1. Introduction

Most of the patients with neural diseases such as Parkinson’s disease, Stroke and Depression, cannot be cured by taking pills or conducting surgery. In contrast to the conventional therapies, physical therapies such as TMS (transcranial magnetic stimulation) (Fig. 1) and tDCS (transcranial direct current stimulation) (Fig. 2) are the most popular methods in treating neural disorders with a non-invasive way. TMS employs electromagnetic (1-3 Tesla) induction generates an Electric field suitable for neural stimulation; tDCS employs a weak current (1-2 mA) to modulate neuronal excitabilities.

2. tDCS in a rat model of Parkinson’s disease (PD)

tDCS maintains a lot of advantages to TMS, such as less costly, more safe and more reliable sham group. But we need to learn the exact functional mechanisms for tDCS by a large amount of animal experiments in order to find out the best stimulation protocol (such as the current intensity, the duration of the stimulation, and the area of the electrode).

We test the effects of tDCS in a rat model of Parkinson’s disease. In order to deliver current to the cortex of a freely moving rat (without any anesthetics), we develop a portable current source and a suitable electrode montage for the rat (Fig. 3).

Corridor test (Fig. 4) and step test (Fig. 5) are employed to assess the effects of tDCS.

3. Result

tDCS relieves the symptoms of the PD rats by nearly 32% (P<0.01) in the corridor test, and 43% (P<0.01) in the step test. The experimental protocol presented above is valid.