The Relationship between Body Image Development and Motor Function in Children with Intellectual Disabilities through Whole-Body Self-Portrait Drawing

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In educational settings, we often see that children with disabilities have difficulty with physical activities. However, we don't understand well why they are not good at physical activities. In this study, we investigated the development of motor function in children with intellectual disabilities from the perspective of body image. Specifically, we asked six children (two from elementary school, two from junior high school, and two from high school) to draw a human figure. When drawing human figures, we instructed them to draw a self-portrait of themselves. We scored their drawings in terms of the Goodenough Figure Drawing Intelligence Scale (DAM) and evaluated them based on the development of body image. In addition, we examined the relationship between the development of body image and the children's motion behavior, exercise habits, and daily activities by interviewing their classroom teachers and physical education teachers. Although there were few age-dependent differences between grades in the compositional items of the figure drawings, we found significant differences between students with mild and those with moderate to severe disabilities. Regarding the characteristics of each child and the development of figure drawings, we confirmed that there was a relationship between them and motor function and exercise habits as well, however, not so much correlation between them and the daily living activities. In particular, the association with exercise habits was strong, and the development of figure drawing was more advanced in children who performed more exercise in a week. Focusing on the characteristics of the figure drawings, we assumed that the figure drawings by children with autism were influenced by some kind of character. As a result, we inferred that they were imaging the human body from the appearance of the character. Furthermore, through this study, we inferred that although motor habits are related to the development of body image, experiences in daily life are more important than motor habits.

Keywords: children with intellectual disabilities, body image, motion behavior, exercise habit

1. INTRODUCTION

Children with intellectual disabilities may show developmental delays in motor functions such as lack of integrated movement and adjusting ability. It is thought to be related to distortions in self-body image and perception of the body. However, there are few data on actual physical fitness measurements, therefore, we don't know much about it, such as which specific physical fitness elements are weak, or whether there is a difference between children who exercise regularly and those who don't. In addition, despite various studies, we still don't know why they are not good at physical activities. We feel that it is necessary to examine this issue by focusing on the motion abilities and the distortions in body image and perception that hinder the acquired exercise ability and its performance. Therefore, in this study, we decided to investigate the relationship between

motor function and body image perception (Body Image) in children with disabilities. In addition, we would like to clarify in which of the children's physical movements they are not good at and the characteristics of physical movements they are good at. For this, we measured how much children with disabilities aware their own bodies and how far they have developed compared to the actual age. In addition, we would like to clarify the relationship between the children's body awareness and the things interviewed such as their daily life activities and exercise movements, challenges in daily life movements, and exercise movements that they are good at. In this study, as a method of measuring the development of the body image of children with intellectual disabilities, we used the Goodenough Figure Draw-A-Man Test (DAM) that measures the intellectual developmental level of movement in targeting infants, early elementary school students, and children with intellectual

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disabilities. Regarding the relationship between DAM and motion intelligence, Kifune (1984) states that DAM is a test closely related to motion intelligence regardless of disabilities such as cerebral palsy or mental retardation[1]. In addition, regarding motor ability, Kifune and Nakajima (1988) state that, for mentally retarded children, the DAM is more appropriate to be positioned as a visual/motor ability test rather than as an intelligence test[2]. Based on these points, we measured the body image development of children with intellectual disabilities using the DAM. By determining from the findings of these previous studies, we inferred that DAM-induced body image development in children with intellectual disabilities is closely related to the development of motor function. This is the reason why we used body image. In this study, we decided to calculate of MA and IQ by the DAM only for reference, because the examination is used to make assumptions about body image. Furthermore, since the DAM is limited to subjects with a mental age level of 9 years or younger, we conducted on students with a mental age level of 9 years or so when conducted in the junior high and high schools.

The purpose of this study is to clarify the relationship between the motor functions and daily exercise habits of children with intellectual disabilities and their perception of body image. Through the results, we would like to consider the effectiveness of body image awareness activities, and to present effective teaching methods in physical education and independent activities for children with intellectual disabilities.

2. METHODS

2.1. Survey subjects

We studied six children with intellectual disabilities at the Aichi Prefectural SetoTsubaki Special Needs Education School. We obtained the valid responses from those six children out of six (Effective response rate: 100%). We defined that valid responses are figure drawings showing the head. Those six children included 2 in elementary school, 2 in junior high school, and 2 in high school.

We conducted Interviews and questionnaires on athletic ability and others to three teachers at the Aichi Prefectural Seto Tsubaki Special Needs Education School. These three teachers were the class teachers, the physical education teachers, and the occupational learning teachers of each student who drew the self-portrait.

In this study, we explained the intent and purpose of the study in writing to the principals and vice-principals of the target special-needs schools in advance, and conducted the survey on the students whose consent was obtained as the subjects of the study.

2.2. Survey location

Aichi Prefectural SetoTsubaki Special Needs Education School

Since face-to-face surveys were not possible due to the Covid-19 pandemic, we conducted the body image drawings of children in classes held at the special needs education school. In addition, we conducted the questionnaire survey at this special needs education school with the request to the teachers in charge.

The situation at Seto Tsubaki Special Needs Education School was as follows:

There are 89 students in the elementary school, 5 students in the junior high school, and 123 students in the high school, for a total of 277 children enrolled in the school. The number of teachers is 123, and when combined with other staff, the total number of faculty members is 136.

2.3. Survey method
2.3.1 Self-portrait drawing for children with intellectual disabilities

We asked the target students to draw a picture of a person from head to toe on the drawing paper prepared in advance. When having the test, we asked them to "Draw one person. Draw properly from the head to the toe. Do your best." In addition, we questioned about the gender of the drawn person, and decided to ask to draw a picture of a "boy". We scored the drawn pictures on a 50-point scale based on the Goodenough Human Drawing Intelligence Test Handbook (Kobayashi, 1991)[3]. After that, the scores were converted to mental age (MA) according to the "MA Conversion Table", divided by chronological age (CA), and multiplied by 100 to calculate motor intelligence quotient (DAMIQ), which was used to assume body image development. In addition, since the six students who drew portraits had a variety of disabilities, we observed the characteristics of each portrait in detail, and evaluated and considered while incorporating elements of other drawing methods.

2.3.2. Questionnaire survey for teachers in charge of target students

We conducted a questionnaire survey for teachers in charge of physical education, play instruction, and occupational learning for the target students. The contents of the survey were the activities of daily exercise and sports from the aspect of their feelings toward exercise and sports, their strong and weak movements, and the issues and/or challenges they are currently facing in their exercise and daily life movements. The survey was conducted by interview. In addition, we interviewed the degree of disability, mental

age, and intelligence test results of the target students to the extent possible.

2.3.3. How to handle results

Based on the scores and characteristics of their drawing and the results of interviews about each student, we examined and considered the relationship between their body awareness and motor abilities of children with intellectual disabilities by comparing the relationship and characteristics of their body image development, their strong and weak movements, and their daily life movements. Furthermore, we l examined the relevance of exercise habits and efforts to exercise and sports.
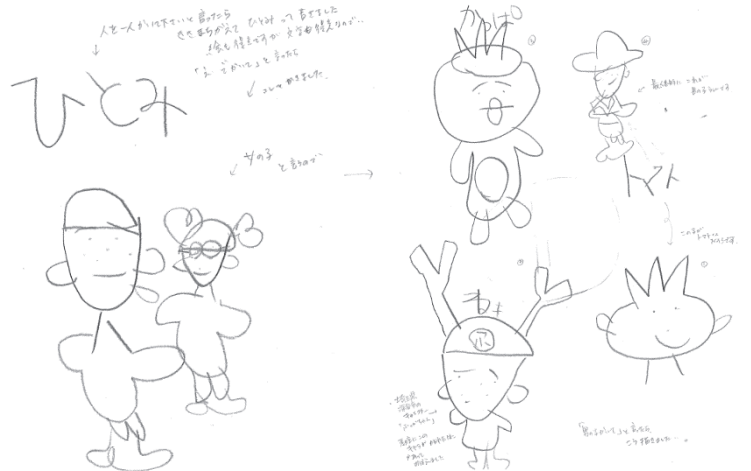

Fig. 1. Figure Drawing of Student A

3. RESALTS

3.1. Elementary school

3.1.1. Student A (3rd grade elementary school girl)

Student A was a female child diagnosed with autism and a severe disability (Grade A on the "Ryoiku-techo" (certificate of disability)). As for physical exercises, she answered that she "likes" them that she was good at, and was able to play well on jungle gyms, slides, and trampolines. As for the physical exercises that she was not good at, she answered throwing a ball and high crawling. In terms of daily activities, she was generally able to do everything except for holding chopsticks; however, she was not good at staying still in the same place in the same posture. She was used to drawing pictures because she usually drew various characters. Figure 1 shows a figure drawing of Student A. When drawing, she misheard the instruction to "draw one person," and wrote "Hitomi" in letters (Japanese Hiragana). After

that, when instructed to "draw a picture", she drew a girl. Therefore, again instructed to "draw a boy", she drew a picture of a boy after writing "tomato" in letters, and drawing a green onion and "kappa" (water imp) character. Her figure drawing was clearly distinguished between face, torso, and legs, and a hat was drawn on the head. Eyes, mouth, and ears were also drawn; however, not in the proper position. In addition, the eyes, nose, and mouth were drawn with simple lines and dots. As for her figure drawing in terms of developmental stages, we found many elements of the incorrectly realistic period (around 3–5 years of age) of the symbolic drawing period (around 3 to 7 years old). The result of scoring by DAM was 9 out of 50. This score in the MA conversion table was: mental age was 4 years and 8 months, and the performance IQ was 52.8.

The results of the interview survey by questionnaire were as follows. (Table 1)

Table 1. Results of the interview survey of Child A

List of questions	An anser to a question
Dose she like exercise and sports?	It depends on the case, such as what you are good at.
How often dose she exercise in a week? (Approximately 30 to 60 minutes including class time)	She does the exercise once or twice a week.
What is her favorite sports and movements during her physical education and play instruction time?	She likes climbing jungle gyms, sliding down slides, jumping trmpolines and running. she is I also like rowing kick scooters and tricycles. She is also good at wheelbarrows and on all fours.
What sports or movements is she not good at in physical education or play?	She is not good at throwing balls or crawling. She is also not good at kenkenpa. (She can do it somehow)
What is her good movement in everyday life?	She can do anything in her daily life.
What is her not good movement in everyday life?	She uses helpchopsticks in her daily life. She doesn't like staying still in the same place as same position.
What are her current physical education, exercise and issue of daily living activity tasks?	She is not very good at doing things with objects, such as throwing a ball. She is practicing using chopsticks. She has become quite proficient in using chopsticks.

3.1.2. Student B (6rd grade elementary school boy)

Student B was a male child with Grade C of the "Ryoiku-techo" (certificate of disability). He enjoyed physical exercise and did physical activities in his daily life to get sweaty during free-play-time for about 10 minutes. He was good at long-rope jumping and short-distance running; however, not good at ball games. Figure 2 shows a figure drawing of Student B. The drawing was characterized by the proper positioning of the eyes, mouth, nose, and ears, and by using outlines rather than simple lines and dots for the facial parts. He drew hair clearly over the outline of the head and indicated clothing by drawing what looked like buttons on the torso. As for his figure drawing in terms of developmental stages, we found that many elements of the intellectual realistic period of the symbolic drawing period (around 5 to 7 years old). In addition to that, there were a few elements of the incorrectly realistic period, such as the head being the same size as the torso, the neck not being drawn, and the ambiguity of the shape of the feet and hands. The result of scoring by DAM was 23 out of 50. This score in the MA conversion table was: the mental age was 7 years and 5 months, and the performance IQ was 61.8.

The results of the interview survey by questionnaire were as follows. (Table 2)

Fig. 2. Figure Drawing of Student B

Table 2. Results of the interview survey of Child B

List of questions	An anser to a question
Dose he like exercise and sports?	He likes.
How often dose he exercise in a week? (Approximately 30 to 60 minutes including class time)	in his daily life, he moves his body enough to sweat during "free play" for about 10 minutes.
What is his favorite sports and movements during his physical education and play instruction time?	He is good at exercises such as long jump rope and short distance running.
What sports or movements is he not good at in physical education or play?	He is not good at exercises using a ball. (He has a clumsiness)
What is his good movement in everyday life?	Nothing in particular.
What is his not good movement in everyday life?	He is in a standing position with one leg at the center of gravity. When he sits on a chair, his buttocks slide forward and he can't hold his posture with his trunk.
What is his current physical education, exercise and issue of daily living activity tasks?	His Physical Education tasks are simple, such as shooting and passing basketball. In his morning assignment, He do sit-ups 20 times and stretch. (Stand up high on the whiteboard, reach out and stick a magnet). He runs on the playground.

3.2. Junior high school
3.2.1. Student C (1st grade junior high school boy)

Student C was a male student with Prader-Willi Syndrome and with Grade B of the "Ryoiku-techo" (certificate of disability). He was not good at sports, He answered that he liked to move his body in some cases, only in the physical exercise that he was good at. He did physical activities of 30–60 minutes 3–4 days a week, including physical education classes. In physical education class, he made a conscious effort to imitate the instructor's movements. Figure 3 shows a figure drawing of Student C. His figure drawing was characterized by the absence of arms, the face being one size larger than the torso, and the eyes, mouth, and legs drawn with simple lines and dots without outlines. In addition, the neck, nose, and ears were not drawn, and the face and torso were drawn as simple figures. As for his figure drawing in terms of developmental stages, we found many of the characteristics of the incorrectly realistic period of the symbolic drawing period such as the unusually large head and the absence of arms and neck. The result of scoring by DAM was 7 out of 50. This score in the MA conversion table was: the mental age was 4 years and 1 month, and the performance IQ was 31.6.

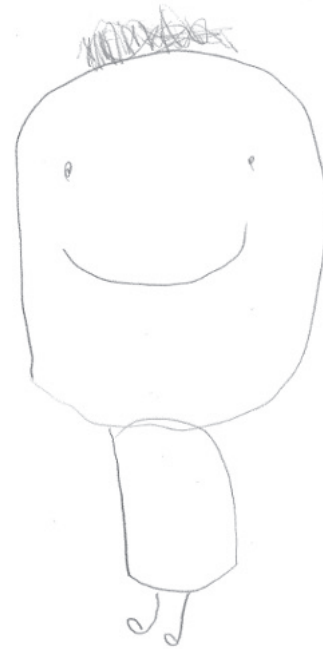The results of the interview survey by questionnaire were as follows. (Table 3)

Fig. 3. Figure Drawing of Student C

Table 3. Results of the interview survey of Child C

List of questions	An anser to a question
Dose he like exercise and sports?	It depends on the situation, such as that he is good at.
How often dose he exercise in a week? (Approximately 30 to 60 minutes including class time)	He does the exercise three or four times a week.
What is his favorite sports and movements during his physical education and play instruction time?	Nothing in particular.
What sports or movements is he not good at in physical education or play?	He is not good at moving his body. He is not particularly good at moving his body in rhythm.
What is his good movement in everyday life?	He is good at detailed work. (Picking iron beads with chopsticks, etc.)
What is his not good movement in everyday life?	He doesn't like lifting heavy things.
What is his current physical education, exercise and issue of daily living activity tasks?	I didn't give him any instructions on how to move. I tell him to imitate the teacher's model correctly in physical educational class.

3.2.2. Student D (2nd grade junior high school boy)

Student D was a male student with a diagnosis of severe autism with Grade A of the "Ryoiku-techo" (certificate of disability). He liked physical exercises and sports and performed physical activities 3–4 days a week. He was not good at ball sports because he did not have much experience with them. In daily life, he was good at using his hands and dexterous with his hands, therefore he was basically able to do anything. He was good at drawing characters and drew some kind of character every day. He was the student who was the most familiar with drawing in this study. Figure 4 shows a drawing of Student D. He drew something like a character when asked to "draw a person". A characteristic of his figure drawing was symmetrical with clear lines. Although it was difficult to see it as a figure drawing because of its strong character aspect, we recognized the head shape and the eyes were drawn. Therefore, we scored it. The result of scoring by DAM was 6 out of 50. This score in the MA conversion table was: the mental age was 3 years and 10 months, and the performance IQ was 28.2.

The results of the interview survey by questionnaire were as follows. (Table 4)

Fig. 4. Figure Drawing of Student D

Table 4. Results of the interview survey of Child D

List of questions	An anser to a question
Dose he like exercise and sports?	He likes
How often dose he exercise in a week? (Approximately 30 to 60 minutes including class time)	He does the exercise three or four times a week.
What is his favorite sports and movements during his physical education and play instruction time?	Nothing in particular.
What sports or movements is he not good at in physical education or play?	Since he has little experience in ball sports, he is not good at it. (He is especially bad at throwing the ball hard.)
What is his good movement in everyday life?	He is so handy that he can do anything.
What is his not good movement in everyday life?	He is good at doing anythings with his hands.
What is his current physical education, exercise and issue of daily living activity tasks?	In physical education, He is involved in handball and running.

3.3. High school
3.3.1. Student E (1st grade high school boy)

Student E was a male student with Grade C of the "Ryoi-ku-techo" (certificate of disability). As for physical exercises and sports, he answered "like" only for the sports he was good at. He performed physical activities 5–6 days a week, including physical education classes. Although he willingly worked on strength training, we observed that he tried to take a break for reasons of being physically demanding or difficult. In addition to physical activities, he was able to assemble small Lego blocks with the instructions, showing his dexterity. Figure 5 shows a figure drawing of Student E. Although his drawing was the smallest in size among all the drawings collected in this study, some aspects of the drawing were more developed than others as a figure drawing, such as the clear drawing of clothing of tops and pants, and the neck. Facial parts were also drawn almost in appropriate positions, and the eyelashes were the only visible among the figure paintings collected for this study. However, there were also some features similar to those in the figures drawn by elementary and junior high students, such as the vaguely drawn palm and one of the legs with the simple line. As for his figure drawing in terms of developmental stages, it was from the intellectual realistic stage to the realistic stage (around 8–9 years old). The result of scoring by DAM was 22 out of 50. This score in the MA conversion table was: the mental age was 7 years and 3 months, and the performance IQ was 45.3.

The results of the interview survey by questionnaire were as follows. (Table 5)

Fig. 5. Figure Drawing of Student E

Table 5. Results of the interview survey of Child E

List of questions	An anser to a question
Dose he like exercise and sports?	It depends on what he is good at.
How often dose he exercise in a week? (Approximately 30 to 60 minutes including class time)	He does the exercise five or six times a week.
What is his favorite sports and movements during his physical education and play instruction time?	He is willing to do strength training.
What sports or movements is he not good at in physical education or play?	He tries to find a reason to rest when something is physically demanding or difficult.
What is his good movement in everyday life?	He can assemble small Lego blocks by looking at the instructions.
What is his not good movement in everyday life?	Nothing in particular.
What is his current physical education, exercise and issue of daily living activity tasks?	He works on movements and exercises that he is not good at.

3.3.2. Child F (2nd grade High school boy)

Student F was a male student in the second grade of high school with Grade C of the "Ryoiku-techo" (certificate of disability). His IQ was 63 and his disability was mild. He enjoyed exercise and sports and did almost every day for 30 to 60 minutes per week. He was good at basketball and short-distance running, and his weakest exercise was long-distance running. In daily life, he was good at cleaning and had difficulty picking up small objects. Currently, he is working on the task of organizing his belongings, such as putting things back in the same place they were located. Figure 6 shows a figure drawing of Student F. The characteristic of his drawing was size, the largest one among all the drawings collected in this study. The DAM score was the highest among them, as drawing the facial parts and the number of fingers appropriately, and the shoulders and neck clearly visible. However, some developmental delays were observed, such as the obviously large proportions of the torso, the simple shapes of the face and torso, and the transparency of the clothing. His figure drawing was the developmental stage from the intellectual realistic stage to the realistic stage. The result of scoring by DAM was 26 out of 50. This score in the MA conversion table was: the mental age was 7 years and 11 months, and the performance IQ was 49.5. Student F's drawing is displayed enlarged because the lines were thin.

The results of the interview survey by questionnaire were as follows. (Table 6)
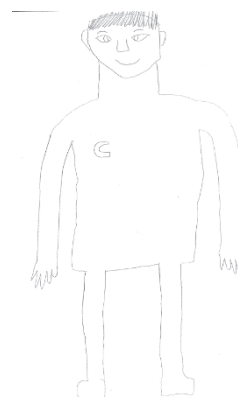

Fig. 6. Figure Drawing of Student F
(His drawing is shown enlarged,
because the lines are thin.)

Table 6. Results of the interview survey of Child F

List of questions	An anser to a question
Dose he like exercise and sports?	He likes.
How often dose he exercise in a week? (Approximately 30 to 60 minutes including class time)	He works out almost every day.
What is his favorite sports and movements during his physical education and play instruction time?	He likes playing basketball and running short distances.
What sports or movements is he not good at in physical education or play?	He is not good at running long distannces.
What is his good movement in everyday life?	He likes to clean.
What is his not good movement in everyday life?	He is not good at picking up small objects.
What is his current physical education, exercise and issue of daily living activity tasks?	His focus is stretching and circuit training. His daily activity task is organizing his belongings. (put back what he put out)

3.4. About DAM scoring items

Table 7 shows DAM scoring items. Of the 50 scoring items, 17 items were not drawn by anyone, which include: 18. Leg proportions, 23. Heel, 33. Ear position and proportions, 34. Outlines of arms and legs, 36. Shoulder or arm joints, 38. Palm, 39. Clothing parts (four or more), 41. Arm joints, 42. Outlines of nose and mouth, 43. Sideways A, 44. Nostrils, 45. Facial features, 46. Chin protrusion, 47. Completion of clothing types, and 48. Differentiation of thumb, 49. Sideways B, and 50. Drawn line B. Based on these points, we analyzed and discussed the whole body drawing of each student.

3.5. About figure drawing by school grade

Fig. 7 (7-a to 7-c) shows the configuration items (using DAM items) of figure drawings for each school grade. In the elementary school (Fig. 7-a), 22 out of 50 items were drawn, and 9 items that both two children were able to draw, were the head, eyes, torso, legs, mouth, arms, length of the torso, where/how to attach arms and legs A, and ears. The characteristics of the drawings were drawing the head and torso separately, and each body part somewhat differently such as the arms and legs are drawn from the torso. In addition, some details were ambiguously depicted, such as the absence of the neck and the simple shapes of the palms

Table 7. DAM scoring items

| 1. Head	11. Eyebrows or Eyelashes	21. Eye shape	31. Outline of the trunk	41. Leg joint
2. Eye	12. Clothes	22. Ear	32. Number of fingers	42. Outllne of ear and mouth
3. Trunk	13. Hair B	23. Heel	33. Ear position and proportion	43. Sideways A
4. Leg	14. Neck	24. Leg proportion B	34. Sholder	44. Nostril
5. Mouth	15. How to attach arms and legs B	25. Outline of the head	35. Shoulder	45. Facial features
6. Arm	16. Finger	26. AII of the clothes	36. Shoulder or arm joint	46. Protruding jaw
7. Hair A	17. Neck contour	27. Arm proportions	37. Chin and forehead	47. Completion of clothing types
8. Length of Trunk	18. Leg proportions A	28. Finger detail	38. Palm	48. Differentiation of the thumb
9. Nose	19. 2 or more clothes	29. Head proportion	39. 4 or more pieces of clothing	49. Sideways B
10. How to attach arms and legs A	20. Pupil of both eyes	30. Direction of eyes	40. Drawing line A	50. Drowing line B
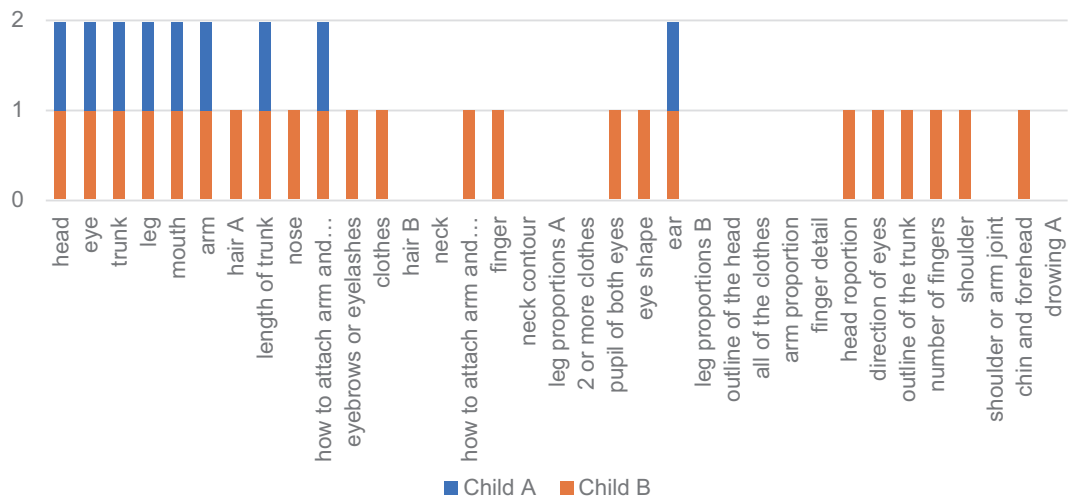
Fig. 7-a. Component of painting portraits by DAM scoring in the elementary school

and feet. However, when comparing the figure drawings of these two elementary school students, there was a difference in the expression of details, such as the parts of the face, the torso, and the five fingers. The drawing of Student B (6th grade of elementary school, male) was much more developed than that of Student A (3rd grade of elementary school, female).

In the junior high school students (Fig. 7-b), 10 out of 50 items were drawn, and the three items that both students were drawn were the head, eyes, and torso. Characteristics of the figure drawings included that the neck was not yet represented, the eyes were represented by simple dots, and the shape of the face was like a simple figure. As a result, the division of body parts was more ambiguous than in the figure drawings of the elementary school students.

In the high school students (Fig. 7-c), 30 out of 50 items

were drawn, and both two students drew 18 items, such as the head, eyes, torso, legs, mouth, arms, hair A, length of body, nose, where/how to attach arms and legs A, eyebrows or eyelashes, clothing, neck, where/how to attach arms and body B, fingers, outlines of the neck, ears, and a number of fingers. Characteristics of the figure drawings were drawing neck, clothing, and five fingers. Among all the drawings from each school grade, those two drawings were the most developed figure drawings. The body was drawn separately in each part, on the other hand, the proportions of the head, torso, arms, and legs varied among the students. In terms of the composition items of the figure drawings by each school grade, the highest was 30 items for the high school, followed by 22 items for the elementary school, and the lowest was the junior high school with 10 items.
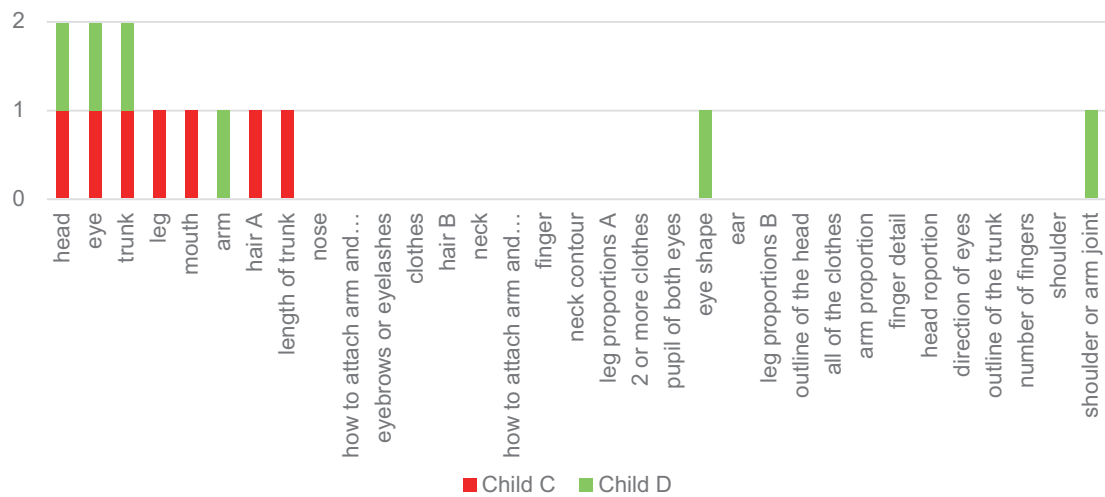

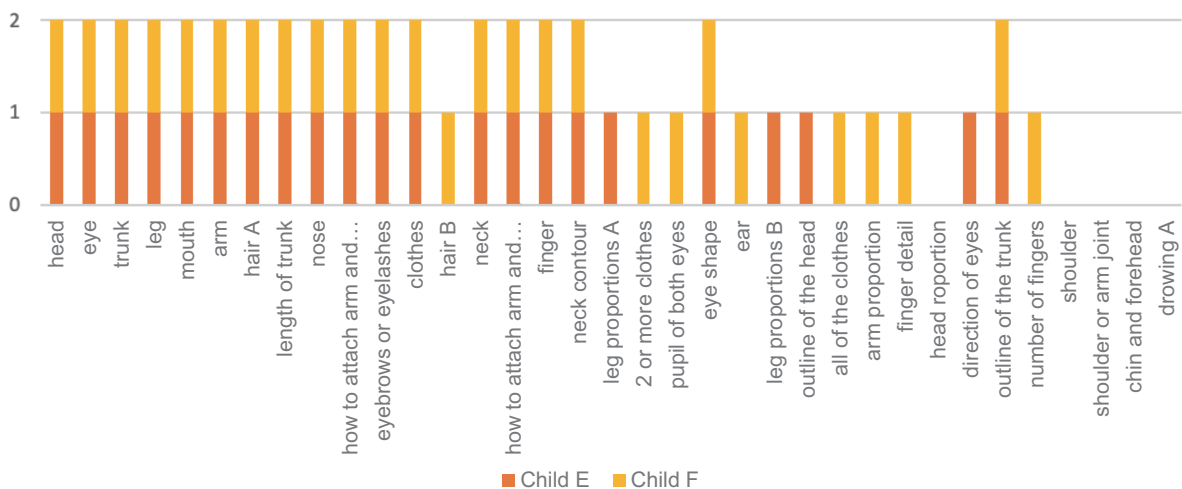Fig. 7-b. Component of painting portraits by DAM scoring in the junior high school.

Fig.7-c. Component of painting portraits by DAM scoring in the high school.

3.6. About figure drawings by degree of disability

Fig. 8 (8-a to 8-c) shows the configuration items of figure drawings for each grade of the "Ryoiku-techo" (certificate of disability). In this study, 2 students were in Grade A of the "Ryoiku-techo", 1 student was in Grade B, and 3 students were in Grade C. The students with Grade A (severe) of the "Ryoiku-techo" had drawn 10 out of 50 items, and the items that both students had drawn were five: head, eyes, torso, arms, and ears.

The student with Grade B (mild to moderate) of the "Ryoiku-techo" had drawn 7 out of 50 items, head, eyes, torso, legs, mouth, hair A, and length of the torso.

The students with Grade C (mild) of the "Ryoiku-techo" (certificate of disability)had drawn 32 out of 50 items, and the items that all three students had drawn were 16: head, eyes, torso, legs, mouth, arms, hair A, length of the torso, nose, where/how to attach arms and legs A, eyebrows or eyelashes, clothing, where/how to attach arms and legs B, fingers, ears, and a number of fingers. In terms of the composition of figure drawings by the degree of disability, 32 items were the highest for Grade C of the "Ryoiku-techo", followed by Grade A with 10 items, and the lowest was Grade B with 7 items.
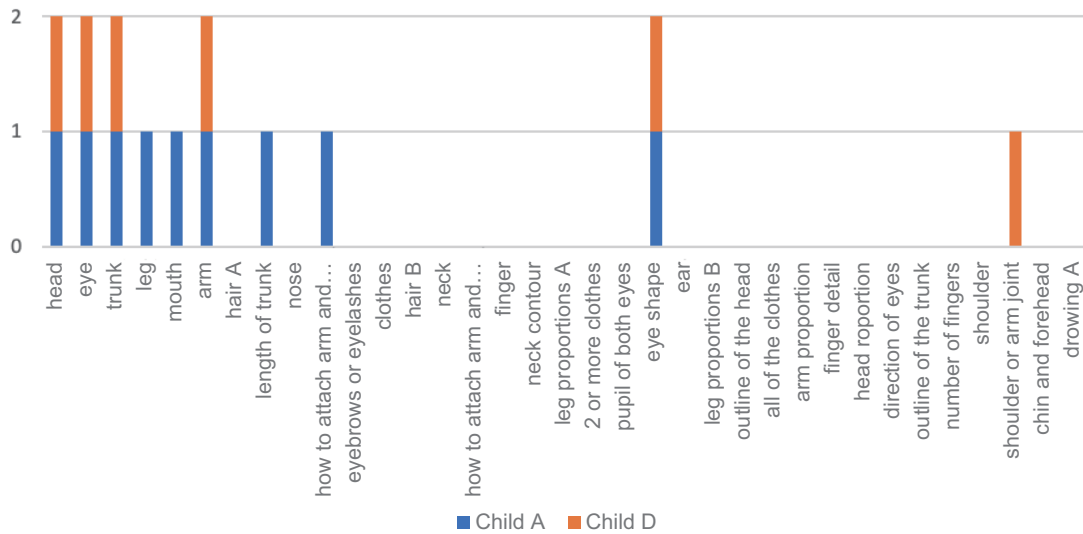

Fig. 8-a. Components of DAM Portraiture in Children with Mild Intellectual Disability
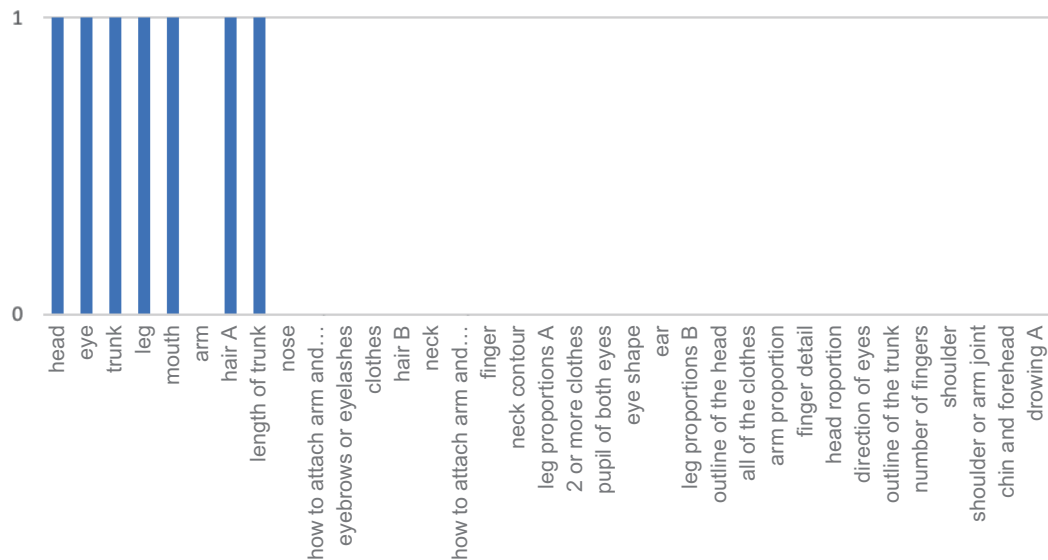

Fig. 8-b. Components of DAM Portraiture in Children with Moderate Intellectual Disability
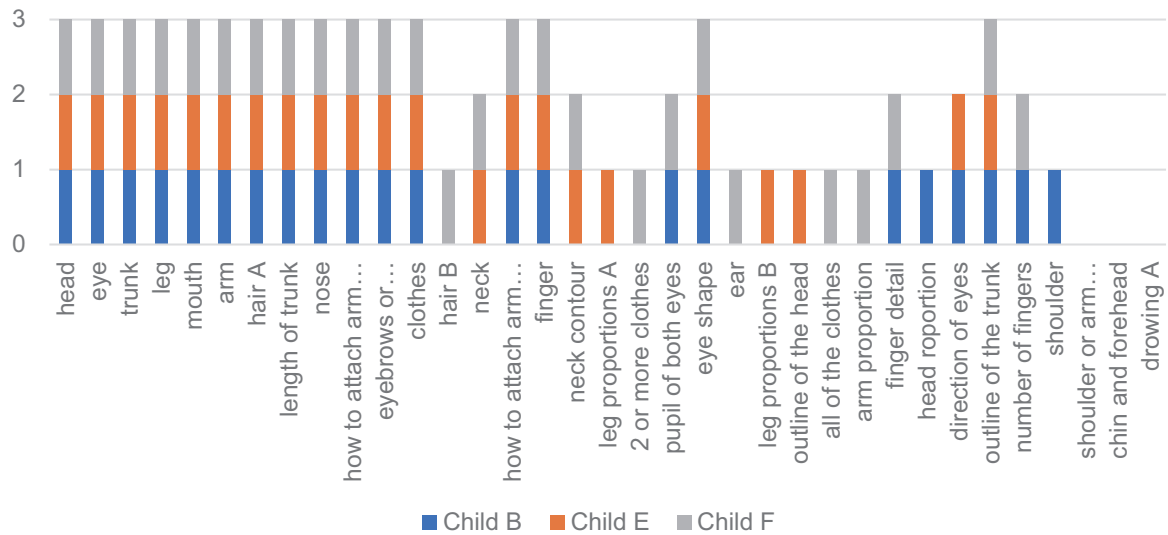
Fig. 8-c. Components of DAM Portraiture in Children with Mild Intellectual Disability

3.7. Others

In terms of facial expressions, most of the objects with recognizable mouths were smiling and drawn with simple curves or semicircles. Figures without mouths or difficult to recognize were expressionless. In addition, we found that only the figure drawings of the students with Grade C of the "Ryoiku-techo" (certificate of disability) were with a clear gender distinction, and buttons or marks indicating clothing.

4. DISCUSSION

The drawings we were able to obtain this time were for a total of six children, and the characteristics of the disabilities of these six children varied. Therefore, in this study, we discussed the relationship between the drawings, physical activities, and activities of daily living for each of the six children individually.

4.1. Student A

In the figure drawing, Student A drew most of the basic body parts such as eyes, mouth, ears, torso, arms, and legs. However, she didn't correctly draw the proportions and positions of these parts, and with the entire body balance. There were no detailed drawings of the arms, legs, or hands, therefore, we inferred that she had difficulty extracting detailed information about her own body. These characteristics of autistic children have been revealed in previous studies. Kore-eda and Tojo reported that although autistic children were able to clear depictions of basic body parts, such as eyes, mouth, hands, and feet, their drawings slightly

a lack of balance depiction of the body as a whole, such as the proportion of the length of torso, where/how to attach the arms (arms protruding from the sides of the trunk, not from the shoulders), the proportion of head and legs (the head and face are extremely large)[4]. These points suggest that Student A generally understands her own body; however, not yet aware of details such as the size of each part and the tips of her fingers.

As for bodily movement, she can climb a jungle gym and pedal a tricycle and is good at using her hands and feet for physical activities. However, she is not good at throwing a ball and high crawling which require shifting the center of gravity of the lower body and the ability to kick the ground. In relation to her figure drawing, we inferred that the development of body image from the upper body to the tips of the toes was delayed due to the unclarified depiction of arms and legs and the lack of balance of the entire body.

Student A drew various characters after drawing the girl's figure, one of which was a boy's figure. When we looked at how the gender differences and clothing were expressed in her drawings, we found that the girl's drawing had something like hair, while the boy's drawing had a cap. The clothing representation was only a cap in the boy's drawing. She was able to perform all daily activities except for holding chopsticks. Although she was able to put on clothes by herself, she did not draw clothes in her drawings and seemed to have difficulty visualizing her observations and experiences in daily life. Since she was mainly looking at gender differences with different hairstyles, we expect that she achieves further clarification of gender differences by deepening her daily life experiences. Regarding the devel-

opmental process of drawing expression in autistic children, Tamura and Tanabe (1991) pointed out that it is important to nurture drawing expression activities by expanding and developing images through daily life experiences[4]. Since Child A usually draws various characters, we thought that she obtained the image of the human body image from the figure of the character.

4.2. Student B

In the figure drawing of Student B, he was able to correctly depict facial parts, hair, and the number of fingers. He had a fairly clear image of his own body with the positioning of the body parts drawn generally correct and the facial parts outlined. However, the proportion of the head and arms was not correctly drawn, the neck was not correctly drawn, and the clothing and the body were not separately drawn. Regarding exercise habits, in addition to 30–60 minutes of exercise one or two days a week, he routinely exercised for about 10 minutes during breaks. Although it was a short period of time, we thought that his daily exercise habits may have been related to his ability to accurately depict body positioning and the number of fingers in the figure drawing. In terms of motor (exercise) movements, he was good at long jump rope and short-distance running, and his clumsiness in the use of a ball indicated that he was good at simple movements such as flying and jumping; however, he had low required skill when using a ball. In the figure drawing, he drew the number of fingers, on the other hand, he didn't draw details on the fingertips, or clarify the toes. We thought that these are related to the low level of dexterity.

In activities of daily living, he had balance issues, such as a one-legged center of gravity when standing and an inability to hold the posture with the trunk when sitting in a chair.

However, he was able to draw well in terms of body balance in his figure drawing, consequently, we inferred that he had low awareness of his toes and postural distortion of which he was unaware. From the above points, we considered that although his body image was developing due to his daily exercise habits, his recognition of the tips of his hands and the ends of his feet had not been clarified, and factors other than his own recognition related to his posture.

4.3. Student C

Student C's figure drawing had a torso directly attached to the head, and no arms. The eyes, mouth, and legs were drawn with simple lines and dots, and the overall structure was simple. We inferred that the student did not have a well-developed image or awareness of her own body.

Regarding exercise, although he was engaged it 3–4 days a week, he was not very good at it, in particular at moving his body in a rhythmical manner. In physical education, he consciously imitated the instructor's movement correctly, and had many opportunities to watch other people's movements and bodies. However, we observed several underdeveloped areas in body image, such as the lack of depiction of the arms and clarity in the depiction of the legs. We thought that these factors were due to not being aware of his own arms and legs, nor being good at representing the body image that he had imagined.

In daily life activities, he was good at small tasks such as picking up iron beads with chopsticks, which did not seem to be related much with the lack of arms in his figure drawing. We found that the movement he was not good at was holding heavy objects, and movements using the whole body were generally weak. In addition, from the interviews, we clearly understood that he had few experiential activities outside of school and his personality was very calm and gentle. Therefore, we inferred that the floaty atmosphere, a lack of arms, and underdeveloped part of the legs in his drawing were a reflection of his experiences in daily life. From the above points, we considered that the figure drawing of Student C was a projection of his personality and underdevelopment parts due to his limited experience in daily life. His drawing is an example of a figure drawing accurately reflecting the state of the child.

4.4. Student D

Student D's figure drawing was a drawing more like some kind of character than a human figure. Clearly drawn lines and symmetry was the characteristics of his drawing. However, it included only a few elements of the human body, and the DAM score was the lowest among the six students. Regarding the drawing activities of autistic children, Hamatani and Kihara (1990) stated that they may have been more likely to draw by memorizing and reproducing visual forms as they were rather than by conceptualizing visual stimuli from the outside world[5]. Since he drew some kind of character every day, we thought that, like Student A, he obtained the human body image from the appearance of the character. Based on the interview about exercise movement, there was no movement that he was good at, therefore, we inferred that he was not good at any physical activities. From the above points, we thought that the cognitive characteristics peculiar to autistic children may have caused Student D to be unable to recognize his own body correctly, and that this discrepancy in his body image reflected in his low score for the figure drawing.

In daily activities, he is very dexterous and can basically

do anything, particularly using his hands. We inferred that these his daily drawing activities derived his dexterity and reflected in the clear lines and symmetry of his figure drawings. From the above points, clearly, the development of motor habits, abilities and body image is not the only factor that plays an important role in the development of figure drawing, but also projecting and visualizing of the image of the figure through everyday life experiences. In addition, we thought that autistic children may draw human figures based on what is most familiar to them, such as characters, due to their unique cognitive characteristics and their difficulty in expressing what they imagine.

4.5. Student E

Student E's figure drawing was drawn in a small drawing in the upper left corner of the drawing paper. Facial parts and body parts were generally drawn correctly, and the neck, which had been absent in figure drawings up to the junior high school level, was shown, and clothes and pants were recognizably drawn. Therefore, we thought that he has been able to concretely visualize and represent the neck and clothing in a developmental stage.

In relation to exercise, Student E answered that he liked exercise in some cases, such as what he was good at, and he performed it about 5–6 days a week. In the physical education class, we observed that he was willing to work on strength training, therefore, we inferred that the development of his body image was related to his daily exercise habits. In the movements that he was not good at, we observed that he took a break for reasons that were physically demanding or difficult. We thought that it was related to the size and placement of the drawings. According to the book, "Personality Projection in the Drawing of the Human Figure" (K. Machover, translated by Takashi Fukada, 1988), it is stated that small images are drawn by schizophrenics who are regressive and have less motions, which indicates low energy level and ego atrophy[6]. Therefore, we considered that the drawing of Student E projected not only the development of body image, but also personality aspects such as regressive aspects when he encounters difficulties.

In daily life activities, he was able to assemble small Lego blocks with the instructions, and was able to project and represent visual information in his brain. In addition, from the compositional items in the figure drawing, he had some idea of body features and clothing. Therefore, we inferred that he developed his body image from his experiences in exercise and daily life. However, the mental age of the figure drawing was 7 years and 3 months, which was considerably behind in development compared to his age in months. From the above points, we found that the development of body image of children with intellectual disabilities is accumulated through life experiences; however, the speed of development is considerably slower than that of normal children.

4.6. Student F

Student F draw the figure very large, using the entire drawing paper. He correctly drew facial parts and body parts as well as Student E.

As for the clothing, he drew only the clothing, and it blended with the body. Although he obtained the highest score for the figure drawing, there was a considerable difference between the verbal IQ of 63 and the performance IQ of 49.5, indicating a delay in the development of body image and drawing ability compared to the overall development of the child. In addition, Matsuda (1973) stated that the age-related development of children with IQs between 56 and 65 was even clearer, with a tendency toward realism, and that some drawings seemed to be influenced by TV and Manga[4]. This suggested that student F's perception of the body image is likely to be directly projected onto his figure drawing.

In relation to exercise, he liked to engage in physical activities and sports, and did so almost every day. While other students often felt that they were not good at ball games, he was good at basketball, therefore, we inferred that he had the highest motor skills among the students in this study. The scores of the figure drawings as well, we thought that he was superior to the other students in terms of body image development. Although he answered that his weakest exercise was long-distance running, we thought that it was due to the physical difficulty of the exercise. From this, we inferred that there was little relationship between this and his figure drawing. The relationship between student F's figure drawing score and his exercise habits suggested that there may be some relationship between the development of body image and exercise habits.

In terms of activities of daily living, Student F was good at cleaning and not good at picking up small objects. We believe that this is related to the lack of palm expression in his drawing. He did not draw clothes and body separately, as a result, we inferred that although he had a general understanding of his own body, he was not yet able to visualize his body image with specificity or detail. In addition, the mental age of his figure drawing was 7 years and 11 months, and showed a considerable developmental delay compared to his age in months, like Student E. From the above points, we inferred that the development of body image was clarified through daily life experiences and motor experiences, and approached the age of life. However, in

the case of children with intellectual disabilities, regardless of daily life experiences, once they have developed to a certain point, their development stagnates afterwards.

4.7. Overall Considerations

All of the developmental ages of the figure drawings of the children in this study were younger than their ages in months. Comparing the difference between the age in month and the mental age according to DAM, we found that the DAM mental age was, on average, 7 years and 3 months behind the age in months. Therefore, we found that children with intellectual disabilities were considerably behind in body image development compared to their ages in months.

In terms of the relationship between motor skills and body image, the students who answered that they were good at at least one motor movement (exercise/sports) had the performance IQ of 52.9 on average, while the students who answered that they were not good at any motor movement (exercise/sports) because they could not find any exercises they were good at had the performance IQ of 29.9 on average. This indicates that there is some relationship between motor skills and body image development. In the interview of motor movements, a large percentage of the students answered that they were good at running short distances, while ball games, throwing a ball, and long-distance running were the movements they were not good at. From the results of the interviews, we found that children with intellectual disabilities can perform simple movements well such as short-distance running, on the other hand, they are not good at movements required using the entire body, such as throwing and controlling a ball, and physically demanding exercises. Regarding the motor functions of children with intellectual disabilities, Tanabe and Tamura (1988) stated that even if they had the motor skills for elemental movements, the formation and probability of their own body image, such as which part of their body they should manipulate, may play an important role in organically combining these skills into a single motor movement[7]. From the above points, we considered that the development of body image is important for the implementation of exercise movements that combine the movements of various parts of the body, such as the movement of throwing a ball.

For exercise habits, the number of days per week that children exercised for 30–60 minutes increased as their grade in school advanced; however, DAM scores were higher in the order of high school, elementary, and junior high. Therefore, it didn't show any relationship much between exercise habits and the development of body image. However, Student B, enrolled in the elementary school, exercised for about 10 minutes on a daily basis and had the highest performance IQ. This suggested that daily exercise, even for a short period of time, had some effect on the development of body image.

In the results regarding activities of daily living, the two junior high school students with the lowest DAM scores were good at detailed tasks, while student F, who had the highest DAM score, was not. Since there were many differences among the students in the motion movements of daily living that they were not good at, we thought that life experiences and school activities rather than the development of body image may be more important for the development of motion movements of daily living.

In terms of the composition of the figure drawings by disability level, students with mild disability (Grade C of the "Ryoiku-techo" (certificate of disability)) drew the most body parts with 32 items, next was the student with severe disability (Grade A of the "Ryoiku-techo") with 10 items, and the last was the student with moderate disability (Grade B of the "Ryoiku-techo") with the least number of items, 7 items. This showed that although there was not much difference between moderate and severe, the development of figure drawing was considerably delayed when compared to mild. Based on the results of the interviews, we believe that these differences are related not only to the development of body image and intellectual level, but also to differences in drawing ability, life experiences, and other factors. From the above points, we considered that although there are differences in the development of body image depending on the degree of disability, the actual condition of each student's disability and his/her daily life experiences are greatly involved in the specific factors. In addition, the child with mild disability, having extensive experience in exercise, and having high DAM scores, was less than 8 years old in the mental age of the figure drawing. From this, we thought that the development of body image of children with intellectual disabilities may stagnate after a certain point.

In this study, we asked two autistic children to draw figure drawings; however, they drew some kind of characters, not a person. This caused the lower DAM scores than the other students. Therefore, we inferred that this may be due to a discrepancy regarding their own body image, since the autistic children obtained information about their own bodies from the figure of a character rather than from a person. Tanaka and Ki (2020) stated that to make ASD (Autism Spectrum Disorder) children's body awareness clearer, it is effective to actually move their bodies and realizing them[8]. From the above points, we considered that it is necessary to approach body sensation through physical activities, par-

ticularly in the development of body image in children with autism.

5. Conclusions

In this study, the development of body image in children with intellectual disabilities was measured using a method of figure drawing. As a result, clearly, a part of the development of body image appeared in figure drawings, and there was a particularly strong relationship with motor movements and exercise habits. Therefore, we considered that it is better to approach each body part and conduct activities to make the children with intellectual disabilities aware of their own body movements when teaching exercise. In addition to exercise, it became clear that there was no relationship with daily activities, and that it is difficult to draw human figures for autistic children. Although we used the figure drawing method in this study, there are other methods, such as hand imitation and verbal instruction of body parts, and we would like to make it possible to measure body image with suitable ways for each student's actual condition. In the interview survey, we had to conduct a questionnaire survey due to the COVID-19 pandemic. As a result, we were only able to analyze the data in writing. For the next time, we would like to analyze and evaluate their movements and body image based on the observation of their actual movements. In particular, since there were many students who had difficulty in throwing a ball this time, we would like to observe how they actually throw a ball and clarify the relationship between the motion of throwing a ball and the development of their body image. From the above points, we would like to conduct research on body image development focusing on the motion of throwing a ball, incorporating not only figure drawing but also other methods such as body-related instruction challenges using verbal instructions in the next study.

6. ACKNOWLEDGMENT

REFERENCES

1) Noriyuki Kifune: "The Concurrent Validity of the Draw-A-Man Intelligence Test in the Cerebral Palsied Children-Relationship with the WISK-R and the Bender Gestalt Test-", *The Japanese Journal of Special Education*, 22(1), p. 4, 1984

2) Kifune, N., Nakajima, S.: "Concurrent Validity of the Draw-A-Man Development Test for Children with Mental Retardation", *The Japanese Journal of Special Education*, 26(3), p. 45, 1988

3) Kobayashi, Shigeo: "Handbook of Good Enough Draw-A-Man Intelligence Test", Sankyobo, p. 92, 1991

4) Myogan Mitsunori: "Prospects for Research on Drawing in Developmental Disabilities: Focusing mainly on Drawing A Man", Proceedings of Tokai Gakuin University, 4, pp. 215–221, 2010

5) Naoto Hamaya, Kumiko Kihara: "On the Extraordinary Development of Two Autistic Children's Drawing Devices", *Japanese Journal of Educational Psychology*, 38, p. 86, 1990

6) K. Machover (translated by Takashi Fukada): "Personality Projection in the Drawing of the Human Figure", Reimei Shobo, p. 87, 1988

7) Masatomo Tanabe, Hiroko Tamura: "Development of Ability to Imitate Others' Movements in Mentally Retarded Children : In Relation to the Body Image", Proceedings of the Institute of Education, Nara University of Education, 24, p. 15, 1988

8) Momo Tanaka, Hyeyoung Ki: "A Study on the characteristics of Body consciousness of Autism Spectrum Disorder (ASD): An analysis of DAM and Self-portraits", Proceedings of Clinical Psychology, Graduate School of Fukuoka Jo Gakuin University, 17, p. 9, 2020