Basic Study on Motor Ability Evaluation and Training System Using Virtual Collision Avoidance

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Abstract. In this study, we focused on whether or not we can use for the evaluation / training of motor ability from collision avoidance movement which needs the earliness of recognition, the speed, accuracy and so on of the movement. Then, we built the prototype of measurement system for collision avoidance movement using VR. In this paper, we explain about the characteristics, the obtained results and so on of the system.

Keywords: collision avoidance, evaluation, training, virtual, motor ability.

1 Introduction

A decline of the motor ability causes increase of an accident of fall and so on. Therefore, various initiatives which intend to maintain the motor ability of senior people are performed. The conventional fall risk evaluation which is a kind of motor ability evaluation has focused on local muscle, balance ability or walking performance [1] [2]. However, opinions meaning "when being about to fall, it's important to react quickly and move body (it is called “agility”)" are also existed [3] [4]. Therefore, I consider that for reduce accidents such as falling, it is more practical to evaluate / trait from the viewpoint of "whether or not the person can handle immediate danger by accurate and quick body movement". Of course, it is unfavorable to put the subject in danger using a direct touch disturbance. Then, I suggest using “collision avoidance” with VR(Virtual Reality).

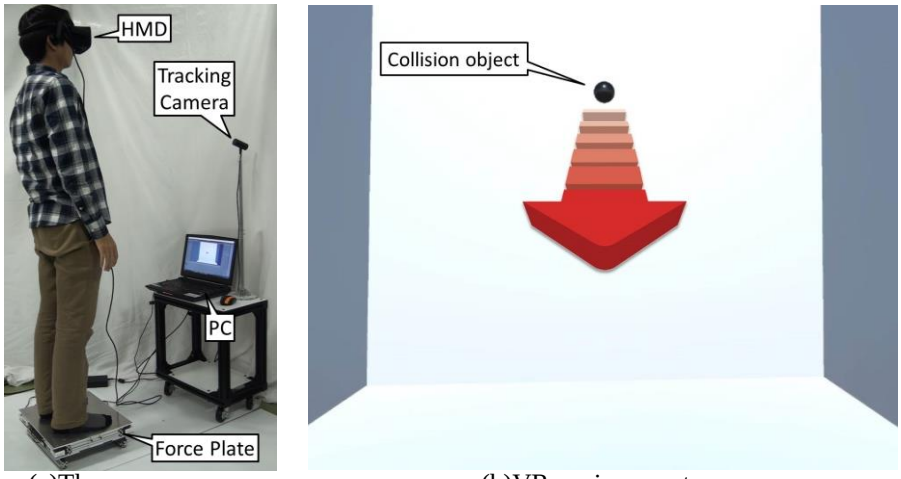
In general, people try to avoid unconsciously and reflectively if something came to before eyes. Whether or not the person can avoid the collision depends on how early he can recognize and how quickly he can move. However, the earliness of recognition, the speed, accuracy and so on of the movement vary from person to person. We suppose that it depends on difference in motor ability. Then, we suspect we can use for the evaluation / training of motor ability from collision avoidance movement. In addition, approach of an object is perceived visually. Therefore, it is possible to make a harm impression only by visual stimulus (no touch). I supposed unconscious movement can be induced by virtual image.

In this study, we examine that whether or not we can evaluate or trait motor ability by analyzing collision avoidance movement. In this paper, we explain about the proto-

type of measurement system for collision avoidance movement we built. For example, the characteristics, the obtained results and so on.

2 The measurement system for collision avoidance movement

Fig.1 shows the measurement system. (a) shows the appearance of the system. (b) shows the VR environment viewed from the user through HMD.



(a)The appearance (b)VR environment

Fig.1. The measurement system

The composition of this system is HMD, camera, PC, and force plate. The subject avoids a collision object that comes flying suddenly to before eyes in virtual. The avoidance movement is measured by the camera and the force plate. Then, the amount of displacement of head and CoP(Center of Pressure) is indicated. From the result, it is possible to acquire various parameters, for example reaction time, motor time, avoidance speed, avoidance direction, max transfer, vibration of body, etc.(Fig.2)

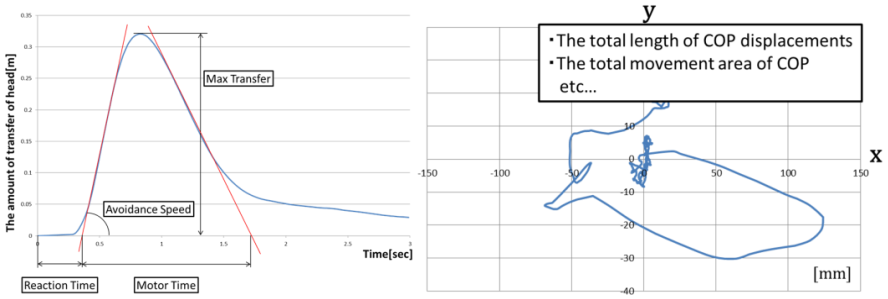


Fig.2. Examples of obtained result

3 Conclusion

In this paper, we suggest the possibility that we can evaluate / trait motor ability by analyzing collision avoidance movement, and we built the prototype of measurement system for it. We confirmed that it is possible to acquire various parameters of the avoidance movement by this system. From now on, we research what kind of task is suitable for motor ability evaluation / training. Then, we establish the method for it.

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