



Approach of the evaluation system to re-acquire the independent walking from the assistive walking of the disabled elderly

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Until now, performance analysis device using camera was developed for those who gained independent walking in the parallel bars. Correspondingly we took the images of walking by cameras, and approached to measure the level of recovery through image analysis. In these cases, some therapists could get into images, and it is not able to measure necessarily all the time. Also, there are approaches to take the walking data by floor reaction force through walking and the measurement of loading of parallel bars, but its effectiveness is poor. Thereon, to generalize this technique, we propose a measuring system a degree of recovery for walking form unsteady gait by him/her self by analyzing dynamic behavior of the weight, using time historical data of floor reaction force during walking and camera images [WUGOAD].

[Purpose] A walking training in the parallel bars by the disabled ankle movable sanctioned to disabled elderly with following a recipe as part of individual rehabilitation is done in the Takizawa program, and generally it isn't done very much. As a result, the disabled elderly who was diagnosed to be abasia and had their life forced with wheelchair in other facilities re-acquired walking again. It is the present condition that the specific physical therapist judged degrees of the recovery for walking by the visual observation after the walking training, either to judge by him/her self depending on the person's consciousness of one who has an ability for walking one self. Therefore we figure out WUGOAD for generalizing the training system and for standardizing the degree of recovery to measure.

[Method] In measurement using video camera, we measure the angle of lower thigh and upper thigh with marking the three points of lumbar, knee, and ankle in order to recognize them as gauge marks for the data of the cameras on right and/or left side of the patient. Then, a distance between the markers and the length of the sole of foot are measured. In addition, we define the angle of the ankle by taking shape with the floor, the circumference of heel and the knee marker. We examine a recovery level from that angle, but in a way of caring, therapist or therapists come in front of objectives, and all three points cannot be reflected. At this time, we calculate an angle of the thigh, knee and ankle by two or one points that are reflected and

the barycentric coordinate depending on floor reaction force and/or the position of the foot. Also, we arrange a camera or cameras on the unaffected side. Following things could be considerable of the points that could not be reflected in video. 1. When only a lumbar could not be reflected, we find its position by analyzing the barycentric coordinate. 2. When only a knee could not be reflected, we find its position from the two points of the lumbar and an ankle by measuring the length of the thigh in advance. 3. When only the ankle could not be reflected, its position could be measured from floor reaction force. 4. When the lumbar and a knee could not be reflected, we analyze those positions by the image data of the camera of the unaffected side, the position of the foot by floor reaction force, the analyzed barycentric coordinate, and the position information of the affected and unaffected sides which should be measured beforehand. 5. When the lumbar and the ankle could not be reflected, we analyze the position of the lumbar and the ankle by the position of the foot by the floor reaction force and the analyzed barycentric coordinate with using information of distance between the markers. 6. When the knee and the ankle could not be reflected, we analyze the position of the foot by the floor reaction force, and the position of the ankle by the method 3 and the position of a knee. There are the cases that the floor reaction force isn't formed when the foot floats or almost floats in time of walking. Or, it maybe almost floating, and at the time when the floor reaction isn't generating, Even if in this case, we can measure the position of the foot by the floor reaction of the other foot. We analyze the position of the lumbar when both feet are on the floor and steady. For example, the floor reaction of walking turns in zigzag formation like the lumbar (almost the center of right foot and the left foot), to the left foot, to the lumbar, to the right foot, so the position of the feet and the lumbar could be measured two-dimensionally.

[Summary] This system is a new invention through our investigation. We are developing this invention. We will report the development of this system when more data is available. We believe that this enables not only to re-acquire of walking for disabled elderly but also handicapped people.