

Prognosis for patients with cognitive motor dissociation identified by brain-computer interface

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Cognitive motor dissociation describes a subset of patients with disorders of consciousness who show neuroimaging evidence of consciousness but no detectable command-following behaviours. Although essential for family counselling, decision-making, and the design of rehabilitation programmes, the prognosis for patients with cognitive motor dissociation remains under-investigated. The current study included 78 patients with disorders of consciousness who showed no detectable command-following behaviours. These patients included 45 patients with unresponsive wakefulness syndrome and 33 patients in a minimally conscious state, as diagnosed using the Coma Recovery Scale-Revised. Each patient underwent an EEG-based brain-computer interface experiment, in which he or she was instructed to perform an item-selection task (i.e. select a photograph or a number from two candidates). Patients who achieved statistically significant brain-computer interface accuracies were identified as cognitive motor dissociation. Two evaluations using the Coma Recovery Scale-Revised, one before the experiment and the other 3 months later, were carried out to measure the patients' behavioural improvements. Among the 78 patients with disorders of consciousness, our results showed that within the unresponsive wakefulness syndrome patient group, 15 of 18 patients with cognitive motor dissociation (83.33%) regained consciousness, while only five of the other 27 unresponsive wakefulness syndrome patients without significant brain-computer interface accuracies (18.52%) regained consciousness. Furthermore, within the minimally conscious state patient group, 14 of 16 patients with cognitive motor dissociation (87.5%) showed improvements in their Coma Recovery Scale-Revised scores, whereas only four of the other 17 minimally conscious state patients without significant brain-computer interface accuracies (23.53%) had improved Coma Recovery Scale-Revised scores. Our results suggest that patients with cognitive motor dissociation have a better outcome than other patients. Our findings extend current knowledge of the prognosis for patients with cognitive motor dissociation and have important implications for brain-computer interface-based clinical diagnosis and prognosis for patients with disorders of consciousness.

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科学研究

近日，我校软件学院潘家辉副教授在临床神经学领域的国际顶级期刊Brain（5年影响因子11.773）以第一作者身份发表论文“Prognosis for Patients with Cognitive Motor Dissociation Identified by Brain-Computer Interface”（DOI: 10.1093/brain/awaa026）。我校心理学院秦鹏民教授、南方医科大学珠江医院谢秋幼副主任医师为共同第一作者，华南理工大学李远清教授、中国人民解放军南部战区总医院虞容豪主任医师为该论文的通讯作者。

严重脑损伤病人是很难评估的且经常被误诊。“认知运动分离”就是描述这些患者的一个子集，他们表现出意识的神经影像学证据，但没有可检测到的命令跟随行为。尽管认知运动分离患者的预后对家庭咨询、决策和康复计划的设计至关重要，但目前仍缺乏有效的方法。针对这一重要临床问题，本文作者提出了基于多模态脑机接口技术，设计人脸图片识别、数字识别与心算等脑机接口刺激范式，鉴别意识障碍患者中具有明确意识的认知运动分离患者，建立认知运动分离患者的精确鉴别和康复预测方法。

本文的研究包含了78名意识障碍患者，他们均没有表现出命令跟随行为。这些患者包括45名植物病人和33名微意识病人。每位患者都进行了基于脑电图的脑机接口实验，在这个实验中，他们按指导语执行一个项目选择任务（即从两个候选对象中选择一张照片或一个数字）。获得统计学上显著高于平均水平的脑机接口准确率的患者被鉴别为认知运动分离患者。在实验前和实验后三个月，分别用对他们进行了两次昏迷恢复量表（CRS-R）评估，以评估患者的行为改善情况。本文实验结果显示，在植物病人中，18名认知运动障碍患者中有15名（83.33%）恢复了意识，而其余的27名植物病人中只有5例（18.5%）恢复了意识。此外，在微意识病人中，16名认知运动分离患者中有14名（87.5%）的CRS-R量表得分有所改善，而其余17名脑机接口准确率不显著的低意识病人中，只有4名（23.53%）改善了CRS-R量表的得分。本文结果表明认知运动分离患者比其他患者有更好的康复效果。本文的发现扩展了认知运动障碍患者康复预测的现有知识，对基于脑-机接口的意识障碍患者临床诊断和预后具有重要意义，为临床治疗优化提供了坚实基础。



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