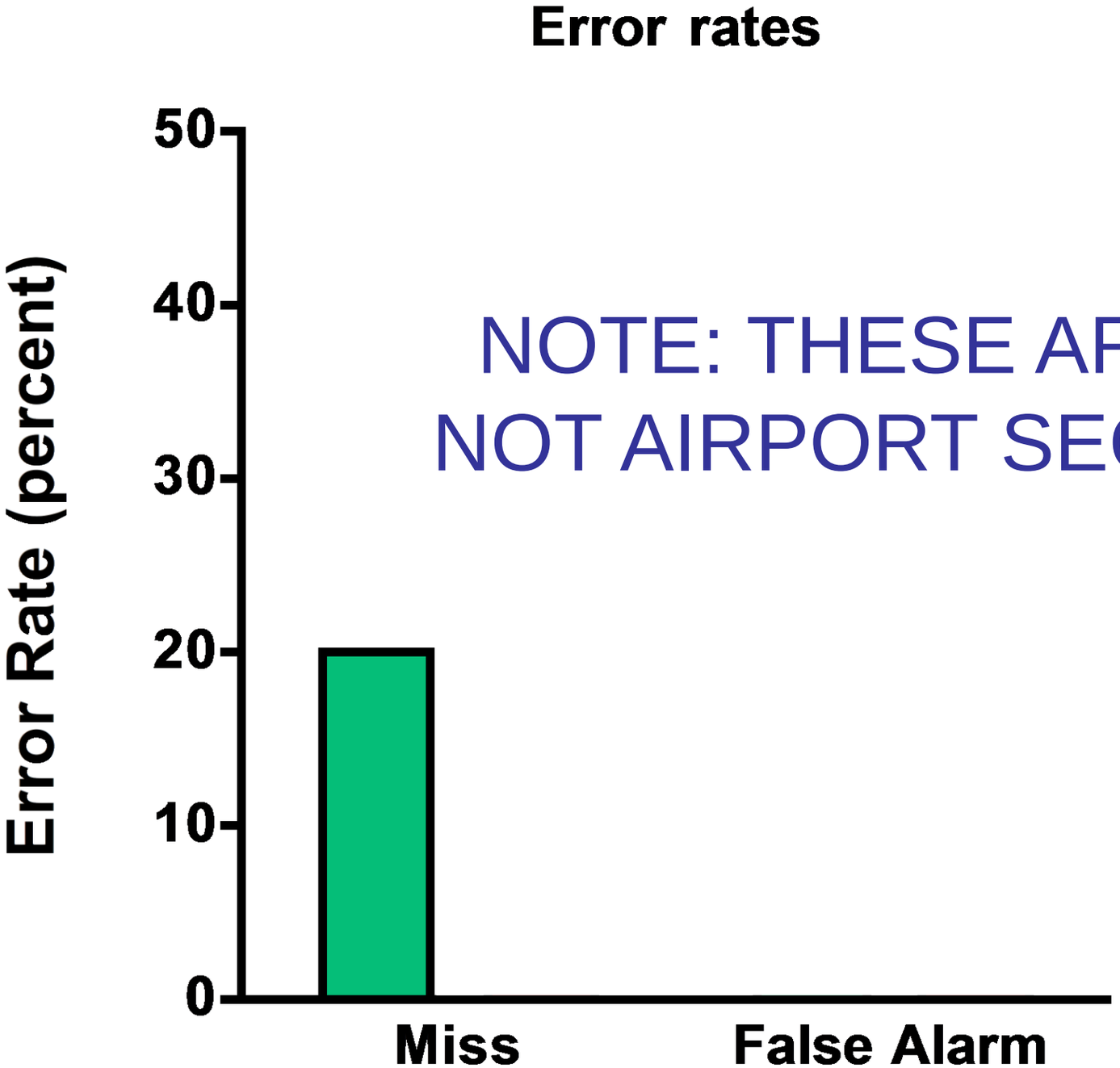
And put them in a stack of 40 bags
50% Prevalence

http://www.selectism.com/news/tag/luggage/page/4/

Or 1000 bags 2% Prevalence

http://jamesthecomic.com/blog1/2010/05/03/top-10-reasons-why-your-luggage-gets-lost-or-damaged/

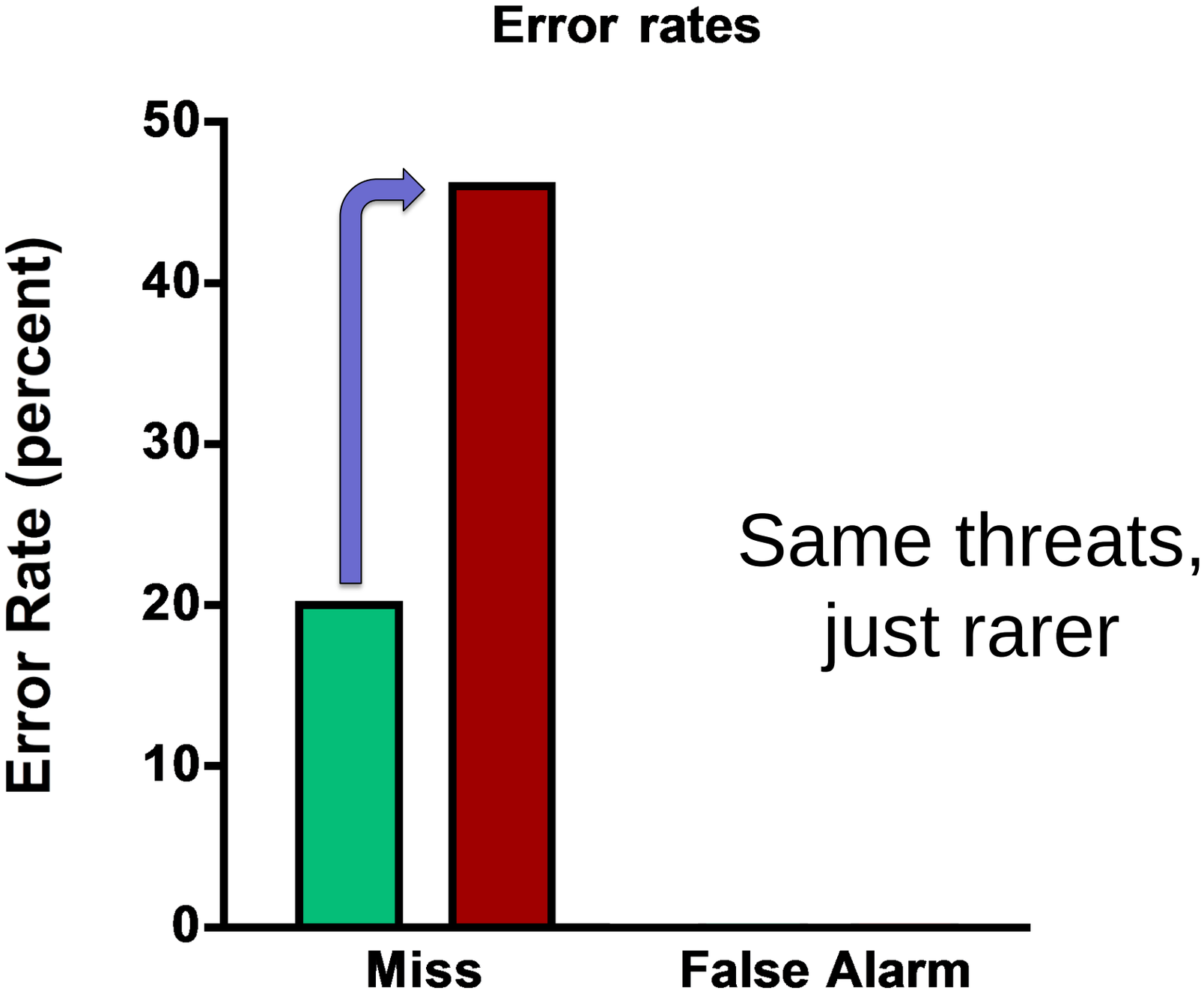
When targets are present in half of the bags people miss about 20% of them



NOTE: THESE ARE VOLUNTEERS, NOT AIRPORT SECURITY OFFICERS

Wolfe et al., 2007, JEP: General

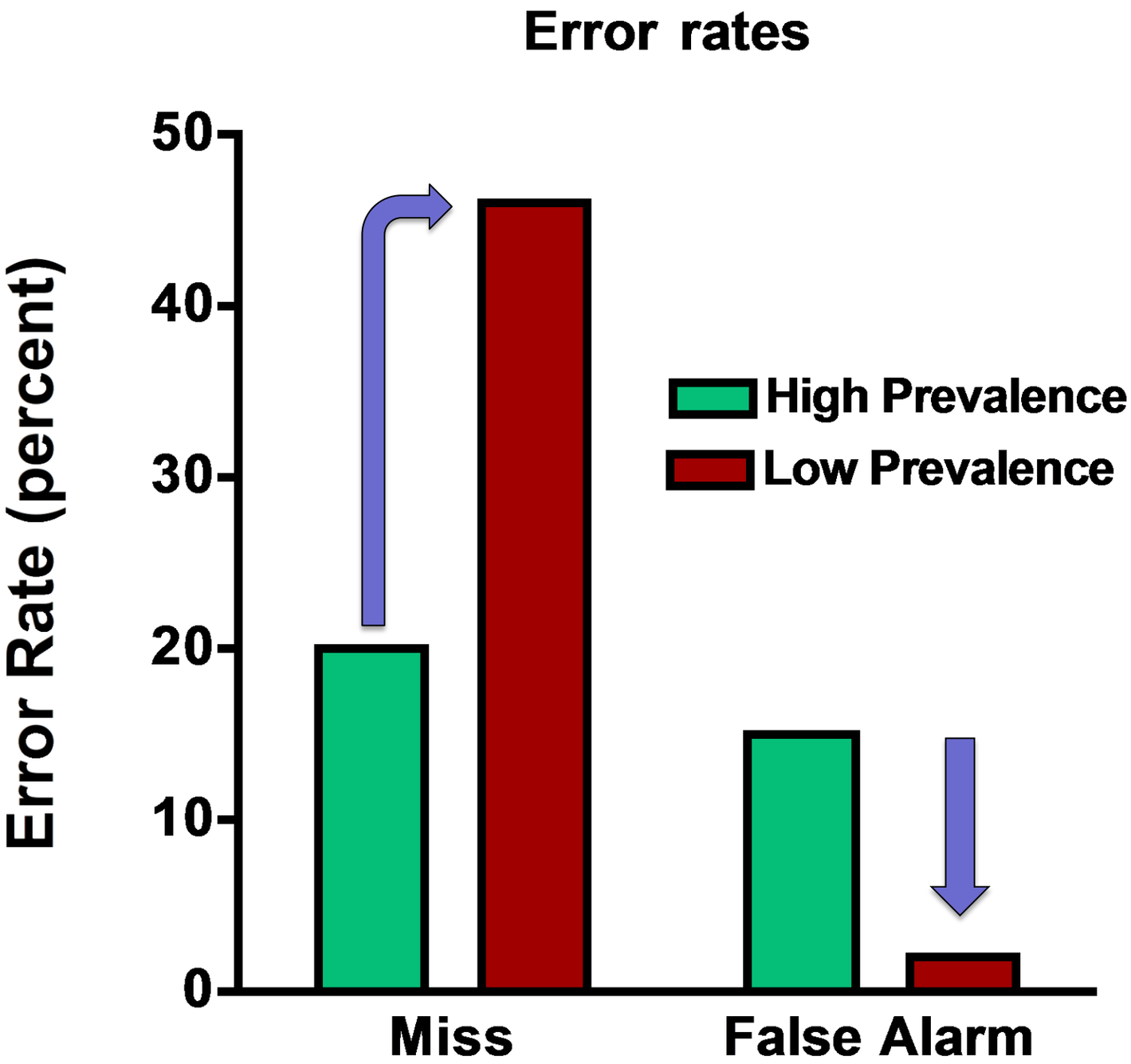
When targets are present in 2% of the bags people miss over 40% of them!



Same threats,
just rarer

Wolfe et al., 2007, JEP: General

False alarm errors go the other way

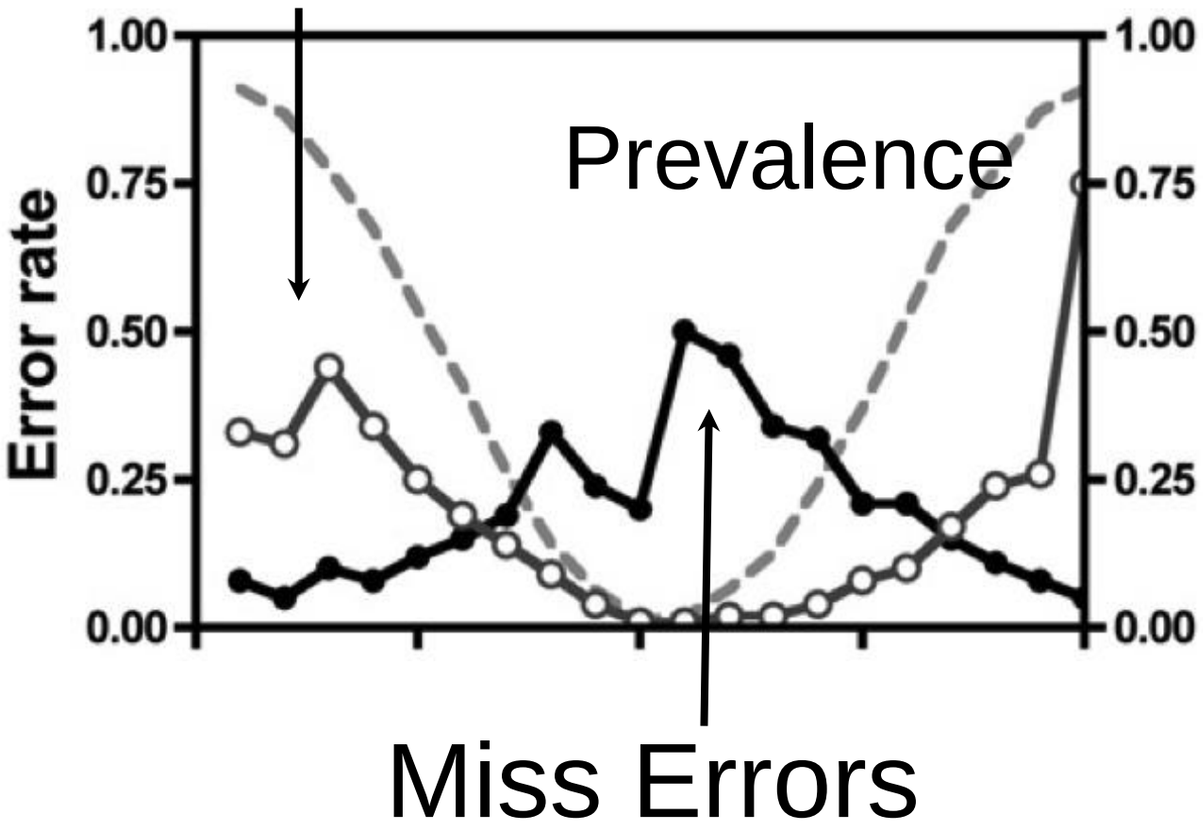


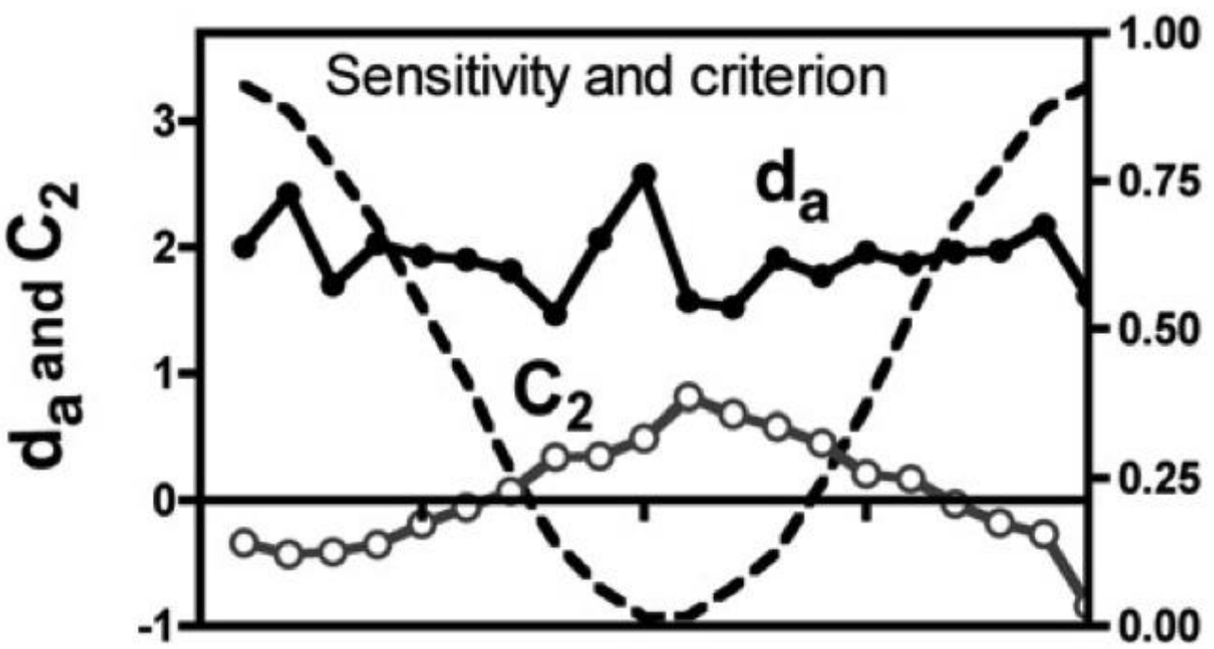
Which kind of error do you want to minimize?

Wolfe et al., 2007, JEP: General

Sensitivity to Prevalence

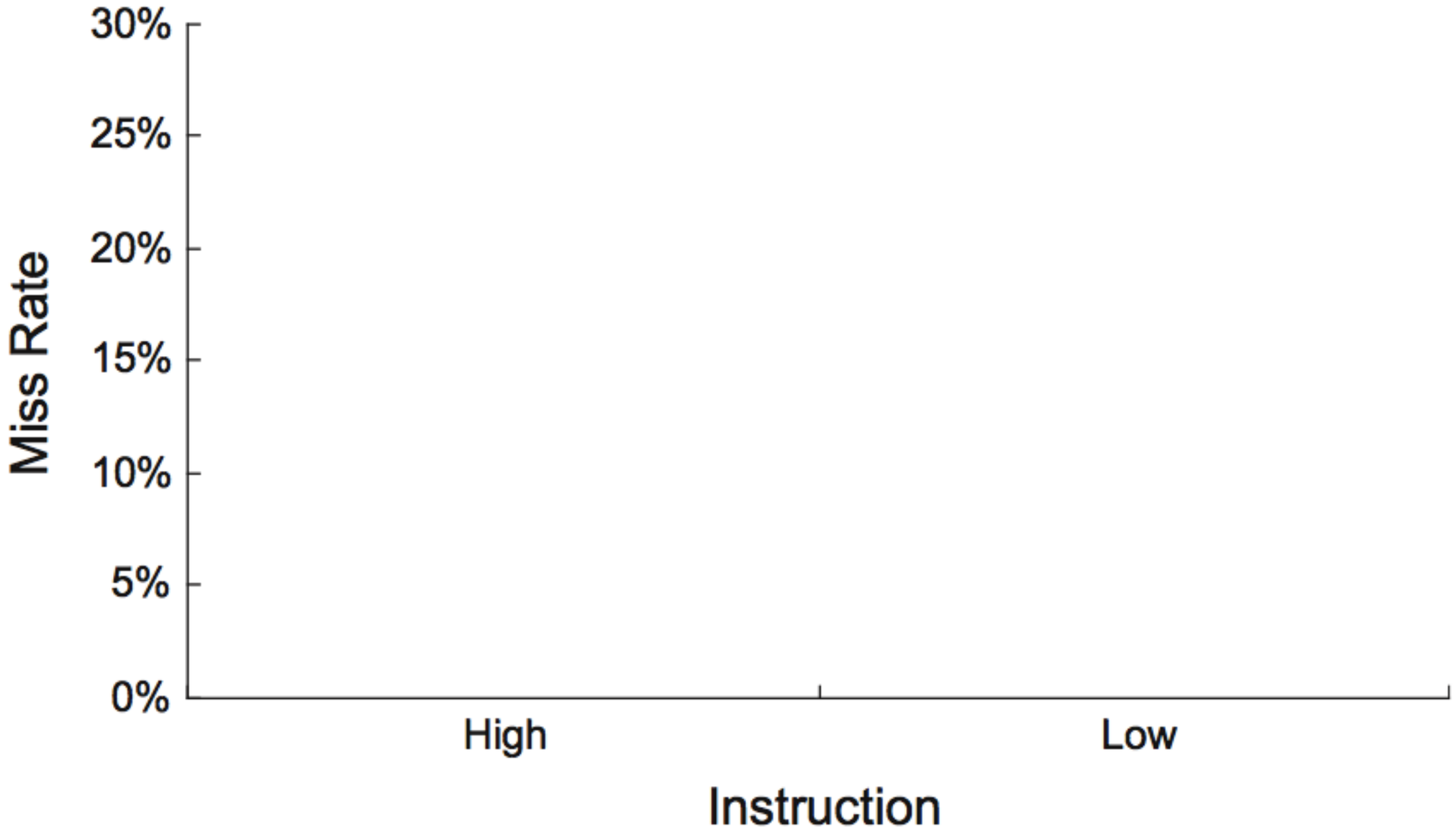
False Alarms





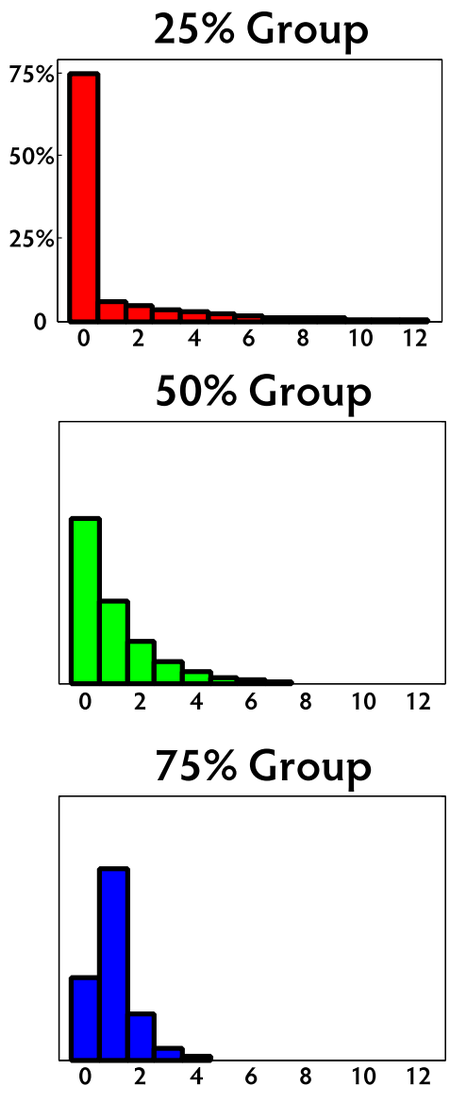
Wolfe & Van Wert, 2010, Current Biology

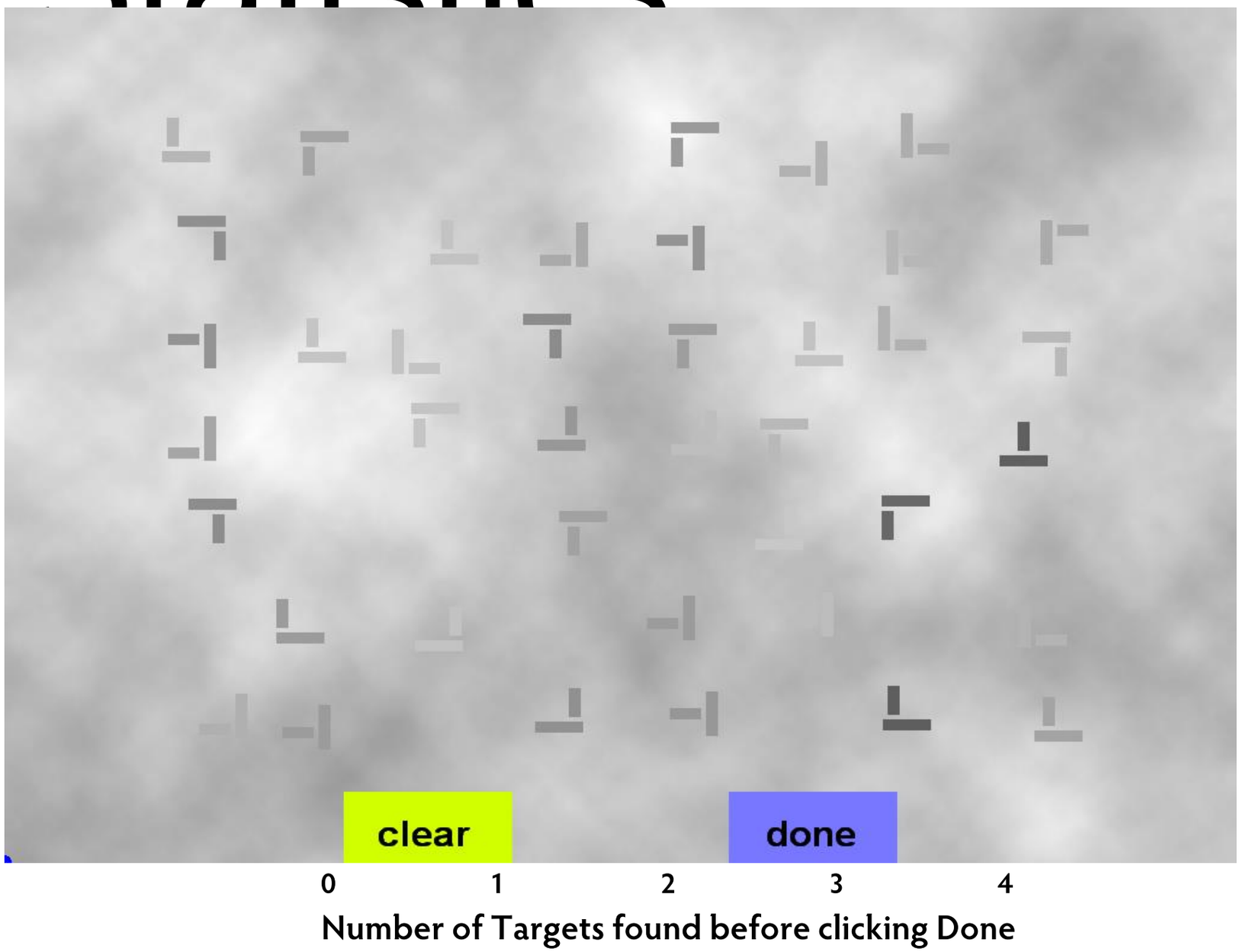
Implicitly Driven



Lau & Huang, 2010, Vision Research

Sensitivity to Complex Target Distribution Statistics





Cain, Vul, Clark, & Mitroff, 2011, Psychological Science

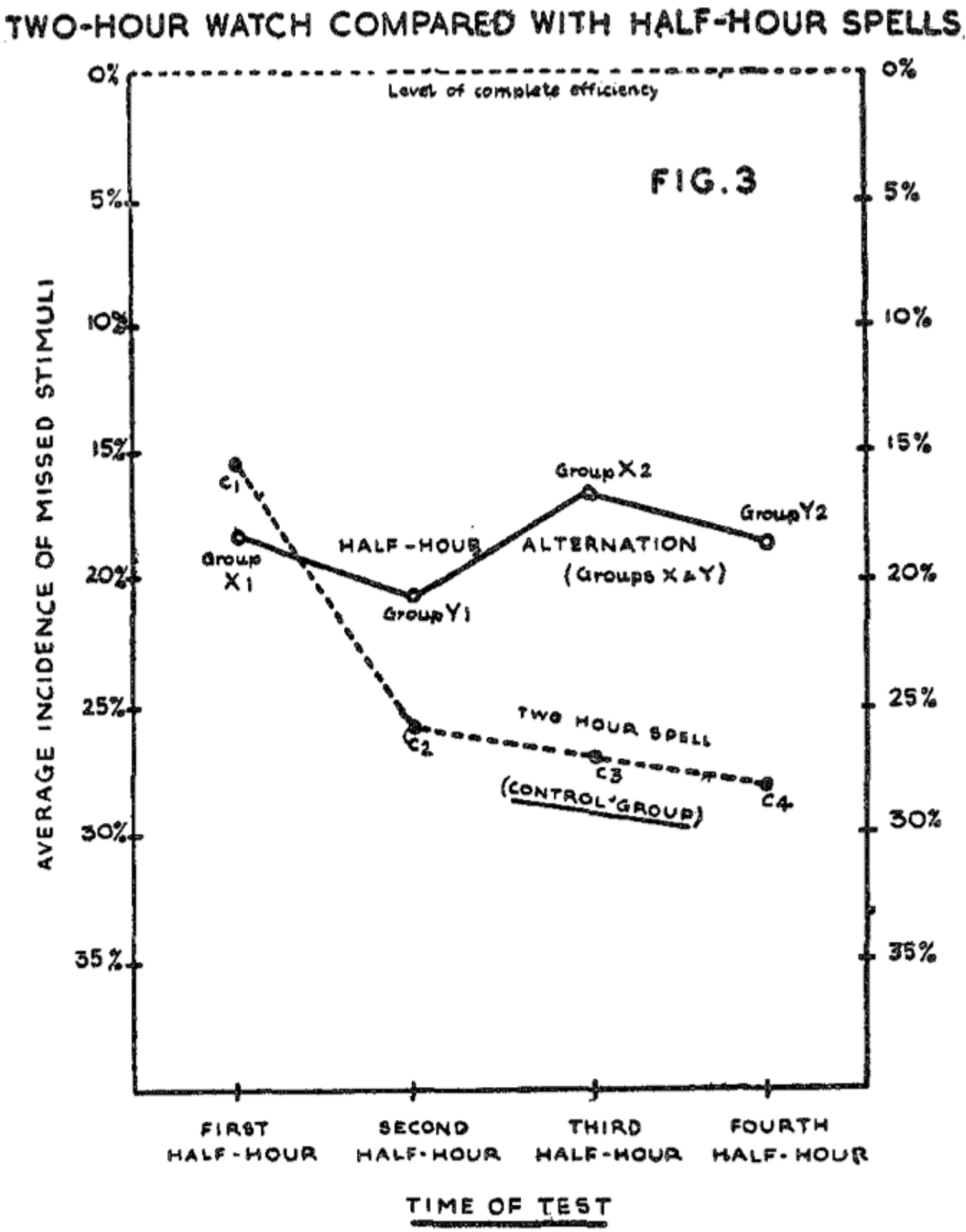
Sensitivity to Task

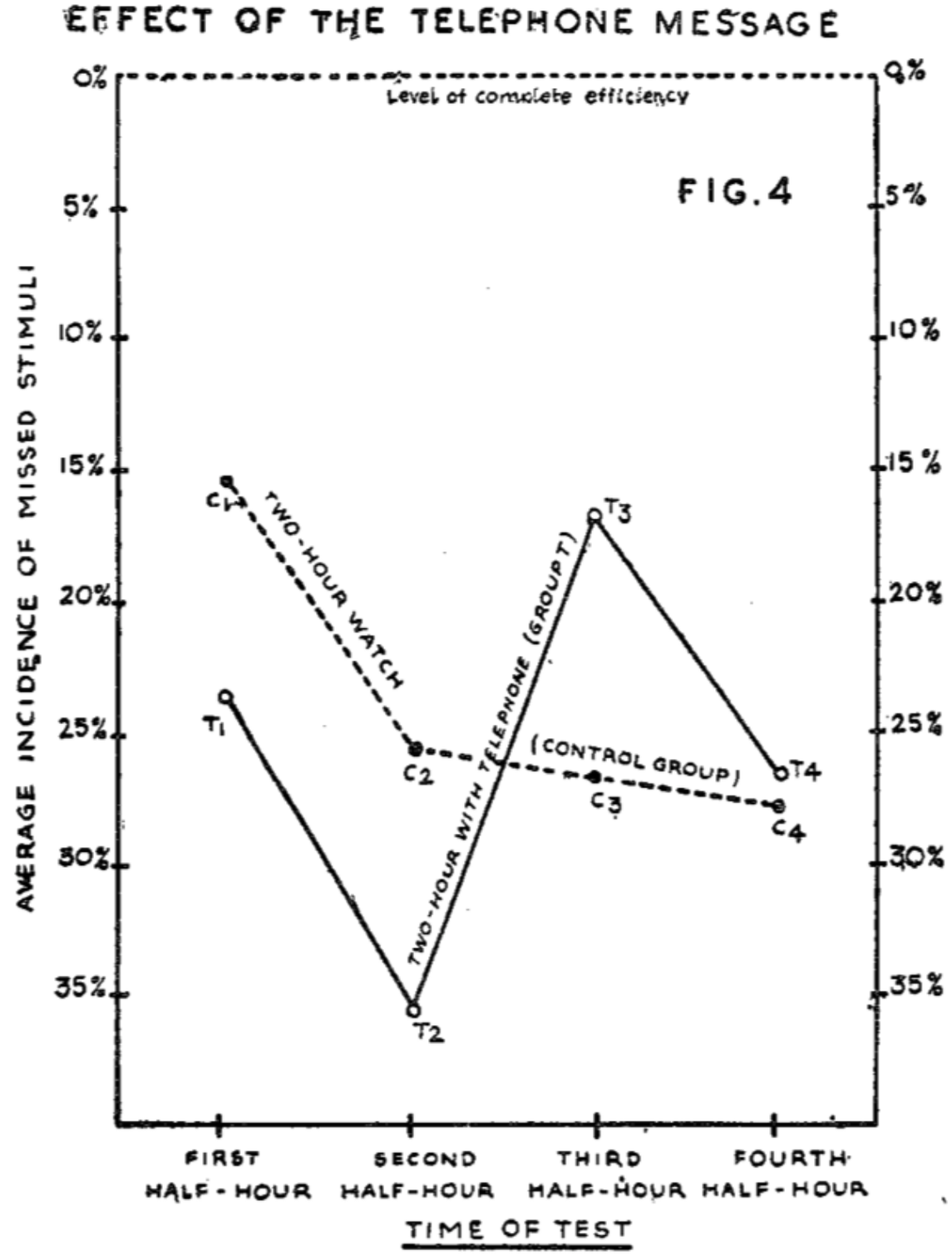
Drew, Võ, & Wolfe, 2013, Psychological Science

How Do We Address This?

- Step 1: Give breaks
- Step 2: Allow adequate handling time
  - Preferably Individualized

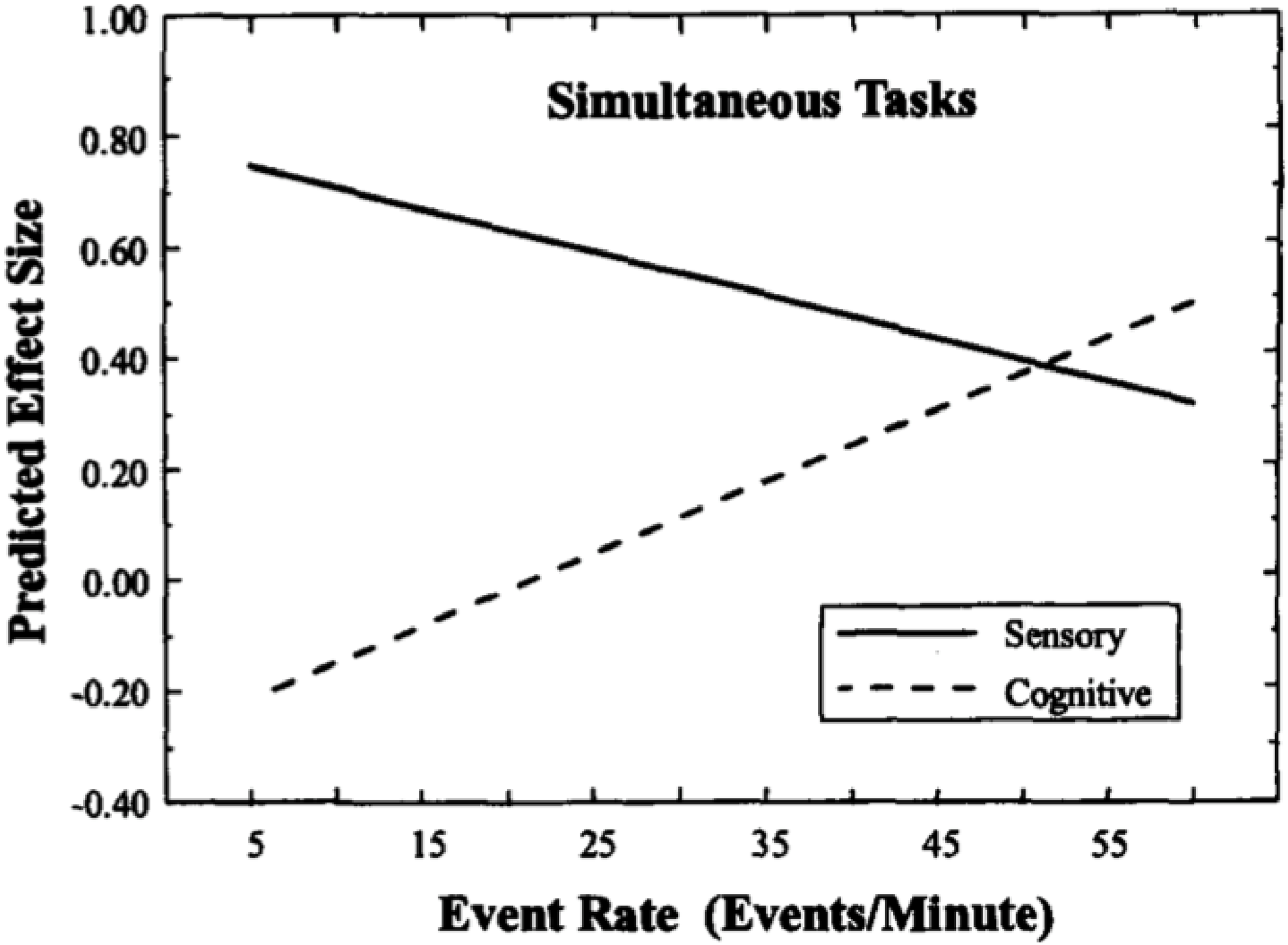
Breaks





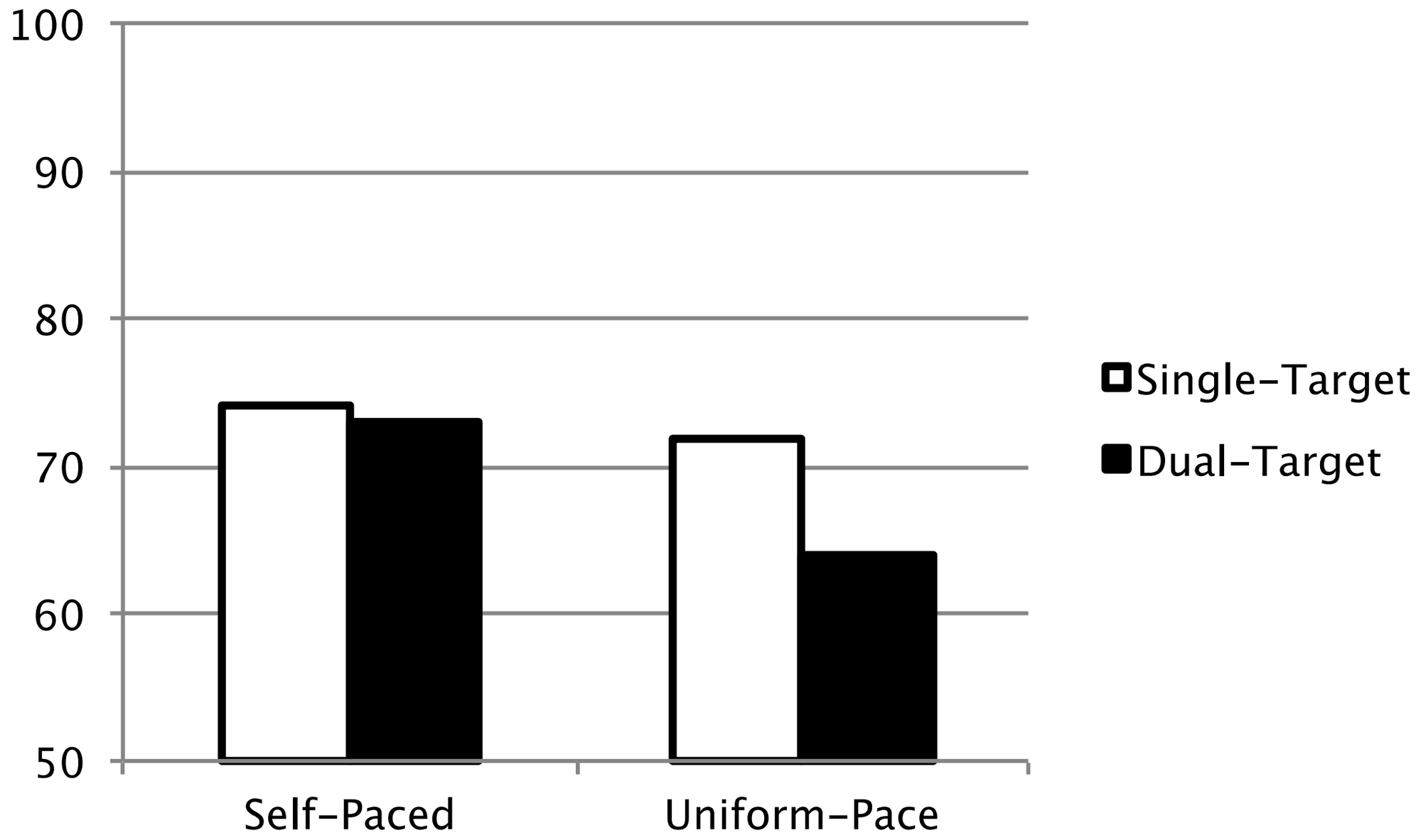
Mackworth, 1948, QJEP

Adequate Handling Time



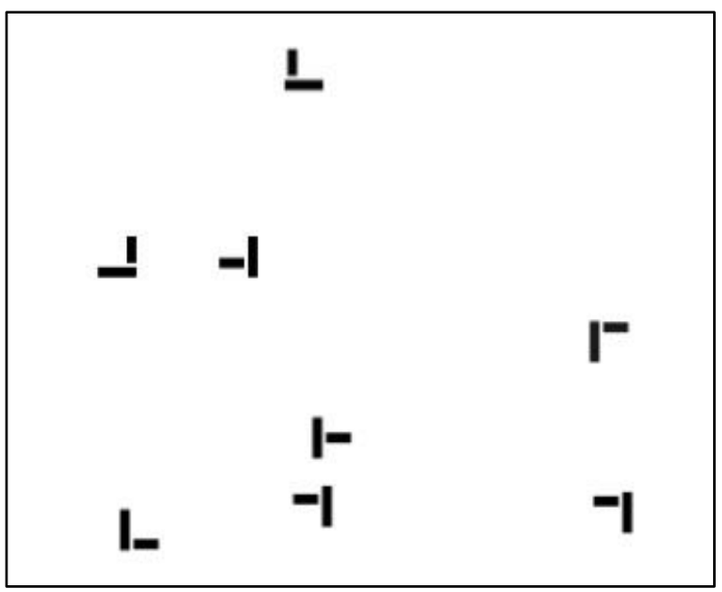
See, Howe, Warm, & Dember, 1995, Psychological Bulletin

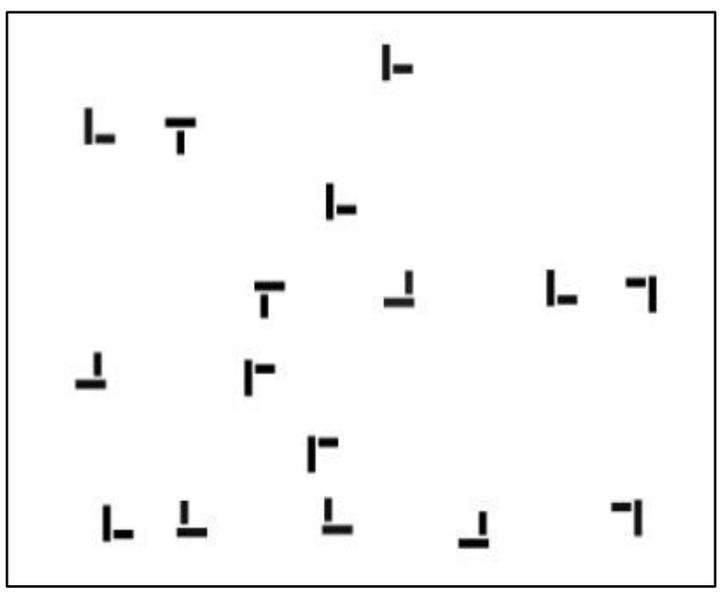
Control Over Pace

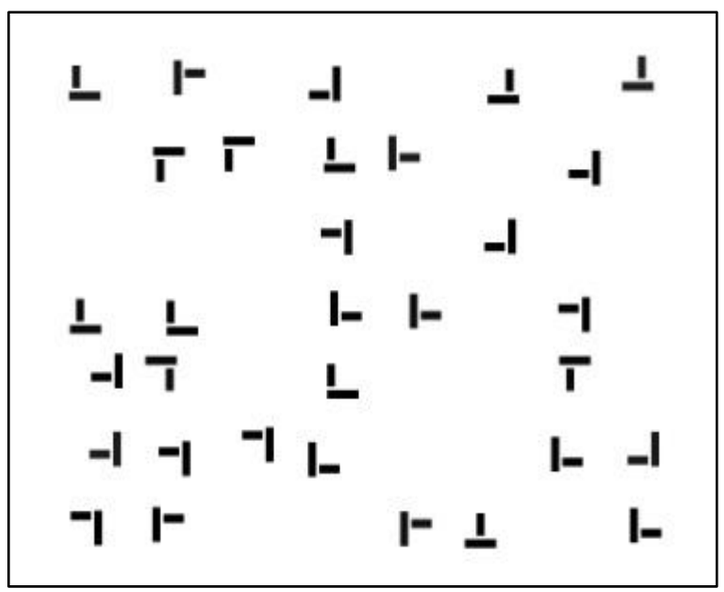


Fleck, Samei, & Mitroff, 2010, Psychological Science

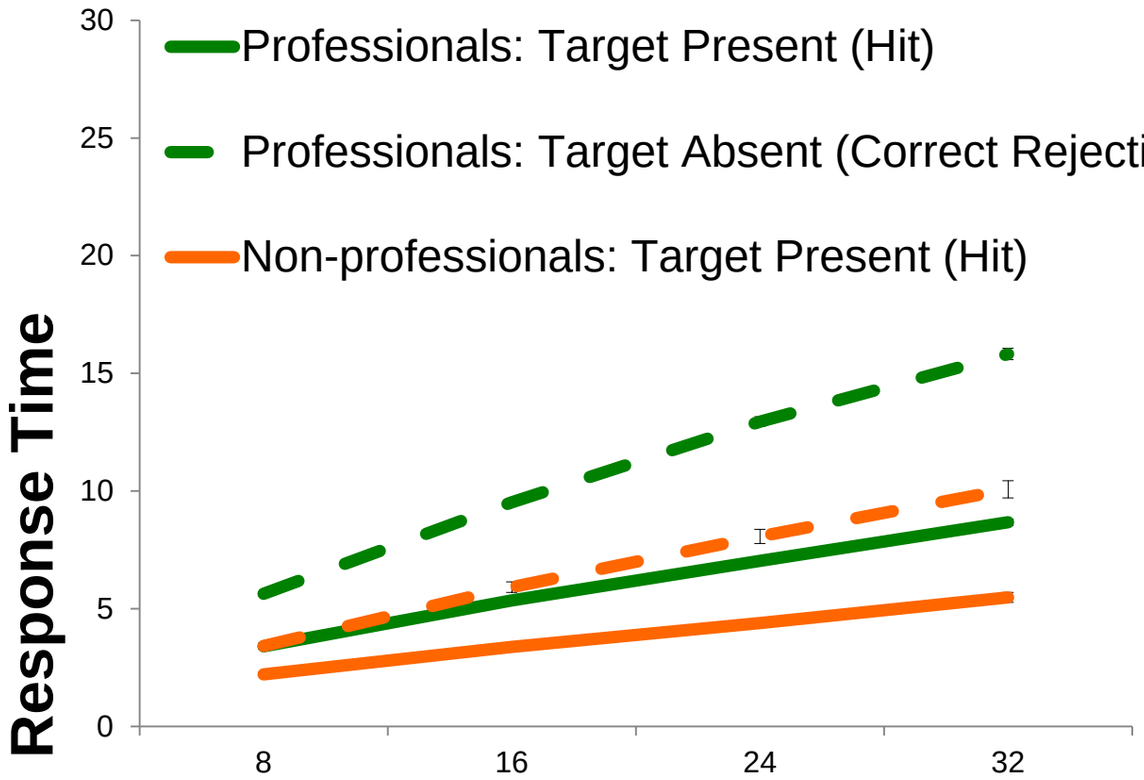
Work with TSA Officers







Speed/Accuracy Trade-off



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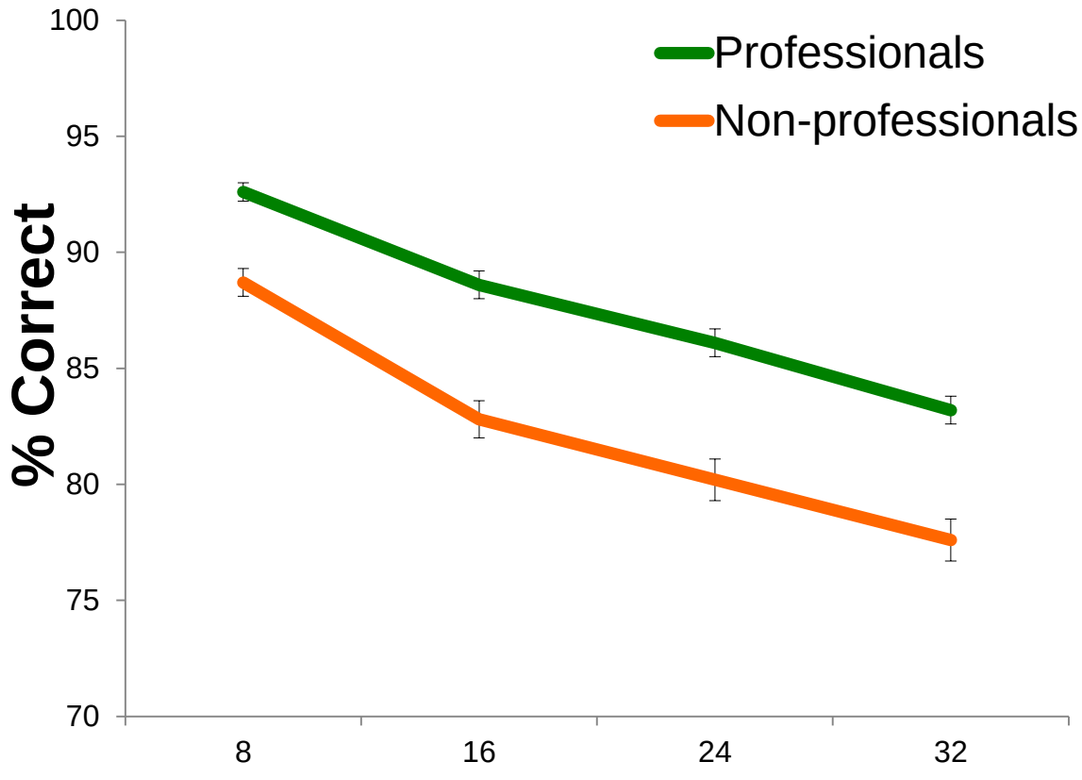

Set Size
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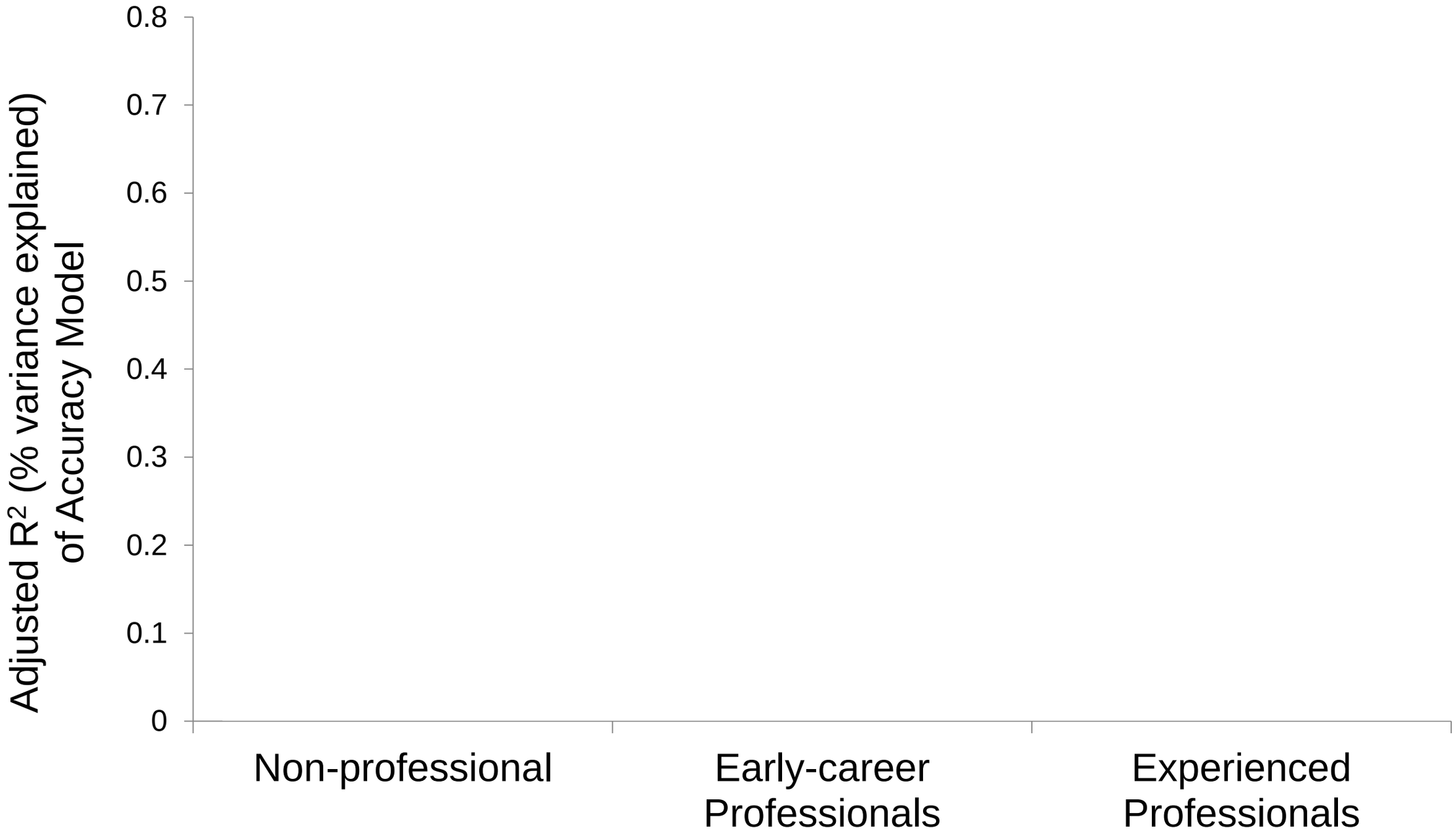
Biggs, Cain, Clark, Darling, & Mitroff, 2013, Visual Cognition

Search Consistency



Biggs, Cain, Clark, Darling, & Mitroff, 2013, Visual Cognition

Conclusions Redux

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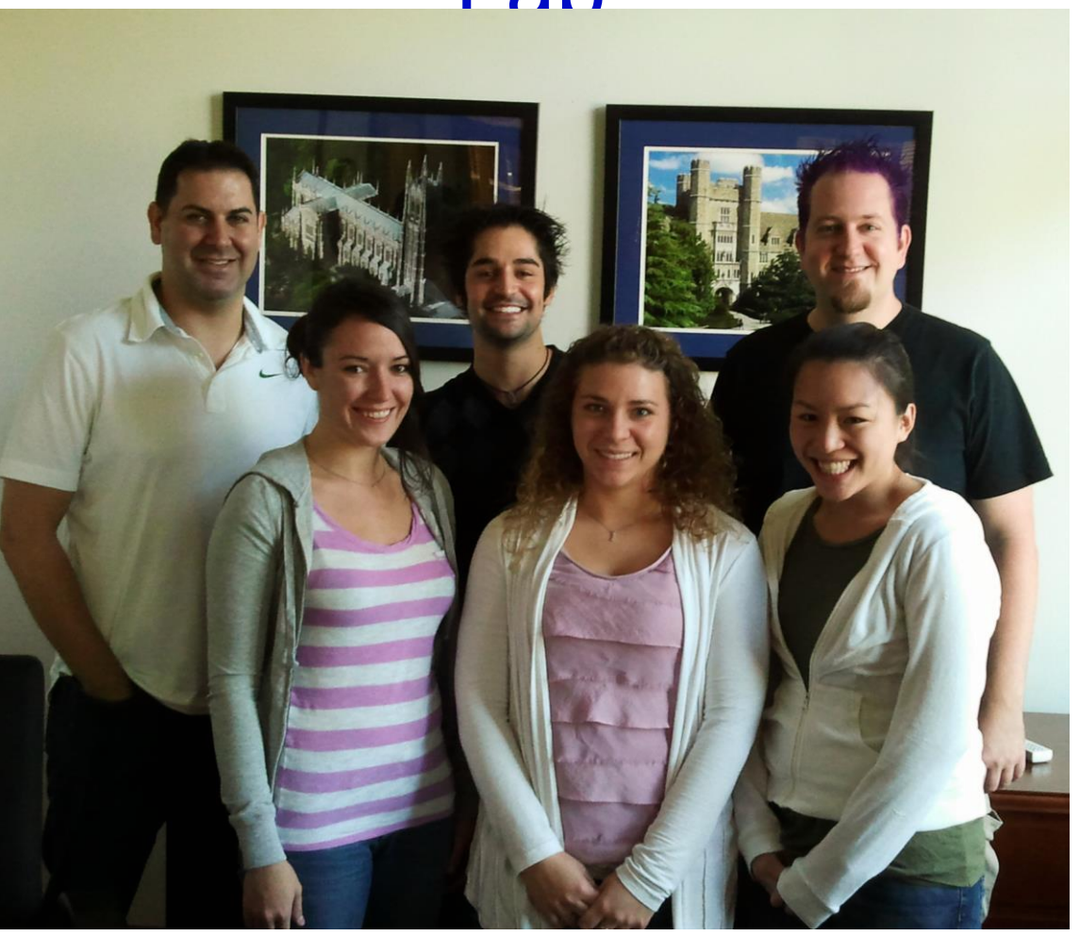
Thanks!

Duke Visual Cognition Lab



BWH Visual Attention Lab