

Four eyes aren't always better than two: Collaborative categorical multiple-target hybrid search

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Difficulties faced by professional searchers

- Real world search is rarely as simple and straightforward as many laboratory tasks.
- Professional visual searchers (e.g., radiologists, baggage screeners) face challenges that make their jobs difficult.
- Categorical search: Looking for targets without knowledge of precise visual details (e.g., “weapons,” “abnormalities”).
- Multiple-target search: More than one item may be present (e.g., multiple tumors that need to be identified).
- Hybrid search: The number of search targets may exceed the capacity of working-memory (e.g., baggage screeners look for many potential prohibited items).

The current investigation

- We conducted a laboratory experiment specifically designed to mimic challenges faced by professional searchers.
- Our goal was to determine under which conditions having a partner would help to overcome some of these difficulties.
- People looked for many categorically-defined target categories in displays wherein between 0 and 3 targets could appear.
- There were two team groupings: 1) A tandem group that worked together, but were not permitted to communicate/strategize. And 2) a collaborative group that were allowed to communicate.
- Two-person team performance was also compared to a single-person control condition.
- We hypothesized the collaborative group would respond slower than the tandem group, but would maintain higher accuracy than both solo and tandem groups.

Method

- N = 45 teams; three collaboration conditions (solo, tandem, collaborative)
- Memory target set of either 8 or 24 categories (e.g., teddy bears, printers).
- Required to achieve 80% on a memory recall task before proceeding to experiment.
- Participants viewed an array of 32 real-world objects, finding 0-3 targets on each trial.
- Feedback and points accrued were displayed after each trial (+1 point for every “hit” and -1 point for every “miss” or “false alarm”).
- Encouraged to score as many points as possible.

Procedure: Target memorization

- Target categories displayed for 3 seconds each.
- Old/new recognition test was administered.
- Two cycles of this procedure were passed with 80% accuracy or better, before people could continue.

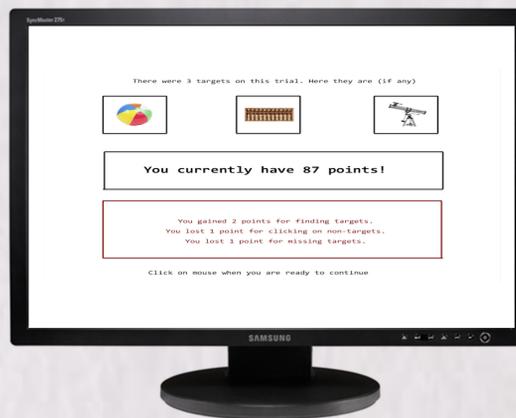


Procedure: Visual search

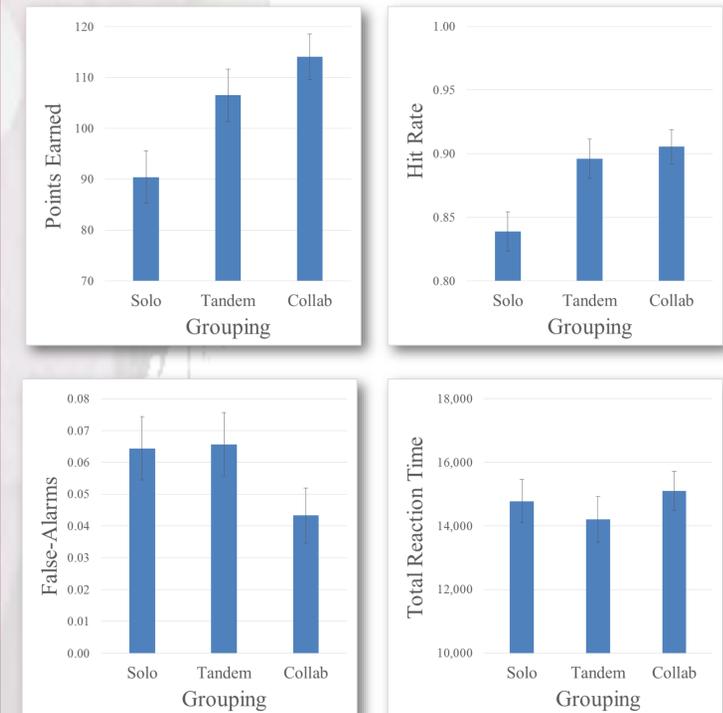
- Participants searched for all target categories simultaneously.
- They clicked on each target they found; hits were then bordered in green, false-alarms in red.



- After each trial, the correct target items were shown, along with specific feedback about hits, false-alarms, misses, and total points accrued.



Results



- More points were earned by teams, relative to the solo condition.
- Hit rate was higher among teams than solo.
- False-alarms were not different across conditions.
- Total search time was not different across conditions.
- Individual item RTs (not shown) showed a benefit to groups, particularly with smaller set sizes.



Conclusions

- Working as a pair benefited the accuracy of search, as well as how swiftly targets were found.
- However, overall duration of search, as well as false-alarm rates showed no differences between conditions.
- Working as a pair does not convey universal benefits to search behavior. Moreover, non-communicative groups (tandem conditions) frequently performed on par with communicative groups (collaborative conditions).
- Future work is being directed at implementing specific strategies, such as splitting the memory set between the searchers, and directing each participant to primarily search a specific portion of the screen.