A multi-variate pattern analysis investigation of strategic thinking and deception in a dynamic, competitive game.

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Abstract

The majority of human interactions require the understanding of others' actions and intentions – a process commonly labeled as social cognition or theory of mind – which then feeds into the strategic control of behavior and decision making. Most such tasks employ static or sequential interactions, which show the engagement of the social network, notably the temporal-parietal junction (TPJ). They do not, however, allow one to investigate differing levels of [**social cognition / engagement**] over short time scales. In this study, we adapted a dynamic, competitive game wherein human subjects controlled the ball in a simplified penalty kick against a human- or computer-controlled goalie, while measures of brain activation were obtained using functional magnetic resonance imaging (fMRI). This allowed us to carry out detailed investigation of subjects' interactions with their opponent, the strategies they employ, and how all relevant factors change over time on both large and small scales. K-means clustering on the difference between the y position of the subject-controlled ball and their human opponent revealed that participant behavior naturally reduced to two pairs of clusters, one pair representing **strategies involving feints and misdirection** (i.e., separation between participant and opponent near the start of the trial) and another pair representing **strategies intended to hide intention for as long as possible** (i.e., separation only at the end of the trial). These cluster pairs – each further separable into upward or downward movements – correspond to distinct strategies in behavior based **only on analyses of behavioral time courses**. Using multivariate pattern analysis (MVPA), we examined whether local brain regions carried information that predicted trial features (e.g., opponent, outcome, deception strategy). We found that ... [**human v computer result**]. Using this dynamic task allows distinction of strategic elements of deception (e.g., timing of movement) from the conditions that elicit deception, the nature of the opponent, and the outcome of the action. Accordingly, the use of dynamic tasks can reveal new information about the online processing that shapes social deception.

- Human v computer result currently shows best classification in occipital cortex and FFA, since we're doing it at the time point when the opponent's picture is shown. I'm not sure this is an interesting result to mention...