

Background Info

- Professional visual searchers (e.g., radiologists, baggage screeners) face challenges that make their jobs difficult, leading to elevated risks of target misses and false-alarms.
- Airport baggage screeners must determine if any objects in a suitcase fall into the category of “prohibited” or “dangerous” items.
- Not all prohibited items appear in travelers’ bags with equal frequency, and indeed, hazardous items (e.g., weapons) likely appear less frequently than more innocuous prohibitions (e.g., water bottles).
- These differential frequencies of occurrence may make dangerous items more difficult to detect, as infrequent items are more likely to be missed than more frequent ones (the “low prevalence effect;” Hout et al., 2015; Wolfe, Horowitz & Kenner, 2005).

The Current Investigation

- We conducted a laboratory experiment specifically designed to mimic challenges faced by professional searchers.
- Our goal was to determine whether the use of a partner to aid in search would increase the accuracy and efficiency of search behavior when looking for low-prevalence targets.

Method

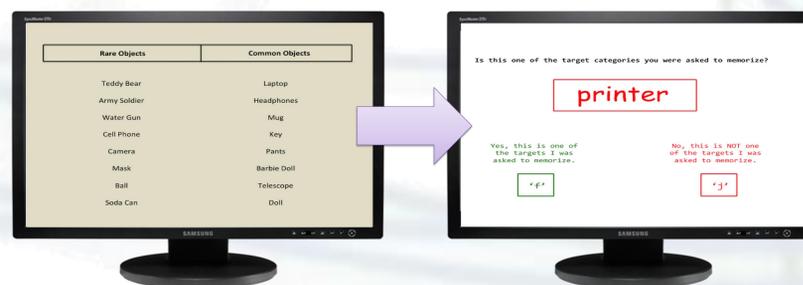
- N = 46 teams; 3 collaboration conditions (solo, collaborative, strategy).
- Memory target set of 16 categories (e.g., teddy bears, cameras, laptops).
- Categories displayed into two lists: rare and common objects (unbeknownst to participants, there were actually four graded levels of frequency).
- Required to achieve 80% accuracy on a category recognition task before proceeding to search.
- Participants viewed arrays of 32 real-world objects, finding 0-3 targets on each trial.
- Feedback and points accrued were displayed after each block of trials (+1 point for every “hit” and -1 point for every “miss” or “false-alarm”).
- Encouraged to score as many points as possible.

Strategy Condition



- Additionally, in the “strategy” condition only, participants were instructed to split up the 16 category memory set, by specifically assigning one individual to pay close attention to the rare objects and the other individual to pay close attention to the common objects.

Procedure: Target Memorization



- Memory target set of 16 categories.
- Participants viewed the lists for as long as they chose to.
- Memory tested using 2AFC test.
- Two cycles of this procedure were passed with 80% accuracy or better, before people could start search.

Procedure: Visual Search

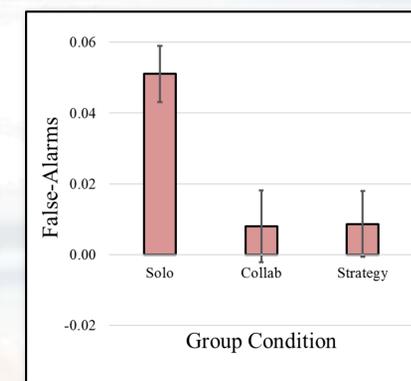
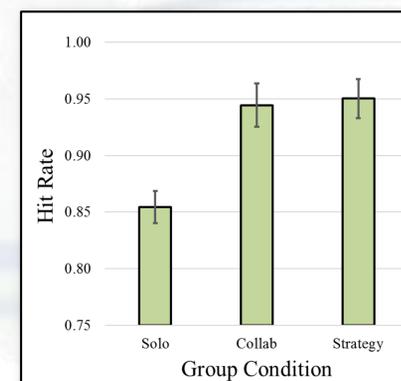


- Participants searched for all target categories simultaneously.
- Touchscreen monitors allowed for simultaneous response from collaborative teammates.
- Selected items were highlighted with black borders.



- After each block of trials, feedback about hits, false-alarms, misses, and total points accrued was given.
- No feedback was given about specific target categories.

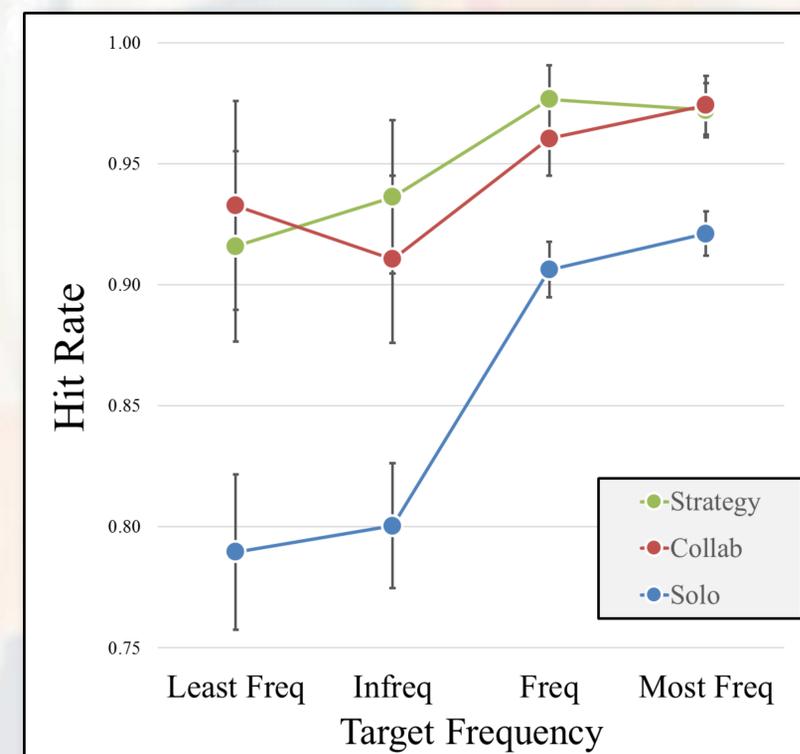
Results: Group Differences



- Overall hit-rates were high, and were higher among teams, relative to solo searchers.
- False-alarms were uncommon, and were effectively non-existent among teams.

Results: Frequency Effects

- Consistent with well-documented “prevalence effects,” less frequent targets were missed more frequently than common targets.



- Performance was no different between “collaborative” and “strategy” groups.
- When the team groups were collapsed upon one another, there was a marginally significant Frequency by Group interaction ($p = .07$).
- This potential interaction may suggest that the frequency effects are less pronounced among teams than they are among solo searchers.

Conclusions

- We found – unsurprisingly, and in line with our previous work – that collaborative search teams performed better than solo searchers.
- Unexpectedly, we found no differential performance between teams instructed to use a divided workload strategy and those left to strategize (or not) of their own accord.
- In both groups, frequency effects were robust: Less frequent targets were more likely to be missed than more frequently present categories.
- Working as a team provided some degree of protection against prevalence effects, indicated by a marginally significant interaction between frequency and group, when the collaborative and strategy conditions were collapsed together.
- It is likely that our strategy manipulation was not forceful enough in encouraging participants to split up the workload effectively.
- Future work will continue to focus on examining collaborative strategies that could be implemented to better facilitate detection of rarely occurring items.