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研究課題名(和文) Detecting Concealed Information using the Medial Frontal Negativity

研究課題名(英文) Detecting Concealed Information using the Medial Frontal Negativity

研究代表者

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研究成果の概要(和文)：何らかの利益のために心理状態を偽ることは珍しいことではない。虚偽検出に利用される Forced Choice Test (FCT) は被検査者の意図的な方略に対し脆弱性を持っており、本研究では FCT に事象関連脳電位(ERP)を組み合わせてその克服を試みた。これまでの研究結果は ERP の利用により FCT の脆弱性に対処できる可能性を示している。

研究成果の学術的意義や社会的意義

A malingering test is used to detect fake psychological or cognitive symptoms. It is needed to ensure the credibility of psychological assessment. I demonstrate a way to improve the diagnostic accuracy of the Forced Choice Test by including trial based feedback and measuring the corresponding P300.

研究成果の概要(英文)：The Forced Choice Test (FCT) can be used as a clinical tool to detect fabricated cognitive symptoms, for example fake memory loss or deafness. However, it does not detect feigners who intentionally randomise their response pattern in this test. My objective was to find novel criteria sensitive to this behaviour in order to improve the overall diagnostic accuracy of the FCT. In this project, I examined the utility of the Medial Frontal Negativity (MFN), Feedback Related Negativity (FRN) and the P300 brain waves. The MFN is an indicator of response conflict, which could occur when malingerers make mistakes on purpose. The FRN and P300 occur when the examinee is presented with feedback on their performance, both could be reduced in malingerers. I demonstrate over two experiments that the MFN does not have diagnostic value in this context. However, the P300 and FRN can detect feigned performance and can be elicited in practice by including trial based feedback to the FCT.

研究分野：Psychology & Neuroscience

キーワード：P300 MFN FRN Malingering Forced Choice Test 2AFCT

1 . 研究開始当初の背景

Malingering is the fabrication of psychological symptoms or feigning cognitive deficits to gain an advantage, financial or otherwise (Slick, 1999). It is not a rare occurrence (Cima, Nijman, Merckelbach, Kremer, & Hollnack, 2004) and forensic psychological examinations should contain specific malingering tests (Slick 1999). One such test is the Forced Choice Test (FCT/2AFCT). It is an effective but simple tool to detect feigned impairment. For example, in case of alleged memory problems, a patient would be presented with a number that he has to remember and after a short interval be presented with two numbers. One of the two numbers is the one seen before, while the other is new and the examinee is instructed to select the correct answer or guess if he can not remember it. Empirical evidence demonstrates that examinees with genuine impairment are forced to guess, meaning their overall test performance approximates chance performance. In contrast, malingerers select much more incorrect answers than would be expected by chance, which is known as underperformance and seen as indicator of malingered performance.

A limitation of the underperformance criterion is that it typically detects less than 50% of malingerers, while the rest follows an intentional randomization strategy that is well suited to avoid detection (Verschuere, Meijer, & Crombez, 2008). Hence, to increase the diagnostic validity of the FCT additional criteria are needed. Several potential candidates exist in the field of neuroscience.

First, the Medial Frontal Negativity (MFN) is known as a marker of response conflict and has been found to discriminate deceptive from honest responding in a yes/no FCT (Johnson, Barnhardt, & Zhu, 2005). In the 2AFCT, a response conflict could also arise when an examinee selects the incorrect answer on purpose, but an examinee who is genuinely guessing should not exhibit this response conflict. Second, brain waves related to feedback processing may be interest to detect malingered performance, because malingerers make mistakes on purpose and hence, feedback should lose its functionality for malingerers. Feedback stimuli can elicit the Feedback Related Negativity (FRN; e.g. Gehring, & Willoughby, 2002) and P300 waves (Sato, Yasuda, Ohira, Miyawaki, Nishikawa, Kumano, & Kuboki, 2005). Both should be reduced in malingering compared to genuine performance.

2 . 研究の目的

The purpose of this project is to detect malingerers who utilize intentional randomization strategies in the FCT with ERPs.

3 . 研究の方法

Two experiments about malingered cognitive dysfunctions were conducted. In experiment 1, I examined malingered working memory problems. Participants were presented with an 18-digit number for 2 seconds and had to memorize it. After a short interval two numbers were displayed on the screen. One number was the one the participant had to memorize and another novel one. Each participant performed this task twice, but the instructions and task difficulty differed for each session. When participants were asked to perform to the best of their ability, the task was hard, so that they had to guess on each trial, thus mimicking real impairment. In contrast, when participants were instructed to feign cognitive impairment, the task was altered to be very easy. Consequently, malingerers could identify the correct answer on each trial and their selection pattern reflected their strategy to avoid detection by the test. After each choice participants were presented with genuine feedback, indicating if their selection was correct or incorrect and their brain activity was recorded with EEG. After both tasks, participants indicated their response strategies and demonstrated their real performance for the malingering task as manipulation checks.

In experiment 2, I examined fabricated auditory impairment with a similar design. In this case, participants were presented with a red and blue screen for 2 seconds in random order per trial. During one of the screens, determined randomly, a sound would be played and afterwards, participants had to indicate during which trial (red/blue) the sound occurred, followed by accurate feedback. In the honest condition, participants received earplugs and the volume was set so low that participants were genuinely unable to hear the sound and had to guess on each trial. In the malingering

condition participants could clearly hear the sounds, so their response pattern reflects their strategy to avoid detection by the FCT.

In both experiments, participants received a warning about the FCT's mechanism in the malingering condition. Verschuere et al (2008) and Orthey, Vrij, Meijer, Leal, and Blank (2018) demonstrate that a simple warning promotes the intentional randomization response strategy, which the goal of these experiments was to detect with brain activity.

4 . 研究成果

In experiment 1, I examined the diagnostic validity of the MFN, FRN and P300. The MFN, believed to be an indicator of response conflict, elicited during the selection of choices had no diagnostic value. Similarly, there was no observable FRN regarding the feedback stimuli. However, there was a large difference for the P300 when observing the feedback stimulus. Both correct and incorrect feedback led to a larger P300 amplitude in the honest condition compared to the malingering condition. As the main difference occurred between condition, I averaged the P300 amplitudes over correct and incorrect feedback and found that the averaged P300 amplitude had a good detection accuracy (Area Under the Curve; AUC = .87). The results suggest that brain correlated during feedback processing may be a valuable tool in the detection of intentional randomization in the FCT and I followed this line of investigation up in experiment 2. In this case both the FRN and P300 differed significantly between honest and malingering condition. Both ERPs had diagnostic value, but the FRN (AUC = .71) was inferior to that of the P300 (AUC = .88). Hence, the P300 elicited by feedback stimuli may be a suitable criterion to detect intentional randomization in the FCT. In both experiments considerably larger P300 amplitudes were elicited in the honest conditions, and a possible explanation for this is that participants are genuinely surprised by the feedback. Malingerers on the other hand make mistakes on purpose, that means they always know in advance what the feedback is going to be.

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5. 主な発表論文等

〔雑誌論文〕 計0件

〔学会発表〕 計2件（うち招待講演 1件 / うち国際学会 1件）

1. 発表者名 Robin Orthey
2. 発表標題 Are you really sorry you made a mistake?
3. 学会等名 CAPS Symposium at Kwasei Gakuin University (招待講演)
4. 発表年 2019年

1. 発表者名 Robin Orthey
2. 発表標題 How to detect crime amnesia in situations with limited information
3. 学会等名 American Psychology and Law Society (国際学会)
4. 発表年 2020年

〔図書〕 計0件

〔産業財産権〕

〔その他〕

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6. 研究組織

氏名 (ローマ字氏名) (研究者番号)	所属研究機関・部局・職 (機関番号)	備考
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7. 科研費を使用して開催した国際研究集会

〔国際研究集会〕 計0件

8. 本研究に関連して実施した国際共同研究の実施状況

共同研究相手国	相手方研究機関
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