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研究課題名（和文）認知記憶の脳機能ネットワークの解明と認知症の早期臨床診断システムの創造

研究課題名（英文）Investigation of the brain function network of the cognitive memory and development of an early detection system for dementia

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研究成果の概要（和文）：　認知症の根本治療薬が研究開発の段階であり、認知症の進行を食い止めるためには、認知症の早期診断が必要不可欠である。認知症の早期診断は非常に難しくその早期臨床診断技術がまだ確立されていないのが現状である。
　本研究では、認知記憶の脳機能に注目して、高磁場環境で使用できる実験装置を独自に研究開発し、認知実験、脳波（EEG）と機能的磁気共鳴画像（fMRI）の統合的手法を用いて、認知記憶の脳機能ネットワークと認知症の認知モデルを提案した。さらに、これらの研究開発の成果に基づいて、健康高齢者、軽度認知障害者と認知症患者を対象とする臨床実験を実施して、認知症の早期診断システムを研究開発した。

研究成果の概要（英文）：It is the present conditions that the early detection of dementia is very difficult, and the early clinical diagnosis technique has not been yet established.
 In this study, we paid attention to a brain function of the cognitive memory and researched and developed a useful experimental device originally in the environment of high magnetic field, and using the integrated technique of a recognition experiment, electroencephalographic (EEG) and the functional magnetic resonance imaging (fMRI), investigated a brain function network of the recognition memory and a recognition model of dementia. Furthermore, based on the results of these research and development, we carried out the clinical experiment for a healthy elderly person, a person with mild cognitive impairment and dementia patients and developed an early detection system for dementia.

研究分野：認知神経科学

キーワード：認知症　アルツハイマー病　認知症早期診断　高次脳機能ネットワーク

1．研究開始当初の背景

１）認知症の現状と早期臨床診断技術の未確立：認知症患者数は 2025 年に日本で 470 万人、世界で 8000 万人以上になると予想される。しかし、認知症は早期臨床診断の技術が確立されていないのが現状である。その理由としては認知記憶脳機能ネットワークの未解明にあると思われる。

２）認知記憶脳機能ネットワークの研究現状と未解決の問題：脳機能ネットワークの解明が神経疾患の診断における最も重要な研究課題である。しかし、認知・記憶障害を主な症状とする認知症に関する認知記憶の脳機能ネットワークはまだ解明されていない。近年の研究成果より、早い段階で高齢者の脳内神経細胞の死亡（老人斑）を脳画像で確認できた。しかし、老人斑が確認できた高齢者の中でもまったく認知症の病状のない人がいるので、老人斑だけでは認知症の早期診断ができない。

２．研究の目的

認知症は認知・記憶の障害を主な症状とした高次脳機能の疾患である。しかし、認知症の根本治療薬が研究開発の段階であり、認知症の進行を食い止めるためには、認知症の早期診断が必要不可欠である。認知症の早期診断は非常に難しくその早期診断技術がまだ確立されていないのが現状である。本研究では、認知記憶の脳機能に注目して、高磁場環境で使用できる実験装置を独自に研究開発し、認知実験、脳波（EEG、ERP））と機能的磁気共鳴画像（fMRI）同時計測の統合的手法を用いて、認知記憶の脳機能ネットワークの解明と認知症の認知モデルの構築を目指す。さらに、これらの研究開発の成果に基づいて、健康高齢者、軽度認知障害者と認知症患者を対象とする臨床実験を実施して、認知症の早期診断システムを研究開発する。

３．研究の方法

まず、fMRI 高磁場環境の実験装置を研究開発して、視覚、聴覚及び触覚の認知記憶脳機能解明の実験タスクを考案する。それから、認知心理学実験、脳波と fMRI 計測の認知記憶の脳機能解明実験を実施する。次に、多変量・独立成分分析などの手法を用いて実験結果を解析し、認知記憶の脳機能ネットワークと認知症の認知モデルを提案する。さらに、ミクロの認知症の動物モデルの知見を参考にし、認知症患者の臨床実験の実施とデータ解析を行う。最後に、上記の研究成果を統合して、認知症の早期診断システムを研究開発する。

４．研究成果

認知記憶の脳機能ネットワークと認知症の認知モデルを研究するため、fMRI 高磁場環境の実験装置を研究開発して、視覚、聴覚及び触覚の認知記憶脳機能解明の実験タスクを考案した。独自開発・考案した実験装置と実験タスクを用いて、認知心理学実験、脳波（EEG,ERP）と fMRI 計測の認知記憶の脳機能解明実験を実施した。得られた認知心理学の離散データ、脳波の波形データと ｆMRI 画像データについて多変量・独立成分分析などの手法を用いて実験結果を解析して認知記憶の脳機能ネットワークと認知症の認知モデルを提案した。さらに、ミクロの認知症の動物モデルの知見を参考にし、認知症患者の臨床実験の実施とデータ解析を行い、上記の研究成果を統合して認知症の早期診断システムを研究開発した。

具体的な成果は雑誌論文 37 件、学会発表 72 件、図書 2 件、特許１件を公表された。主な発表論文等は下記のとおりである。

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〔産業財産権〕

○出願状況（計 1 件）

名称：認知症の発症の有無を確認するために刺激を提供する刺激提供方法、これを用いた認知症の発症の有無を確認するための方法、及び刺激提示装置

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