



SEARCH-O-MATIC 2000: A SOFTWARE PACKAGE TO ANALYSE MORRIS WATER MAZE SEARCH STRATEGIES

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Background & rationale

Search strategy analysis has been around for a long time in visuo-spatial learning and memory tests.

These began using qualitative measures of search path, and have developed into categorization using quantitative measures of performance.

The number of studies that employ search strategy analysis, however, is still relatively low.

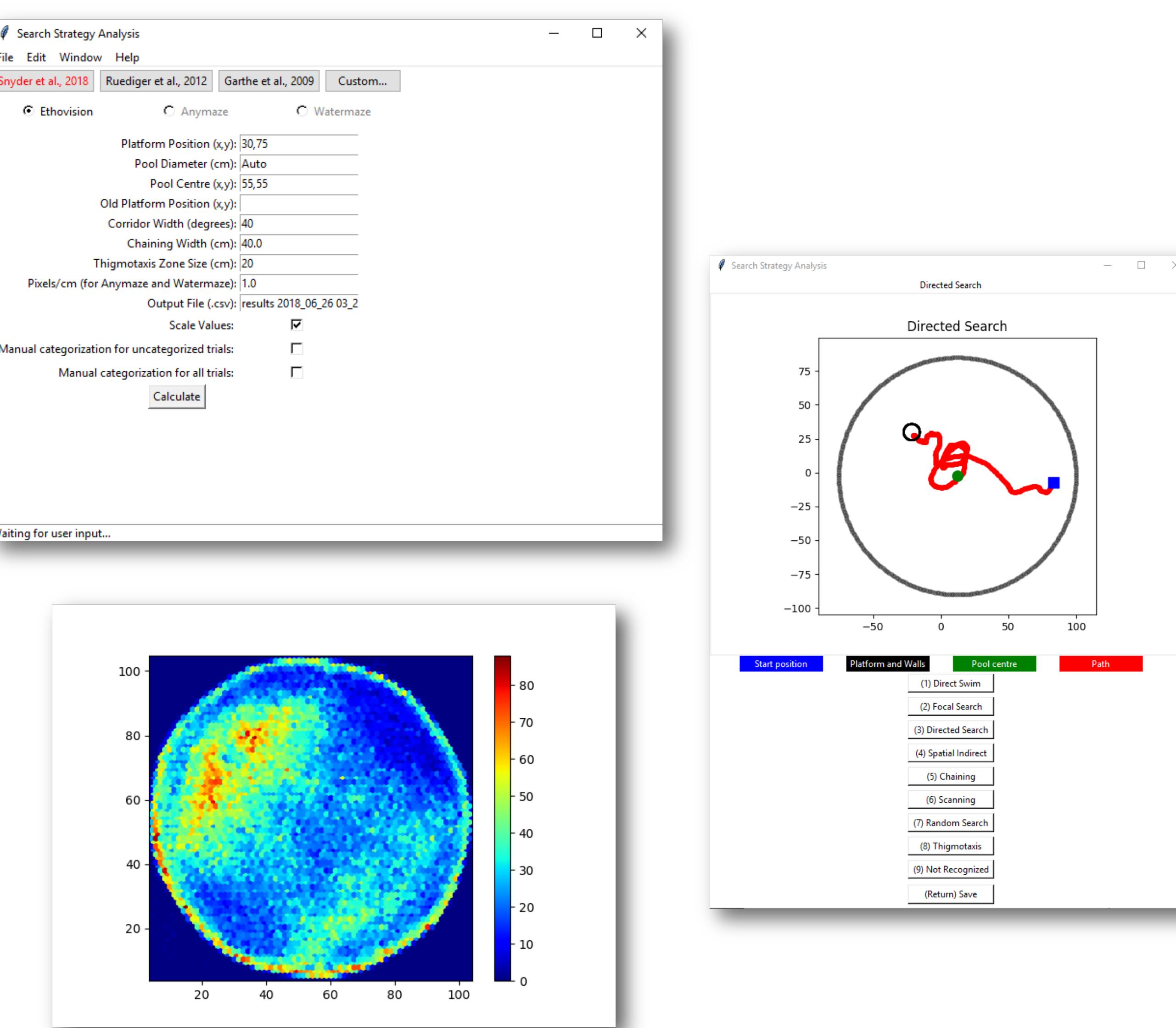
Why is this the case?

- Search Strategy Analysis may not provide anything useful over latency and distance
- There are no accessible tools currently available to facilitate the analysis
- The parameters used in the analysis are not clearly defined, and how to optimize them is still unclear

This software package attempts to address the above issues.

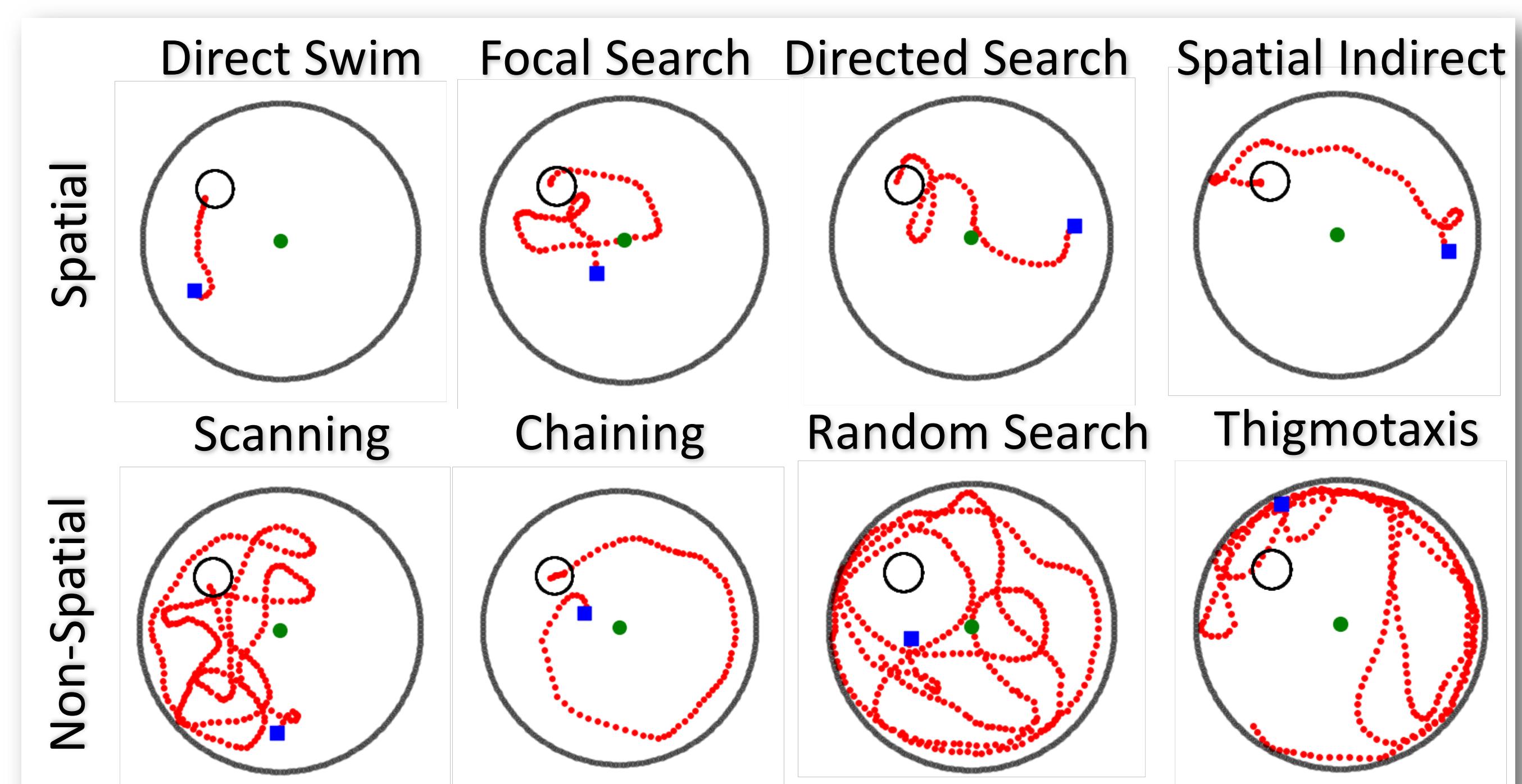
Search-O-Matic 2000

We developed a software package with a user-friendly GUI in order to enable researchers to better analyze Morris Water Maze (MWM) data. The program allows calculation of search strategies, CSE, latency, distance, heading error, and more. It also allows you to generate heatmaps for trials.



What are Search Strategies?

Search strategies have been defined in order to better understand animal behaviour in the MWM. The strategies fall into 2 broad categories: Spatial and Non-Spatial. These can be broken down further into the strategies shown below.

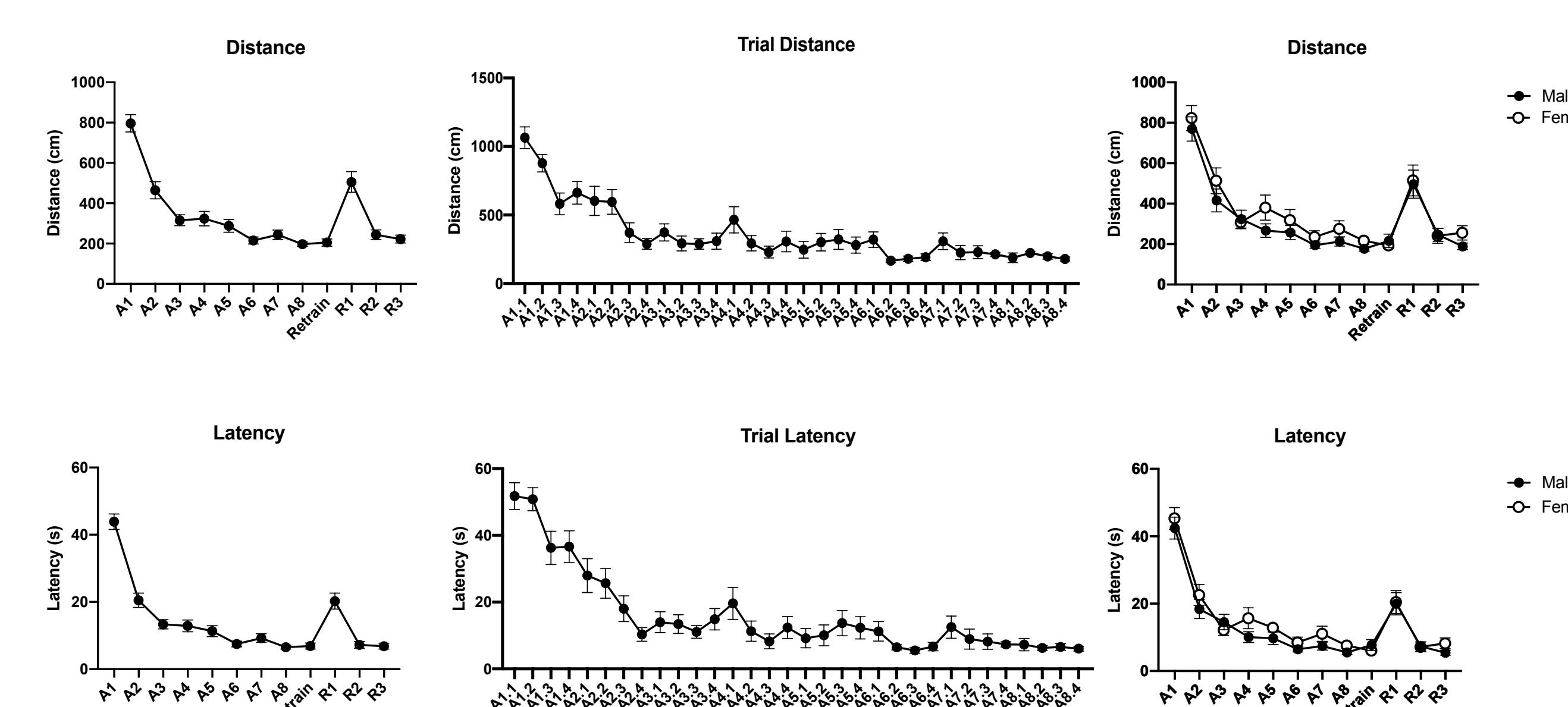


Methodology

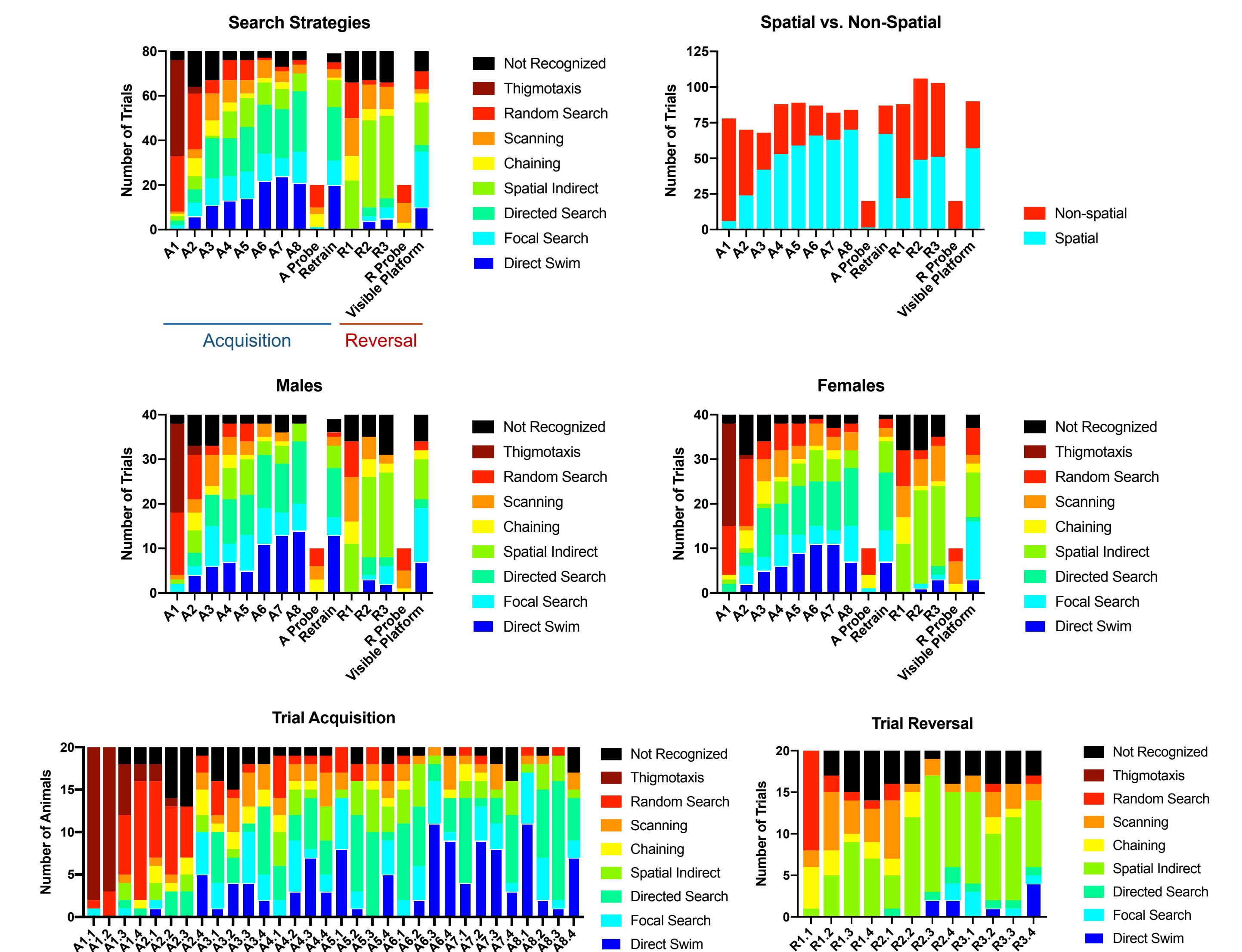
A group of 20 mixed-sex C57BL/6J mice were run on a 4 trial per day, 15 day training paradigm in the Morris Water Maze. Animals were trained for 8 days (A1 – A8) with a hidden escape platform, followed by a single probe trial without a platform to assess memory (A Probe), and then re-trained with a platform (Retrain) to reduce extinction during the probe trial. Mice then completed 3 days of reversal training (R1 – R3) with the platform moved to the opposite side of the maze, followed by reversal probe trial, and lastly one day of training with a visible platform (Visible Platform).

We used the analysis software to process the trials into one of 8 search strategies. We then categorized the strategies into either spatial or non-spatial patterns.

Analysis using latency and distance



Analysis using our software to extract search strategies



Search Strategy Analysis provides novel information absent from traditional methods

Although latency and distance remain very important in analysis of MWM animal trials, these can be augmented with search strategy data. Together, a more accurate representation of animal behaviour can be analyzed and reported in publication.

Future development

In the future, work can be done to improve the program's compatibility with a broader set of tracking software. Currently, we only support Ethovision, Anymaze, and Watermaze. If you would like to use this software with another tracking system, please contact us.

We would also like to expand the software to work with other spatial learning tests. The MWM is a widely used test for spatial learning and memory. However, there are alternatives which may also benefit from search strategy analysis.

Applying the software package to many different training paradigms, as well as different conditions, to ensure its robustness will also be investigated in the future.