

## Stress in Children by Playing at an Indoor Play Facility

– Determined through calculation of salivary amylase –

University of Tsukuba TOKUDA Katsumi

University of Tsukuba MIZUNO Tomomi

### I . Introduction

Tokuda and Mizuno (2017) reported the results of a survey of guardians using S'kids Garden for their children (3-8 years old), which is an indoor play facility run by Aeon Fantasy to identify the effects of indoor playing facilities on child development. The report says that 75% of the guardians experienced that their children were refreshed after playing at the facility and this showed that the facility has a cathartic effect. At the time of the radiation leakage from the Fukushima Daiichi nuclear disaster in 2011, it was reported that children who couldn't play outside developed serious psychological problems (Nishidate, Sawae and Tokuda, 2013; Tokuda and Mizuno, 2012). However, it was also reported that children who played at indoor playing facilities that have a range of equipment, such as trampolines, could reduce their psychological unstableness (Tokuda and Mizuno, 2016).

This study aimed to validate the cathartic effect of the indoor playing facility, which was identified from questionnaires in the survey by Tokuda and Mizuno (2017), using a physiologic index. Moreover, the study included analysis of what types of activities and how they reduced stress from children. Specifically, hypotheses were proposed as follows;

- (1) The value of salivary amylase is reduced after playing at an indoor playing facility.  
Which indicates stress is reduced.
- (2) The value of the salivary amylase was reduced the longer playing went on with equipment that required extensive body movements.
- (3) The value of salivary amylase was reduced the larger the number of equipment children played on over 45 minutes.
- (4) The value of salivary amylase increases the longer the queuing time required to use some equipment.
- (5) The value of salivary amylase is reduced the longer participation in an event which had a game element under instruction by an instructor.

### II . Method

#### (1) Subject

Twenty-five children from 3 to 8 years old (4 boys and 1 girl who are 3 years old, 2 boys and 1 girl who are 4 years old, 3 boys and 1 girl who are 5 years old, 2 boys and 2 girls who are 6 years old, 5 girls who are 7 years old, and 4 girls who are 8 years old) who entered the indoor playing facility in Aeon Laketown, S'kids Garden, were observed. They were selected

via personal connection method.

A 3 year-old boy and a 5 year-old boy out of 25 children refused to be measured for salivary amylase. Therefore those 2 children's data was removed from the analysis.

## (2) Procedure

Using a NIPRO dry clinical chemistry analyzer to measure the children's salivary amylase at the entrance of the facility. After they played for 45 minutes, salivary amylase was re-measured. In case of error, a re-measurement was performed again. Each checker was assigned a child to observe to record the equipment the child played on and for how long. The recording time was 45 minutes between entrance and exit of the facility. The observations were performed on 13th November (Sun.) and 4th February (Sat.).

## III. Results and Discussion

Table 1 is for children who could reduce their salivary amylase after playing, Table 2 is for children who couldn't reduce or who increased their salivary amylase. Both tables include the results, such as the value of salivary amylase by age, gender, before and after playing, ratio of time that children played on equipment requiring large, middle or little kinetic momentum against their entire playing time (traveling time and time children did nothing were removed from the total time), types and the number of play equipment and special notes.

For the details of the play equipment at the indoor playing facility used in this study, refer to the paper by Ohkoshi, Mizuno, Nishidate, Nishimura and Tokuda (2017). However, the event wasn't explained in that paper, therefore I would like to explain it here. In the event, some group activities, such as games for teams or individuals using balls, hula hoops and flags, were conducted by staff of the facility, called play leaders. The play leaders handled about 10 children and the games would excite the children.

The play equipment classified as equipment requiring large kinetic momentum in Tables 1 and 2 were slides, floating balloons, ball pools, basketball hoops, regarding middle kinetic momentum, merry-go-around, vertical hamster wheel, automatic seesaw, merry-go-round cube, circuit course, and musical buttons. Regarding small kinetic momentum there were, pin screens, supermarket, takoyaki shop, okonomiyaki shop, tablet, hospital, beauty salon, flower shop, post office, wooden balls, kitchen, anpanman toy, magnet blocks, toy cars, intellectual toys, blocks, chair toy.

The conclusions deduced from the hypotheses are as follows;

Hypothesis (1) The value of salivary amylase is reduced after playing at an indoor playing facility. 17 of 23 children whose data was successfully obtained could reduce their salivary amylase after playing. This means that 74% of the children could reduce their stress by playing at the facility. The value of salivary amylase of 1 child didn't change after playing and only 5 children saw an increase. We concluded that the hypothesis (1) is evidently true.

Table 1. Children who could reduce the value of salivary amylase.

Child	Age	Sex	Amylase value before playing	Amylase value after playing	Kinetic Moment um Large %	Kinetic Moment um Medium %	Kinetic Moment um Small %	Number of play equipment	Special Note
A	3	M	35	18	21	20	59	18	
B	3	M	45	34	17	32	52	15	
C	4	M	50	41	16	16	69	11	
D	4	M	42	36	41	29	30	10	
E	5	M	37	23	46	30	25	11	
F	5	M	20	15	52	15	33	10	
G	5	F	33	17	26	15	59	12	
H	6	M	55	40	75	10	15	12	
I	6	F	53	12	6	25	69	15	
J	7	F	27	20	26	35	39	10	
K	7	F	43	38	37	28	35	12	Event 1342 sec.
L	7	F	16	13	30	10	60	17	
M	7	F	55	21	66	10	24	13	Event 1098 sec.
N	8	F	65	58	67	16	17	12	Event 1084 sec.
O	8	F	34	20	77	4	19	7	Event 1141 sec.
P	8	F	26	17	25	9	66	14	
Q	8	F	26	18	40	6	54	10	
Average					39	18	43	12.3	

As for children under 6, age doesn't seem to influence increase or decrease of the value. However, most children of 7 and 8 years old could reduce their value after playing. Probably, children over 7 can use play equipment provided at the facility well enough to enjoy themselves.

Child W is a 7 year-old girl who increased in value of salivary amylase after playing. Child W couldn't use the equipment and requested if she could go out after 30 minutes. This might be a reason for increase of the value.

Table 2. Children who couldn't reduce the value of salivary amylase.

Child	Age	Sex	Amylase value before playing	Amylase value after playing	Kinetic Momentum Large %	Kinetic Momentum Medium %	Kinetic Momentum Small %	Number of play equipment	Special Note
R	3	M	13	13	74	26	0	3	
S	3	F	38	46	35	6	59	11	
T	4	F	32	35	9	19	72	10	Waiting time for the tablet was 1070 seconds.
U	6	M	58	63	69	21	10	7	
V	6	F	12	21	15	26	60	12	Left the facility before the time.
W	7	F	17	19	23	28	49	8	Couldn't use the equipment.
Average					38	20	42	8.5	

Hypothesis (2) The value of salivary amylase is reduced, the longer the time playing with equipment requiring big body movements. Table 1 shows the results of 17 children who could reduce the value of salivary amylase. The average ratios of time they played with play equipment requiring large kinetic momentum was 39%, middle kinetic momentum, 18% and little kinetic momentum, 43% ( the bottom row of Table 1). Table 2 shows the results of 6 children who couldn't reduce the value of salivary amylase. The average ratios of time they played with play equipment requiring large kinetic momentum was 38%, middle kinetic momentum, 20% and little kinetic momentum, 42%. There were no differences between the ratios of children who could reduce the value and who couldn't. For the above reasons, Hypothesis (2) was denied.

Hypothesis (3) The value of salivary amylase is reduced the greater number of equipment children played on. The average number of play equipment types for 17 children who could reduce the value of salivary amylase was 12.3 (Table 1), but children who couldn't reduce the value was 8.5 (Table 2). For this reason, Hypothesis (3) was proved to be correct.

Hypothesis (4) The value of salivary amylase increases the longer the queuing time required to use some equipment. At that time, only the tablets required the children a long waiting time. 2 tablets were prepared at the facility. The children were required to stay close to a tablet and wait for their turn, at least for 5 minutes, because the tablets were very popular among the children. Child T waited for about 18 minutes and could play only for 5 minutes and then gave the turn to the next child. (The child followed the rule, which restricted children to play with a tablet for longer than 5 minutes.) Other children were playing with other equipment while they were waiting for the tablet, therefore they might not have felt stress from the long wait.

From the result, we couldn't clearly prove the hypothesis was correct, however, the longer the waiting time children had, the higher increase of salivary amylase value was suggested.

Hypothesis (5) The value of salivary amylase is reduced the longer participating in an event which has a high game element under instructions by an instructor. As the special note in Table 1 shows, 4 children who participated in the event spent at least 18 minutes with the play leader (instructor). The play leader conducted games for children to fully enjoy them. Actually, the children laughed the whole way through. Only 4 children, Child K, M, N and O, participated in the event this time. Therefore, we couldn't fully validate Hypothesis (5) at this time. However, when we observed the children enjoying games with large kinetic momentum under the play leaders, surely we can conclude that these activities reduce the value of salivary amylase.

#### **IV. Conclusion**

In this study, we could verify that children's stress can be reduced by their playing at an indoor playing facility through observing changes in salivary amylase values used as a physiologic index. However, not all children who used the equipment could reduce their stress levels. If children can't use the equipment, their stress can't be reduced. Such children may be able to develop their ability to play and learn how to use play equipment if staff at the facility can instruct them. Children who have enough ability to play at an indoor playing facility, can reduce their stress there but children who don't have such ability also can develop theirs with the support of an instructor.

#### **Additional note**

This research was conducted with the scholarship donation by Aeon Fantasy Co.

#### **References**

NISHIDATE A., NISHIMURA M., AJIMI A., MIZUNO T. & TOKUDA K. (2013) Effect of Evacuation due to the Great East Japan Earthquake on Young Children and Parents, *The Asian Journal of Child Care*, 4, 15-24.

- NISHIDATE A., SAWAE Y. & TOKUDA K. (2013) The Physical Play and the Sensory Play for Young Children with Special Needs: Specific Teaching Methods, Tokyo, Child HONSYA, (in Japanese).
- OHKOSHI K., MIZUNO T., NISHIDATE A., NISHIMURA M. & TOKUDA K. (2017) Toys Preferred by Children: Through the Observations at an Indoor Playing Facility. The 9<sup>th</sup> Asian Society of Child Care. 2017. 37-40.
- TOKUDA K. & MIZUNO T. (2012) Psychological Difficulties Demonstrated by Young Children who Experienced the Great East Japan Earthquake and its Aftershocks, *The Asian Journal of Child Care*, 3, 1-7.
- TOKUDA K. & MIZUNO T. (2016) Current Condition and Challenges in Classes and Indoor Play Area for Toddlers in Large Cities in China, *The 8<sup>th</sup> conference of The Asian Society of Child Care*, 41-44.
- TOKUDA K. & MIZUNO T. (2017) Effectiveness of an Indoor Play Area for Children, as a Place of Developmental Support and Its Issues: Based on the Results of Questionnaire Survey Subjecting the User, *The Asian Journal of Child Care*, 8, 9-16.
- TOKUDA K., MIZUNO T. & NISHIMURA M. (2014) Evaluation of Authorization System by People who Acquired the Qualification and their Activities after Acquiring the Qualification, *The 24<sup>th</sup> conference of The Japanese Society for Education of Young Children*, 304-305 (in Japanese).
- TOKUDA K., MIZUNO T., NISHIMURA M. & OHKOSHI K. (2013) Trial of In-house Qualification System in Companies that Aims for Child Care Support Service. *The 23<sup>rd</sup> conference of The Japanese Society for Education of Young Children*, 114-115 (in Japanese).

## **Stress in Children by Playing at an Indoor Play Facility**

– Determined through calculation of salivary amylase –

TOKUDA Katsumi and MIZUNO Tomomi

This study aimed to validate the cathartic effect of the indoor playing facility, which was identified from questionnaires in the survey by Tokuda & Mizuno (2017), using a physiologic index. Moreover, the study included analysis of what types of activities and how they reduced stress from children. We could verify that children's stress can be reduced by their playing at an indoor playing facility through observing changes in salivary amylase values used as a physiologic index. However, not all children who used the equipment could reduce their stress levels. If children can't use the equipment, their stress can't be reduced. Such children may be able to develop their ability to play and learn how to use play equipment if staff at the facility can instruct them.