# How the Heck Did I Miss That? How to use the hybrid search paradigm to study "incidental finding" errors in radiology.

Jeremy Wolfe, Abla Alaoui Soce

When radiologists perform one task (e.g. Does this patient have pneumonia?), they are also expected to search for "incidental findings" that might be clinically significant (e.g. signs of lung cancer). Unfortunately, these incidental findings are missed at rates higher than is desirable. Moreover, the same lesion that would be found if it were the object of search, can be missed when it is an incidental finding. To develop techniques to address this problem, we have designed a hybrid search analog task that can be used with non-experts. In hybrid search, observers look for an instance of any of several candidate targets held in memory. Reaction time (RT) increases linearly with the visual set size and linearly with the log of the number of targets held in memory. The same pattern is seen with search for categorical targets (e.g. find any cat, car, coin, or cookie), but these targets produce longer RTs. To simulate the incidental finding situation, observers search for any of three specific and three categorical targets. Specific targets are the analog of the radiologist's specific task. Categorical targets are the analog of the incidental findings. They are known to the observer but less well-defined than the specific targets. When categorical and specific targets are mixed within a block, observers miss more than twice as many categorical targets as they do specific targets. Observers miss fewer categorical targets if all targets in a block are categorical. Observers miss the fewest targets when all were specific. In a mixed block with 4X as many specific targets as categorical targets, the categorical target miss rate becomes very large (38%), mimicking the pattern of incidental finding errors in radiology. Given this 'model system', we can test interventions that could reduce the incidental error rate in the lab and in the clinic.