# Oral motor function and smile degree in the rehabilitation for Parkinson's disease

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## Abstract

Patients with a bright expression give the impression that their oral motor function has improved. The association between oral motor function and smile degree was examined in this study. As a result, the oral motor function (lips / tongue) and smile degree were significantly improved after rehabilitation. Also, regarding the oral motor function, smile degree significantly correlated with the tongue motor function. Therefore, it was estimated that improvement of the smile degree contributed to improvement of the oral cavity function through indirect reduction of psychological stress.

**Key words:** oral motor function, Smilescan, smile ratio, rehabilitation, Parkinson's disease

## Introduction

Parkinson's disease is one of the representative neurodegenerative diseases. Treatment includes rehabilitation as well as medical therapy and surgical therapy [1]. However, special rehabilitation for Parkinson's disease is rarely provided. Parkinson's disease is frequently complicated by mood disorders such as a depressed mental state [2]. We devised a new form of rehabilitation for the purpose of stress relief. In this study, the effect of the rehabilitation was examined regarding the oral motor function. Furthermore, we measured "the smile degree", and its association with the oral motor function was examined.

## Materials & Methods

The subjects were 24 people (9 men and 15 women), all of whom were patients with Parkinson's disease who had been hospitalized for the purpose of rehabilitation. They were aged 71.4 ± 7.9 (mean ±SD). The stage of Hoehn&Yahr was 3.1 ± 0.3 (mean ±SD). The patients were hospitalized, and received a four-week rehabilitation course. We measured the oral motor function (lips / a tongue) and smile degree on admission and at discharge. The oral motor function was sorted by the motor of lips and lingual motor. The value resulting from multiplying the excursion of the length and breadth of lips was the index of the motor function of lips. The lingual motor function assumed the value that multiplied front and flanking excursion the index of the lingual motor function. An Omron smile scan was used for the measurement of smile degree. The patients smiled towards the camera for five seconds. The maximum smile degree of the

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meantime was adopted. Stress relief training was matched with conventional physical exercise in the language hearing therapy. Cognitive physical exercise, oral physical exercise, reading aloud and a tongue twister were included in the physical exercise. Stress relief training included karaoke singing and a discussion. Physical therapy and occupational therapy relieved stress using conventional physical exercise similarly, too. Making of work, playing with a Nintendo Wii, Chinese shadow boxing, and Awa Folk Dancing were used in the stress relief training.

## Results

The results of the oral motor function examination on admission and at discharge are shown in Figure 1. The motor function of the lips was significantly improved from 1,327+-409 (mean ±SD) to 1,568+-655 (mean ±SD) (P = 0.022)(Figure 1a). The lingual motor function was significantly improved from 1,850+-552 (mean ±SD) to 2,277+-724 (mean ±SD) (P = 0.001)(Figure 1b). The smile ratio is shown in Figure 1c. The smile ratio significantly improved from 57+-38% (mean ±SD) to 75+-26% (mean ±SD)(P = 0.041). We examined whether the oral motor function and smile ratio were correlative. The lingual motor function significantly correlated with the smile degree (p=0.05). The motor function of the lips did not significantly correlate with the smile degree (p=0.162).

## Discussion

Parkinson's disease is a representative neurodegenerative disease characterized by the selective degeneration of the substantia nigra compact layer [3]. Motor symptoms of Parkinson's disease include resting tremor, muscle rigidity, akinesia, and posture maintenance reflex disturbance [4]. It is known that the patients with Parkinson's disease speak in a monotonous tone, in a low voice. This articulatory disorder becomes significant with the aggravation of disease. It has been reported recently that a starting words symptom is associated with a neurologic manifestation [5]. On the other hand, patients with Parkinson's disease present with an expressionless countenance said to be a poker face. Regarding this countenance, it is thought that mental manifestation is involved in addition to motor symptoms such as akinesia and the muscle rigidity. We hypothesized that the smile degree could be used as a new evaluation scale of patients with Parkinson's disease. In this study, the association between oral motor function and the smile degree of the patients was examined and analyzed in regard to the change during rehabilitation. The oral motor function and smile degree were significantly improved after rehabilitation. The smile degree significantly correlated with the tongue motor function in the oral motor function. The smile degree includes parameters such as the extent of opening and shutting of the eyes, the shape of the eyelids, a furrowed shape, and the shape of the corners of the mouth. Therefore, there is no component of the oral motor function that influences the smile degree directly. It was estimated that the improvement in the smile degree contributed to the improvement of the oral motor function through indirect reduction of psychological stress. The association between smile degree and the psychoneurotic scale will be examined in future.

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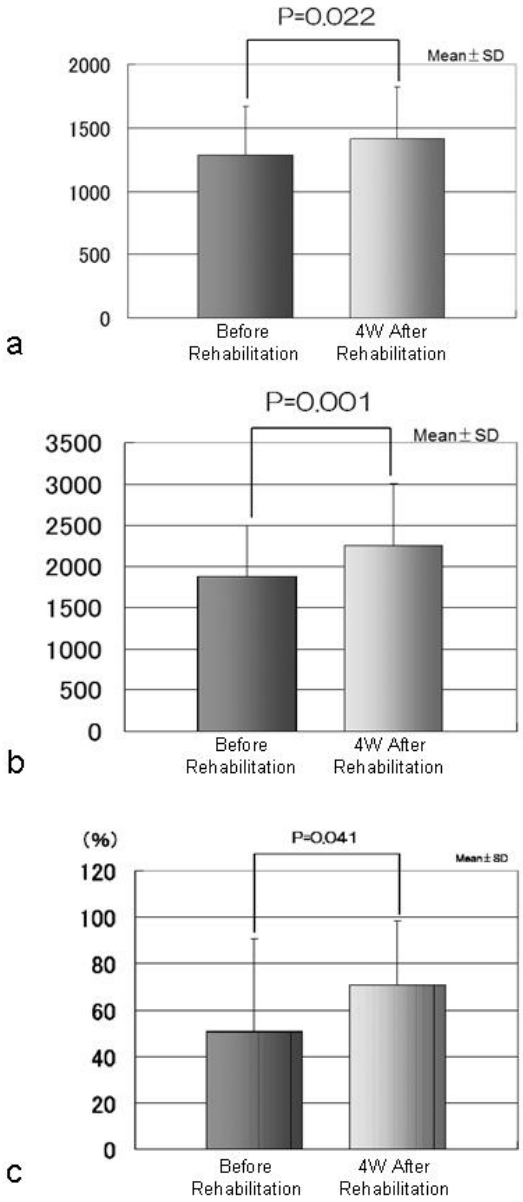


**Figure 1**. Oral motor function and smile ratio. **a.** The motor function of the lips was significantly improved (P = 0.022). **b**. The lingual motor function was significantly improved (P = 0.001) **c**. Smile ratio. The smile ratio was significantly improved from 57+-38% (mean ±SD) to 75+-26% (mean ±SD)(P = 0.041).

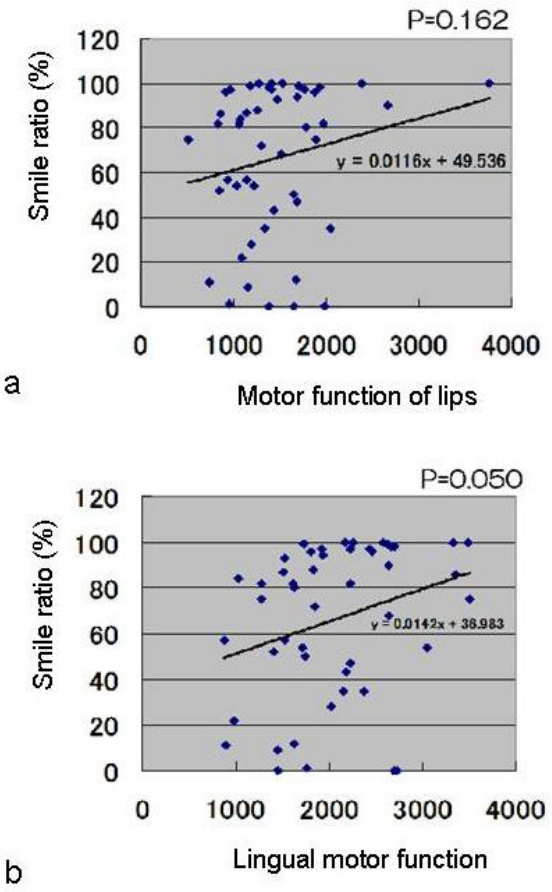


**Figure 2.a,**The lingual motor function significantly correlated with the smile degree (p=0.05). **b,** The motor function of the lips did not significantly correlate with the smile degree (p=0.162).