A Study on the Use of Motion Graphics and Kinect in LMA (Laban Movement Analysis) Expression Activities for Children with Intellectual Disabilities

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Abstract. The purpose of this study is to the motion expression activities of children with intellectual disabilities using motion graphics and Kinect. In the process of recognizing movement expression activity using motion graphics and Kinect, the effect of performance was shown when the movement expression activity through the body was properly performed. The subjects were 8 children with intellectual disabilities, and conducted the program twice a week for 10 weeks. The research design utilized video screen and theme music as contents of musical works. 42 actions were performed randomly. When the movement is perfectly represented, the score is displayed along with the sound. As a research method, Laban Movement analysis was used as a motion expression activity program. It is analyzed by four elements of LMA: Body, Effort, Shape, and Space. We observed the connectivity, body structure, body movements, progress, gestures and postures of each part of the body measured by LMA and figured out what the content of movement was. When the anatomical position of the body is divided into upper/lower (vertical) (average: 34/42: total score), left/right (horizontal) (average: 23/42: total score), and front/back (sagittal) (average: 13/42: total score). Through this study, it is shown that the movement of the children with intellectual disabilities can be induced by using the motion graphics and the functional game using Kinect to train the body structure and movement direction in daily life and to induce the change of the internal attitude.

Keywords: Motion graphics · Kinect · Laban Movement Analysis · Intellectual

1 Introduction

1.1 LMA (Laban Movement Analysis)

One of the practical methods of representing motion research is the motion analysis proposed by Rudolph Laban, which is already being used by infants and children with disabilities. Motion analysis education can present creative programs and it can be done as a treatment program for children with disabilities through movement. However, the development of movement has not been proven in children with disabilities. In this study, it is meaningful that the analysis of Laban movement using ICT is verified in

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actual field for children with disabilities. It is a motion analysis system based on LMA (Laban Movement Analysis) [1] theory. It is a key element of all natural and artificial movements in the world, from various movements expressed in virtual space, the presentation in Table 1 is mainly addressed in Laban's motion analysis. Linder [2] based on the discovery that there are common elements in all movements of Laban's approach to motion. The analysis and records used in the study of movement were to be found in previous unrelated movements this suggests that movement is not simply a physical activity, which means that human activity has always been viewed as a means of conveying internal attitudes or internal responses of the mind [3]. Tables 1 and 2 depicts emotions and thoughts in human movements, and refers to internal motivation, which is expressed by external expressive movements. The movement of the body is to convey various information to the mind and to interact and express it outwardly. In addition to the structure of movement such as movement direction, speed, distance, weight, etc., the port analyzes and records the characteristics of how the effort reflecting the inner psychological state is utilized. The concept of the will is expressed as a core concept [4]. Laban can be classified as 'natural behavior and unnatural act' when he or she approached 'disorder' by movement. By studying human movements, we have argued that we can understand human internal conflicts, in the method of expression and communication that expresses by movement, human beings move to satisfy desire. The basic physical experience emerges from the function of simple transmission to the expression of emotional experience as well as the movement of human life from confirming the existence of life. This is consistent with Hong [5] study. Study on the educational effect analysis of motion expression in motion graphics of Kim [6]: Laban's Movement Analysis as in the centered study, Laban's movement theory was tried in motion graphics, but the limit in motion graphics is dance. The dancer's intentional intentions and motivational movements, expressed directly through the body, are presented through ICT only in a way that expresses emotional and psychological aspects differently from the intention of expressing it directly. The purpose of this study is to present the movement of Laban's movement in the movement of physical activity of children with intellectual disabilities using Kinect and motion graphics.

Table 1. Key elements of Laban Movement Analysis

Configuration	Contents	
Body	Body part	External parts: head, shoulders, arms, legs, etc.
		Internal parts: heart, muscle, bones, joints, etc.
	Body motion	Movement vs non-movement
		Lifting vs lower
		Push vs band

Figure 1 shows the effects of the movement activities on the emotional and psychological aspects of the movement of the children with mental retardation. It is possible to present a study of the program of movement expression activities by

Table 2. Effort element that reconstructs time, space, flow on three steps

Movement element	Effort element		
Time	Speed	Normal speed	Slow
Space	Straight	Little flexible	Flexible
Flow	Stop	Flowing	Growing

interacting with ICT through learning through experiencing confident and movement expressive activities to children with disabilities.

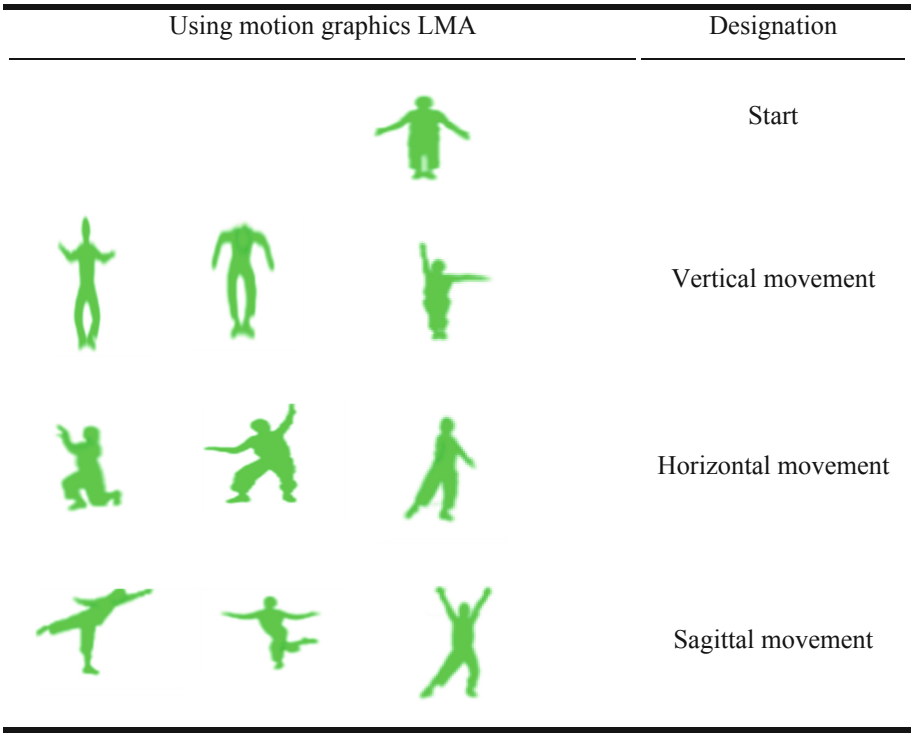


Fig. 1. Effort motion in Laban Movement Analysis

2 Research Design

2.1 Subject

Students with intellectual disabilities were children with disability grade 2 and 3, ages 10 to 18, and 8 children (3 males and 5 females). We participated in the game 20 times (twice a week) in 10 weeks (January ~ March 2018). Table 3 shows the rating characteristics of each participant in the game.

Table 3. Characteristics of participants in the game

Name(sex)	Age	Disability grade
Ko (F)	18	3rd
Ko (M)	16	2rd
Bang (F)	18	3rd
Jeon (F)	16	2rd
Jang (M)	10	3rd
Kim (M)	18	2rd
Park (F)	14	3rd
Yu (F)	18	2rd

2.2 Kinect, Skelton

The program in this study performs the function of recognizing the human body structure and analyzing the movement motion in the Kinect (see Fig. 2) [7] development program SDK in the NUI Library. Through the NUI skeleton API, it accurately recognizes each part around the skeleton of the person in front of Kinect (see Google) (see Fig. 3).

Fig. 2. TIM CARMODY, WIRED.COM

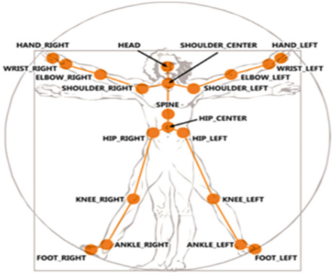


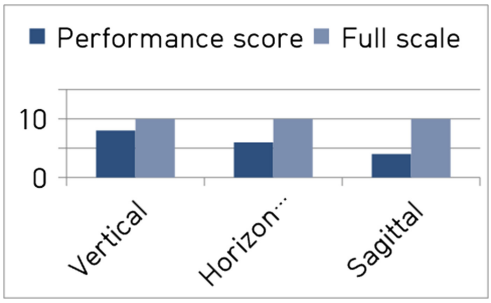
Fig. 3. Space of recognition of NUI Skelton API

3 Results

The purpose of this study is to investigate the motion graphics of kinematics of children with intellectual disabilities and the kinesthetic activities of Kinect. The participating children did not have experience of games at all, and the space where the physical activity was encountered was mainly indoor activities rather than outdoor activities, educational movements programs participating in physical activity are children who have difficulty in experiencing environmental factors. Movement activities were based on the anatomical postures of the body as a result of physical activity of vertical, horizontal, and sagittal (center shift). Vertical movement showed the highest score in children with intellectual disability when divided into vertical movement, horizontal movement, and sagittal movement (average score)/Total score: 8.2 points/10 points),

followed by a horizontal movement score (average score/total score: 6.1 points/10 points). The lowest score was the sagittal movement (average score/total score: 4 points/10 points). In Table 4, the evaluation criteria for the 10-point scale were set by 10 selected motions with 1 preparation, 3 vertical motions, 3 horizontal motions, 3 front and back motions, And the average of the score values of each performed action.

Table 4. Motion representation activity vertical, horizontal, sagittal (movement)



In the movement analysis, the children with disabilities preferred the private space rather than the general space. Vertical movement and horizontal movement. These results show that the movement activities of the children with disabilities are also the most preferred and confidently represented by the non-movement movement.

Also, in the body movement center movement activity, it showed higher score in non - movement than center movement. It is suggested that the activities of expressing the preference of the children with disabilities are represented by the vertical activities indicated by the high scores, and when they are expressed with the vertical direction of the body structure in daily life, And the horizontal direction, that is, the direction that moves left and right, shows the internal attitude of 'communication' as a posture requiring a stability of the body. Finally, the sagittal movement that moves forward and backward, which is the movement of the center movement, is somewhat difficult to express to children with disabilities due to the characteristic of movement that has the lowest attitude of inner will or approach when performing the concentration and operation of a certain work, And the internal attitude of the activity. This study suggests that the presentation of the program that can induce the internal attitude change of the body movements can be used for the education of the movement of the body expressing activity as the educational function of the psychological element to the children with the disability. In particular, it can be used variously in education games for the disabled and the disabled, and for the elderly people in the movement learning and dementia prevention education. By presenting the study of practical educational game programs, it is expected that continuous research should be linked.

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