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Title	二重レベルのメタ認知と学習戦略選択のメカニズム：認知的オフローディングの事例
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論文題目	The Mechanism between Two-layer Metacognition and Strategy Choice for Learning: The Case of Cognitive Offloading
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論文の内容の要旨

Individuals may assess their memory performance and, in turn, rely on external aids to ensure that information remains accessible for future retrieval. For example, an individual might use a password manager if they consider a newly created password challenging to remember. However, perceived memory performance often differs from actual memory performance, making it challenging to predict when external assistance is cognitively necessary. Related research defines self-assessment of cognitive performance as metacognition (e.g., perceived memory performance) and the use of external resources to support cognitive functioning as cognitive offloading (e.g., using the password manager). Accordingly, the unpredictability of cognitive offloading based on perceived memory performance complicates understanding the mechanisms of metacognition involved in deciding whether to employ cognitive offloading. This dissertation introduced confidence in the previous assessment of perceived memory performance as a second-order metacognitive judgement (SOJ) to address this issue, considering the initial assessment as a first-order metacognitive judgement (FOJ). This research examined the following question: “How do individuals decide to employ cognitive offloading based on two-layer self-assessment in learning tasks?”

This research used 48 English paired associates (e.g., ABILITY-CAPABILITY) as learning tasks, incorporating a procedure with Learning, Retention, and Test sessions. In the Learning session, participants were instructed to learn each associate and then estimate their performance to recall the target item (e.g., CAPABILITY) when presented with the cue item (e.g., ABILITY) in a later test. Subsequently, their confidence in the correctness of FOJ was elicited as their SOJ during the trial. Afterwards, the participants chose a learning strategy for each associate: write it down on paper (employing cognitive offloading) or remember it mentally (not employing cognitive offloading). In the Retention session, the participants completed simple mathematical problems. In the Test session, participants were required to freely recall the target items for all paired associates (inputting via a keyboard) when presented with the cues. The learning tasks were administered online, with participants recruited remotely from the United States.

This research comprised three studies: Studies 1 and 2 served as pilot studies, and Study 3 was the main study. Study 1 verified the suitability of the procedure and learning materials for subsequent studies. Study 2 determined a scoring method for strategy choices to reduce the overuse of cognitive offloading. Study 3 provided evidence to

address the research question, finding that (1) FOJs partially predict the selection of cognitive offloading and that (2) SOJs influence the regulation of cognitive offloading choices. The increased consistency with actual memory performance in metacognition may result from confidence regulating the strategy choice relative to the previous FOJ to the opposite option if the SOJ falls below a certain threshold. For example, shallow confidence may lead to switching from relying on memory to offloading information, even if the target was initially perceived as memorable.

This research initially explored how SOJs influence learning strategies, contributing to knowledge science by highlighting metaknowledge as a novel aspect of knowledge creation. On another note, this work provides insights into unresolved issues in cognitive offloading and related research fields that employ metacognitive judgements as a methodology. Additionally, this work has practical implications for educational contexts where individuals interact with information in their environment. Future research could expand on these findings by incorporating a broader range of learning strategies beyond cognitive offloading, exploring diverse methods for eliciting confidence levels, and extending the current findings with various alternative materials.

Keywords
Metacognition, memory, cognitive offloading, metacognitive judgement, monitoring, control

論文審査の結果の要旨

Ma Yuan 氏の博士論文は人の記憶とメタ認知機構の関係を明らかにするものである。人が何かを覚えようとする際、後で思い出しやすいよう馴染みのあるほかのものと関連づけるなどの工夫をする。しかし人はすべてを覚えておくことができないから、後で思い出せる自信がなければメモをとるなどして記録を残す。ではメモを取るか、記憶に頼るかの決定がどのようになされるのかというのが氏の研究テーマである。Ma Yuan 氏の考えは「メモを取るか、記憶に頼るか」を決める判断を担う機構を所与とし、そのような判断を制御するもう一段上の判断能力があるというものである。それは自身の記憶力に関する自覚がどの程度信頼できるかを自己査定する能力であるが、そのようなメタレベルの自己査定能力が存在するか、仮に存在するとしたらそれが記憶戦略にどのような影響を及ぼすのか、については学識者の間で議論が続いており、結論は出ていなかった。そのような状況下で、Ma Yuan 氏は実験を通して記憶戦略を制御する一段上の判断が存在することを示した。従来研究を一歩進めて、メタレベルの自己査定能力の特徴を明らかにしており、新規性が高い。また本研究の成果は人の学習方法に応用でき、効果的にメモをとる方法を学習者に示唆するものである。知識科学においては、知識を文書など外部のものに蓄積するのか、あるいは人が記憶して後継者に伝えていくのか、どちらがよいかという議論がある。本研究はこの議論に心理学の観点から回答を与えるものでもある。以上より、本研究が知識科学の学位に相応しいものと判断する。