

報告番号	※甲	第	号
------	----	---	---

## 主論文の要旨

論文題目 NEURAL CORRELATES OF INTERPERSONAL INFLUENCE:  
A NEAR-INFRARED SPECTROSCOPY STUDY  
(对人的影響の神経基盤：近赤外分光法を用いた研究)

氏名 劉 涛

## 論文内容の要旨

To examine the neural correlates underlying an individual's performance in a social context, this thesis discusses studies measuring brain activation changes in participants during a driving video game task using near-infrared spectroscopy (NIRS).

Classical literature in social psychology has categorized social influences into two types: "direct" interpersonal influence through social interaction between persons, and "indirect" interpersonal influence induced by the presence of others (Allport, 1920). This thesis presents three experiments, focusing on the "direct" (Exp. 1) and the "indirect" (Exp. 2 and Exp. 3) interpersonal influence, respectively.

In Exp. 1, to investigate the neural bases of intrinsic (deriving from intrapersonal processing centered on memory systems) and extrinsic (deriving from interpersonal processing dealing with "direct" social influence) cognitions in daily life, I repetitively measured bilateral prefrontal activation in three groups (one control and two experimental) using NIRS. The control group drove to a goal four times with distinct route-maps illustrating default turning points. In contrast, the memory group drove the memorized default route without a map (intrapersonal processing), and the emergency group drove with a map but was instructed to immediately change the default route following an extrinsically given verbal turning command (interpersonal processing).

I analyzed concentration changes of oxygenated hemoglobin (Coxy-Hb) in three critical periods (pre-turning, actual-turning, and post-turning). The emergency group showed a significant increasing pattern of Coxy-Hb throughout the three periods, and a significant reduction in Coxy-Hb throughout the repetitive trials, but the memory group did not, even though both experimental groups showed higher activation than the control group in the pre-turning period. These results suggest that the prefrontal cortex (PFC) differentiates the intrinsically (memory system) and the extrinsically ("direct" interpersonal influence) driven cognitive processing.

The objective of Exp. 2 was to examine the neural basis of "indirect" interpersonal

influence deriving from the presence of others. Previous studies have reported that the presence of a stranger increases an individual's tension, whereas the presence of a friend decreases it. To address the contradictory effects of others' presence, I measured prefrontal activation in performers with or without an observer during a driving game task using NIRS. The participant's task was to drive from start to goal using a route-map either solely (single group) or with an acquainted partner (paired group). The paired participants alternated their driver-observer roles in a turn-taking style. The first driver (D1) took the role of observer (O2) in the subsequent task, and O1-D2 vice versa. The three groups (single, D1, and D2) were subdivided according to their game proficiency (high versus low).

The tension evaluation scores in single and D2 groups were higher than D1, while driving time and number of errors between the three groups did not show significant differences. NIRS data in low-proficiency performers demonstrated that single and D2 groups showed significantly higher activation than D1. These results suggest that the presence of an acquainted partner reduces a performer's tension (positive presence effect), and prior observation of another's performance negates the positive presence effect and leads to an increase of tension in the subsequent task.

Exp. 2 demonstrated that the presence of others may function positively to reduce a performer's tension. Exp. 3 was designed to verify whether this positive presence effect is induced by the performer's "subjective" appraisal of the co-present observer as supportive. That is, whether the performers who appraise the co-present observer as supportive show higher activation in the inferior parietal lobule (IPL: previously shown to be critical for positive emotional processing) than those who appraise the observer as non-supportive.

To address this issue, I measured the activations in the bilateral IPL of the driver-observer pairs of participants, when they performed a driving video game task using NIRS. The performer's task was to drive from start to goal using a default route-map, while their partner observed the performance. According to the performer's subjective appraisal of the co-present observer obtained after the driving task, the pairs were divided into three groups: supportive, non-supportive, and neutral.

The driving time, number of errors, and tension evaluation scores did not show significant differences between the three groups. However, NIRS data of performers in the supportive group showed significantly higher activation in the left IPL than those in the non-supportive group, but not in the right IPL. NIRS data of observers in the two groups concerned did not show any significant differences bilaterally in IPL. These results suggest that the left IPL responds distinctively according to the performer's "subjective" appraisal of a co-present observer.

In conclusion, the results of the present studies imply both practical and theoretical aspects. Exp. 1 using NIRS demonstrated that the PFC differentiates the intrinsically (memory system) and the extrinsically ("direct" interpersonal influence) driven cognitive processing in daily activities. Exp. 2 and Exp. 3 showed that the presence of others as an observer may reduce a performer's tension, and this positive presence effect is induced by the performer's "subjective" appraisal of the co-present observer as supportive.











