Prospective Rehabilitation System in the Declining Birth Rate and the Aging Society

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Abstract
The number of stroke patients has increased year by year in many countries, as the population ages and fewer babies are born. Most of stroke patients require a rehabilitation after the onset of stroke. Many researchers and companies in most of countries have been studying new rehabilitation systems. The systems include the approach of Brain Machine Interface (BMI), rehabilitation supported robot and so on. It seems that those systems target at higher socioeconomic group in wealthy countries. Since the stroke patients are not necessarily wealthy, it is necessary to make other solution for the non-wealthy groups. Biophilia Rehabilitation Academy (BRA) in Japan have been constructing the new rehabilitation system with easy and cheap devices, which is so-called “Takizawa method”. The proposed method enable that the burden of PT will decrease by contrast of the traditional method, since one physical therapist (PT) treats several rehabilitation patient. In the future rehabilitation, each patient will select a favorite solution among many rehabilitation systems.

Keywords: Takizawa method, Rehabilitation system, motivative exercise

1. Introduction
The number of stroke patients have been increasing every year, as the population ages in many countries. Most of patients require the rehabilitation after the onset of stroke, because they will get paralyzed to part of body. Many researchers and company have been studying new rehabilitation systems, such as brain machine interface (BMI), rehabilitation robot, rehabilitation supported devices and so on. However, those approaches are that one physical therapist (PT) or one operator treats one stroke patient, and that the cost of rehabilitation will be relatively expensive. It seems that those systems are made for the wealthy persons in the advanced countries. Biophilia Rehabilitation Academy (BRA) in Japan have been trying to make the rehabilitation system for non-wealthy persons, using easy and cheap devices\(^1\). Moreover, BRA have proposed system model that one PT treat several patients simultaneously with the devices. In other words, BRA makes new solution of future rehabilitation that is so-called “Takizawa method\(^2\)". In order to perfect the Takizawa system, we must perform some researches of action assignments, such as the evaluation of rehabilitation effect. We try to evaluate the rehabilitation approaches by measuring the brain function at the rehabilitation with functional near-infrared spectroscopy (fNIRS), and with the score of PT. Moreover, we must study the relation between the measured data of the devices and PT scores\(^3\)\(^4\). Besides, the evidence must be validated in the business model of Takizawa method, since the good business model is necessary for the system dominating in medical front.

2. Business model in Takizawa method
Many years ago, more than 2 million baby were born every year in Japan, and many people died till 70 years old. Many working population cared for smaller group of aged persons at that time. Therefore, since the government can fund-raise a large amount of tax from many working population, a considerable amount of tax is used for not so many aged persons at present. The health-care resources are still abundant in national government finances. However now, about 1.2 million baby are born every year, and the length of life increases year by year. Many working population have still long length of life. In future days, the number of working persons is much smaller than one of the aged persons. The amount of tax will become much smaller, because the number of working population decrease than at present. We first consider the business model for expanding use of Takizawa method. At the present day, many rehabilitation hospitals employ the traditional rehabilitation system that one PT treats one stroke patient. In this business model, one PT will obtain small medical care income, because PT takes much time for one patient. Therefore, small hospital cannot hire many
PTs, and becomes increasingly difficult to hire PT. In Takizawa method, one PT will obtain better medical care income, because one PT treats several patients with easy devices simultaneously. Therefore, even small hospital can hire several PT, and PT leaps in employment.

3. Future rehabilitation system

In the future, it seems that each stroke patient will select the most favorite rehabilitation system as shown in the following.

1. Takizawa method with easy rehabilitation devices as shown in Fig. 1.
2. Rehabilitation robot or supported rehabilitation devices
3. Computer-aided Rehabilitation using Brain Machine Interface (BMI)
4. Recovery training in rehabilitation center with leading edge
5. Other systems (currently in progress)

It seems that method (1) gets accepted for all the stroke patients, and methods (2)-(5) will be prepared for the wealthy persons in advanced countries.

![Fig. 1 Examples of devices proposed in Takizawa method](image)

(a) A patients knocks over this devices, “Pata”. (b) A patient rolls over this device, “Koro”.

4. Conclusions

Takizawa method is the future rehabilitation expected by all the patients in the world. Although the method is good solution, we must furthermore study out the problems and action assignment of the method. Besides, we must operate diffusion activity worldwide, in order that Takizawa method becomes the first solution among some rehabilitation systems.

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