

## • Research Article

# The effect of acupuncture on mood and working memory in patients with depression and schizophrenia



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### ABSTRACT

**BACKGROUND:** In patients with depression, as well as in patients with schizophrenia, both mood and working memory performance are often impaired. Both issues can only be addressed and improved with medication to some extent.

**OBJECTIVE:** This study investigates the mood and the working memory performance in patients with depression or schizophrenia and whether acupuncture can improve these.

**DESIGN, SETTING, PARTICIPANTS AND INTERVENTIONS:** A pragmatic clinical trial design was used. The study was conducted in a psychiatric clinic. Fifty patients with depression and 50 with schizophrenia were randomly divided into an experimental and a waiting-list group. Additionally, 25 healthy control participants were included. Twelve weeks of individualized acupuncture treatment was used as the clinical intervention.

**MAIN OUTCOME MEASURES:** All patients were tested before (T1) and after (T2) acupuncture treatment on a mood scale (Beck Depression Inventory-II, BDI-II), a simple working memory task (digit span), and a complex working memory task (letter-number sequencing); the healthy controls were tested at T1 only.

**RESULTS:** Patients with depression scored worse than the others on the BDI-II, and patients with schizophrenia scored worse than the healthy controls. On the digit span, patients with schizophrenia did not differ from healthy controls whereas they scored worse of all on the letter-number sequencing. With respect to the acupuncture findings, first, the present study showed that the use of acupuncture to treat patients with schizophrenia was both practical and safe. Moreover, acupuncture had a positive effect on the BDI-II for the depression group, but acupuncture had no effect on the digit span and on the letter-number sequencing performance for the two clinical groups.

**CONCLUSION:** The clinical improvement in patients with depression after acupuncture treatment was not accompanied by any significant change in a simple working memory task or in a more complex working memory task; the same was true for the patients with schizophrenia.

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## 1 Introduction

Acupuncture is increasingly used as a complementary medicine treatment for psychiatric illnesses<sup>[1]</sup>. Previous research showed that acupuncture affects mood; a reduction of depressive symptoms in patients with depression after acupuncture treatment was revealed by a meta-analysis based on 8 randomized trials<sup>[2]</sup>. Recently, researchers have also started to investigate acupuncture for the treatment of schizophrenia<sup>[3]</sup> and lower positive, negative, and general symptoms in patients with schizophrenia have been reported after acupuncture treatment<sup>[4]</sup>. However, despite its long tradition and wide applications, many questions remain; for instance, is acupuncture able to improve cognitive functioning? In studies on cognitively impaired animals, acupuncture was found to have a restoration and protection effect<sup>[5,6]</sup>. Other studies reported improvements in cognitively impaired patients<sup>[7,8]</sup>.

Therefore, one important cognitive process that will be investigated in the present study is working memory (WM). WM is known to play an important role in higher-level cognitive functioning<sup>[9]</sup>, like reasoning<sup>[10]</sup> and spatial visualization<sup>[11]</sup>. WM was originally assumed to consist of a central executive that was responsible for monitoring and coordinating two slave systems: the phonological loop and the visuo-spatial sketchpad. The phonological loop temporarily buffers spoken and written material whereas the visuo-spatial sketchpad stores and processes visual or spatial information<sup>[12]</sup>. Later, the episodic buffer was added as a third slave system and was responsible for linking information across domains to form integrated units of verbal, visual and spatial information with time sequencing<sup>[13]</sup>. A recent two-group, randomized, single-blind study on 90 healthy students showed that acupuncture significantly increased WM performance on an automated operation span task in comparison with the control group<sup>[14]</sup>.

If acupuncture can improve WM performance in healthy participants, it might also be beneficial for the psychiatric population. For this reason, two long-term (illness duration longer than 5 years) patient groups that were known to have decreased WM performances, namely, patients with schizophrenia<sup>[15]</sup> and patients with depression<sup>[16]</sup>, were investigated by addressing the following research questions: what are the moods of long-term patients with depression or schizophrenia, and what are their WM performances? Also, can acupuncture change mood<sup>[2]</sup> and WM performance<sup>[14]</sup> in patients with depression and in

patients with schizophrenia?

The first hypothesis is that patients with depression score worse on mood than the patients with schizophrenia and the healthy controls. The second hypothesis is that both patients with schizophrenia and those with depression score worse on WM than the healthy controls. Thirdly, we hypothesize that acupuncture treatment will improve mood in patients with depression and perhaps also in patients with schizophrenia. Fourthly, the WM performance in patients with schizophrenia and in patients with depression is expected to be improved after acupuncture treatment.

## 2 Subjects and methods

### 2.1 Sample

All patients with schizophrenia were randomly divided into an experimental group and a waiting-list group, as were the patients with depression, and we used the random number generator program in Microsoft Excel for the randomization. The patients in the waiting-list group received no treatment other than their normal psychiatric treatment. According to the 10th revision of the International Classification of Diseases and Related Health Problems (ICD-10)<sup>[17]</sup>, the patients with schizophrenia were diagnosed with schizophrenia F20.0 (paranoid schizophrenia) or F20.5 (schizophrenic residuum), and the patients with depression were diagnosed with depression F33.2 (recurrent depressive disorder, current episode severe without psychotic symptoms).

### 2.2 Experimental design

#### 2.2.1 Design

A pragmatic, clinical trial design<sup>[18]</sup> was used to address the effectiveness of acupuncture as a health care intervention in treating patients with schizophrenia or depression in real clinical practice<sup>[19]</sup>.

#### 2.2.2 Acupuncture treatment as clinical intervention

The participants were treated weekly for twelve consecutive treatments. Individualized acupuncture according to traditional Chinese medicine principles was applied after careful diagnosis<sup>[3]</sup> by a licensed Oriental medical practitioner with more than 5 years of clinical experience<sup>[20]</sup>. Needles were left in place for one hour after insertion.

#### 2.2.3 Testing

The tests were completed by the patients in the experimental groups before (T1) and after (T2) acupuncture treatment. For the patients in the waiting-list groups, the tests were

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