Social Context shapes behavioral dynamics of foraging and decision-making in freely moving rhesus macaques

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Résumé

Foraging is a core adaptive behavior, requiring animals to continuously assess various features of their environment, such as the types and locations of food sources and how best to access them. In social species, individuals must also account for the positions and potential actions of conspecifics, integrating social dynamics into their foraging decisions. The question remains how rhesus macaques (macaca mulatta) integrate information about a conspecific's actions in their own action planning to optimize their foraging strategies in a freely moving context.
To explore the impact of food variety and social context on the foraging behavior of unconstrained rhesus macaques, we designed a modular experimental setup (the Exploration Room) and tracked full-body poses in 3D, including head gaze. Two monkeys were free to forage the room, either alone or together with their partner. The room offered a shared space with a variety of distributed foraging stations (Playground Experiment), of which each type required a different full-body action to gather the reward. The stations included hidden treats in woodchip piles (patches) strategically placed on the floor, openly displayed food items on flexible branches hanging from the ceiling, and scheduled fluid rewards available at touchscreen-based, wall-mounted kiosk systems (XBIs).

We hypothesized that the monkeys would divide the room into territories potentially by monopolizing foraging stations based on their food or full-body action type preference, thereby minimizing competition. While dominance hierarchies influenced foraging onset, no territorial division emerged based on food or full-body action type. Instead, the monkeys adopted a "tactic coordination strategy", maintaining a minimum distance from each other to reduce conflict potential, while synchronizing their foraging and movement times at separate stations. Compared to solo foraging, observation of food sources as well as exploratory behaviors between stations decreased in the dyadic context. These findings can be interpreted within the framework of the Marginal Value Theorem, which suggests that animals optimize their foraging strategies by balancing the diminishing returns of a depleting station with the costs of traveling between stations. In the dyadic context, this optimization appears to

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involve relying on the partner's action and location thereby enhancing energy efficiency by reducing the need for independent exploration.
Our Playground Experiment in the Exploration Room allows us to capture social foraging dynamics in freely moving monkeys in a controlled environment. This enables us to record and analyze the neural activity underlying these behaviors, offering new insights into the neural basis of foraging within a social context. Our behavioral findings highlight the impact of conspecific presence on foraging strategies in rhesus macaques, indicating that a flexible and dynamic coordination approach may be more advantageous than rigid territorial divisions in ecologically relevant environments. This adaptive strategy could optimize food intake and minimize conflict without necessitating frequent re-evaluation of hierarchy or available food types as environmental conditions shift.