

# **Changes in adaptation indicators among schoolchildren: A follow-up from the third grade of elementary school to the third year of junior high school**

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This study provides an overview of longitudinal changes in adaptation indicators measured by Kokoron-Thermo among 82 participants from 2014, spanning from the third grade of elementary school through the third year of junior high school. The cohort comprised 35 boys and 47 girls in the Japan Children's Study. Findings indicated that both Physical Robustness and Psychological Robustness declined significantly among boys and girls beginning in the fourth grade of elementary school. Group Living Skills increased starting in the first year of junior high school. Athletic Competence decreased among both genders from the first year of junior high school. In contrast to boys, girls demonstrated distinct patterns: they exhibited higher Competitive Achievement Motivation in the third and fourth grades of elementary school than in the first year of junior high school. Girls' Existential Sense and Self-Esteem remained elevated through the sixth grade of elementary school but reached their lowest levels during the second year of junior high school. Gender differences were identified in Satisfaction-Oriented Achievement Motivation, Athletic Competence, Emotion-Focused Coping, and Group Living Skills according to the survey period. Directions for future analysis

are summarized in light of these findings.

*Keywords: Adaptation indicators for schoolchildren, Kokoron-Thermo, resilience*

## Introduction

Kawai et al. (2020) define the adaptive state of school-aged children as “the aggregation of the functions that enable children to resolve challenges by utilizing their own resources when faced with difficult situations, or to maintain adaptive behavior and facilitate recovery” (p. 69). Based on this definition, they developed a checklist to assess children’s psychological state, using the Stress Self-regulation Inventory (SSI) (Sato, 2009), which measures the extent to which individuals possess the elements of self-regulation of stress. The survey was conducted targeting 5th and 6th-grade elementary school students and 1st-year junior high school students, and 34 items were compiled to assess the 12 dimensions: “*Social Support*,” “*Satisfaction-Oriented Achievement Motivation*,” “*Competitive Achievement Motivation*,” “*Athletic Competence*,” “*Physical Vulnerability*,” “*Psychological Vulnerability*,” “*Problem-Focused Coping*,” “*Emotion-Focused Coping*,” “*Existential Sense*,” “*Self-Esteem*,” “*Group Living Skills*,” and “*Logical Thinking Skills*.” This checklist was subsequently revised, with *Physical Vulnerability* replaced by *Physical*

*Robustness* and *Psychological Vulnerability* replaced by *Psychological Robustness*. The revised version is now used as the *Kokoron-Thermo* in elementary and junior high schools throughout Nishinomiya City.

The Japan Children's Study (JCS) has tracked psychological adjustment in children and adolescents by systematically collecting survey responses from both children and their parents beginning in the first grade of elementary school. Although the survey does not encompass all items included in *Kokoron-Thermo*, certain measures have been assessed longitudinally depending on the survey period. This paper offers an overview of longitudinal changes in adaptation indicators among school-aged children, based on an analysis of JCS survey data.

## Method

### Survey Respondents

A sample of 82 children (35 boys, 47 girls) was drawn from JCS survey participants with complete data across annual surveys from third grade in elementary school to third year of junior high school. Mean age in the third grade of elementary school was 9.5 years ( $SD = 0.24$ ) for both genders. All participants were from Mie Prefecture. They had participated in the JCS since 2005 or 2006, and

their data were used with ethical approval granted.

#### Survey Items

*Kokoron-Thermo* consisted of the following components: three items on *Social Support*; three on *Satisfaction-Oriented Achievement Motivation*; two on *Competitive Achievement Motivation*; three on *Athletic Competence*; two on *Physical Robustness*; two on *Psychological Robustness*; two on *Problem-Focused Coping*; two on *Emotion-Focused Coping*; two on *Self-Esteem*; two on *Existential Sense*; seven on *Group Living Skills*; and three on *Logical Thinking Skills*. Not all items were used in the JCS across all grades. For this analysis of JCS survey data, there was one item for *Social Support*, two for *Satisfaction-Oriented Achievement Motivation*, one for *Competitive Achievement Motivation*, two for *Athletic Competence*, two for *Physical Robustness*, three for *Psychological Robustness*, two for *Problem-Focused Coping*, two for *Emotion-Focused Coping*, two for *Existential Sense*, and two for *Self-Esteem*. Six *Group Living Skills* items were added starting in the fifth grade. *Logical Thinking Skills* was excluded from the analysis as there were no common items across all grades.

The JCS items used in the analysis are shown in Table 1. Some items were not strictly identical to *Kokoron-Thermo*, but these were still included in the analysis. For example, *Kokoron-Thermo* asks, “Can you honestly apologize when you make a mistake?” In the JCS, this

Table 1

*Dimensions and Questionnaire Items for Analysis*

Dimension	Item
Social Support	Do you have friends, teachers, or family members you can talk to when you have problems at school?
Satisfaction-Oriented Achievement Motivation	Can you persevere through unpleasant tasks like studying, assigned duties, and cleaning? Do you want to be admired by your classmates, and praised by your family and teachers?
Competitive Achievement Motivation	Do you think it's important to be praised for being amazing at school or in your class?
Athletic Competence	Do you like physical education class? Do you prefer playing outside during recess rather than in the classroom?
Physical Robustness	Do you sometimes feel unwell the day after a field trip, sports day, or school excursion? (R) Do you sometimes go to bed earlier than usual on days when you have classes until the sixth period? (R)
Psychological Robustness	Do you tend to forget unpleasant things right away? Do you easily get irritated when a friend scolds you? (R) Do you feel bad for a long time when a teacher scolds you? (R)
Problem-Focused Coping	Whenever you encounter things you can't do, can you think about what you need to do to be able to do them next time? When you have a fight with a friend, can you think about how you can make up?
Emotion-Focused Coping	When you have a fight with a friend, can you honestly tell your teacher what you did wrong? When you're feeling frustrated after an argument with a friend, does talking to someone help you feel better?
Existential Sense	Do you think you have some good qualities that other people don't have? Do you think you are well-liked by your classmates and considered one of them?
Self-Esteem	Do you think you're contributing to the class? Do you find it interesting when your friends have different ways of thinking than you do?
Group Living Skills	Can you wait your turn even when you have something to say while your teacher or friends are speaking? Can you try to think from the other person's perspective, like, "If I said this to X, how would Y feel?" When you're assigned to a duty or rotation, such as cleaning or serving lunch, can you take it seriously?

When you feel like hitting or kicking someone, or when you feel like being mean to them, can you stop for a moment and think about whether it's okay to do that?

When your teacher or parents correct you, can you think about whether there was a problem with your behavior?

When a friend makes a mistake, or when you make a mistake, can you think that it's okay because everyone makes mistakes?

Even when you realize you've done something wrong, is it hard for you to apologize honestly? (R)

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*Note:* (R) indicates a reversed item.

item was presented as, “Even when you realize you've done something wrong, is it hard for you to apologize honestly?” For each *Kokoron-Thermo* dimension, mean item ratings were calculated. Statistical analyses were performed using JASP (Version 0.95.4).

## Results

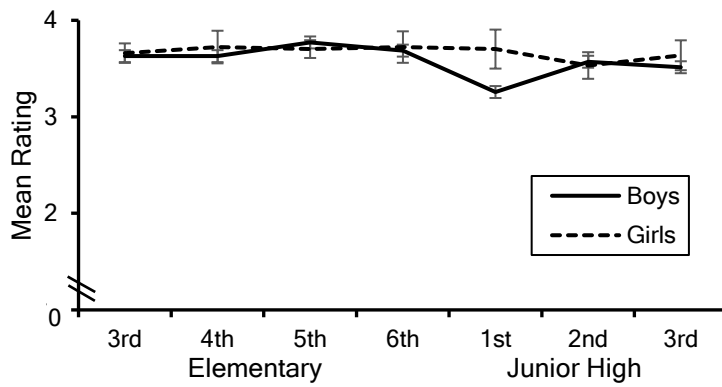
Figures 1-10 present the average ratings for each evaluation criterion from the third grade of elementary school to the third year of junior high school, while Figure 11 shows the average ratings for *Group Living Skills* from the fifth grade of elementary school onward.

We compared mean ratings across grade levels at the time of the survey, separately by gender, using the Friedman test. This approach was necessary given that the *Social Support* and *Competitive Achievement Motivation* dimensions in *Kokoron-Thermo* included only a single item assessed. Results for boys and girls are shown in Table 2

and Table 3, respectively.

Figure 1

*Longitudinal Changes in Ratings of Social Support*



*Note.* Error bars represent standard errors.

Figure 2

*Longitudinal Changes in Ratings of Satisfaction-Oriented Achievement Motivation*

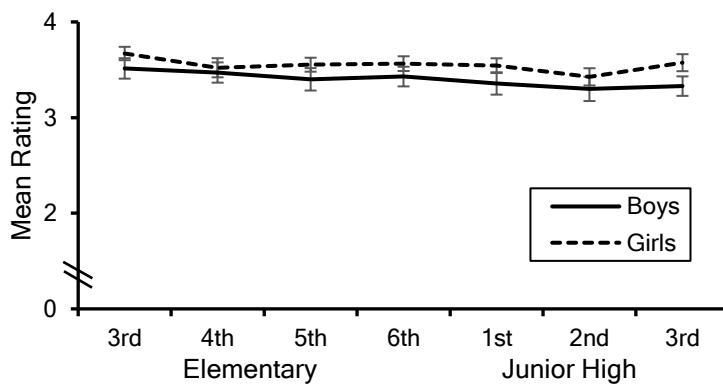


Figure 3

*Longitudinal Changes in Ratings of Competitive Achievement Motivation*

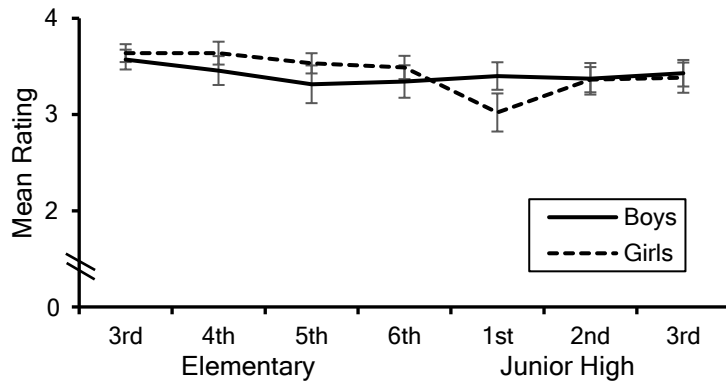


Figure 4

*Longitudinal Changes in Ratings of Athletic Competence*

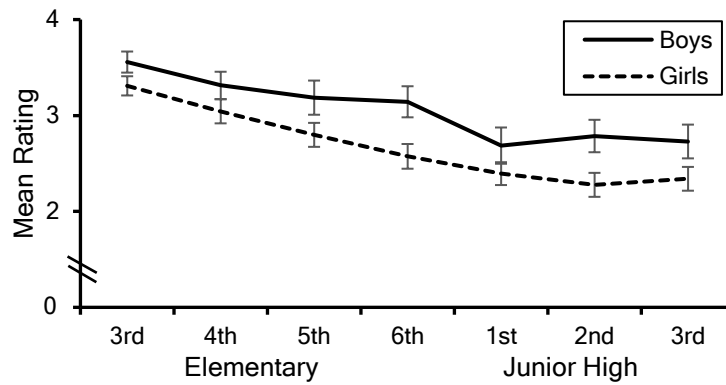


Figure 5

*Longitudinal Changes in Ratings of Physical Robustness*

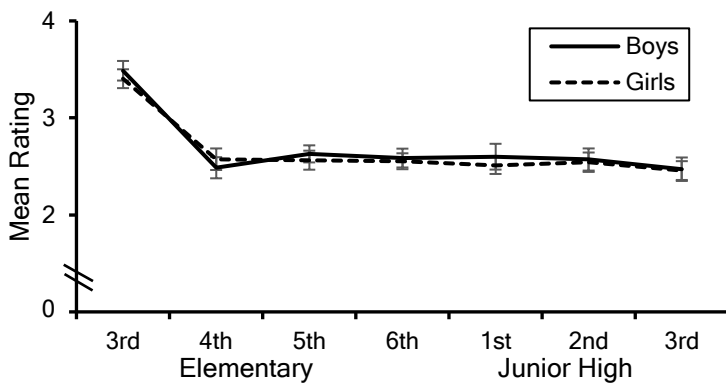


Figure 6

*Longitudinal Changes in Ratings of Psychological Robustness*

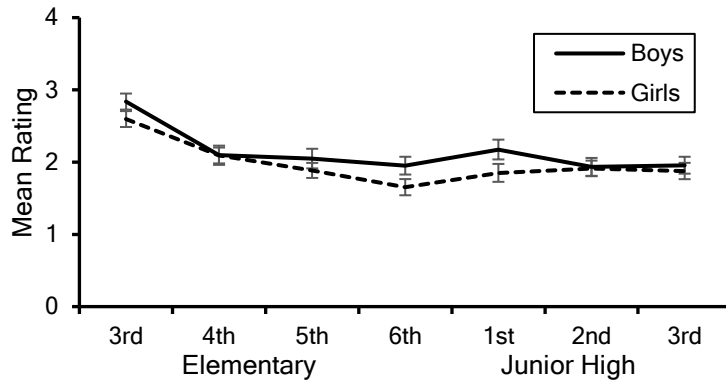


Figure 7

*Longitudinal Changes in Ratings of Problem-Focused Coping*

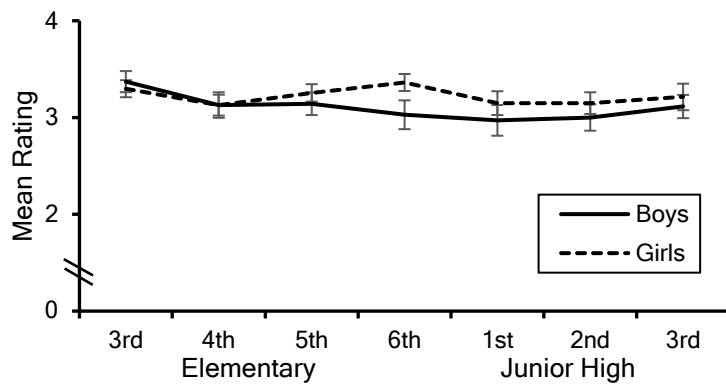


Figure 8

*Longitudinal Changes in Ratings of Emotion-Focused Coping*

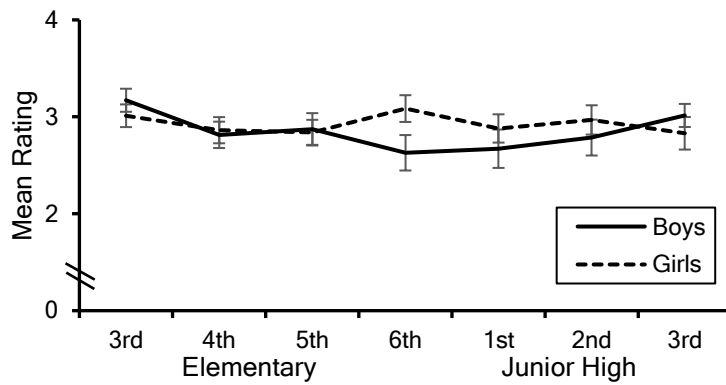


Figure 9

*Longitudinal Changes in Ratings of Existential Sense*

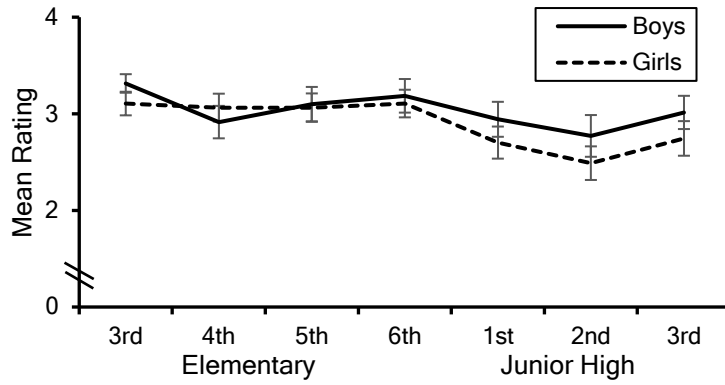


Figure 10

*Longitudinal Changes in Ratings of Self-Esteem*

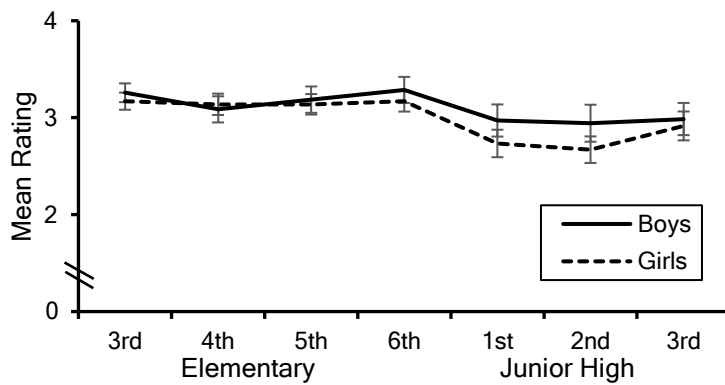
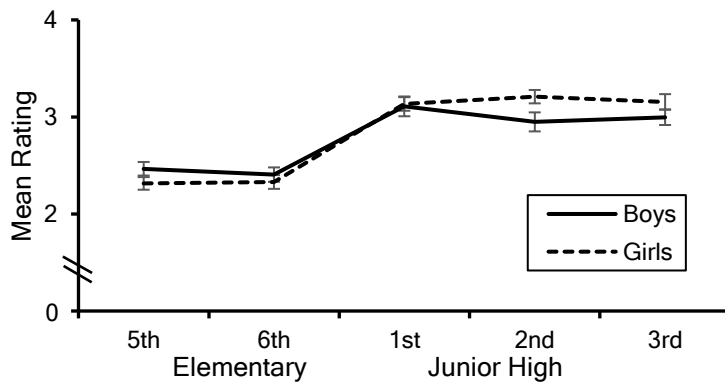


Figure 11

*Longitudinal Changes in Ratings of Group Living Skills*



Results from multiple comparisons of mean ratings revealed that both *Physical Robustness* and *Psychological Robustness* declined sharply in boys and girls from the fourth grade of elementary school. In contrast, *Group Living Skills* increased in both genders from the first year of junior high school. *Athletic Competence* in both groups declined from the first year of junior high school onward. Gender differences were observed in *Competitive Achievement Motivation*, *Existential Sense*, and *Self-Esteem*: for boys, no significant changes were found from the third grade in elementary school to the third year of junior high school; for girls, *Competitive Achievement Motivation* was higher in the third and fourth grades of elementary school than in the first year of junior high school, and their *Existential Sense* and *Self-Esteem* remained high through the sixth grade of elementary school but reached their lowest points in the second year of junior high school.

Gender differences at each grade level were examined using the Mann-Whitney  $U$  test. Apart from the first year of junior high school, boys generally demonstrated higher *Athletic Competence* than girls (3rd-grade:  $U = 1010.5$ ,  $p = .064$ ,  $r = .23$ ; 4th-grade:  $U = 997.5$ ,  $p = .092$ ,  $r = .21$ ; 5th-grade:  $U = 1054.5$ ,  $p = .026$ ,  $r = .28$ ; 6th-grade:  $U = 1124.5$ ,  $p = .004$ ,  $r = .37$ ; 1st-year:  $U = 986.5$ ,  $p = .121$ ,  $r = .20$ ; 2nd-year:  $U = 1071.5$ ,  $p = .018$ ,  $r = .30$ ; 3rd-year:  $U = 1012$ ,  $p = .072$ ,  $r = .23$ ). Additionally, girls demonstrated higher mean ratings than

**Table 2**  
Comparative Results of Item Ratings in Boys

Dimensions	Elementary				Junior High			$\chi^2$ (df)	<i>p</i>	<i>W</i>	Post-hoc analysis	
	3rd	4th	5th	6th	1st	2nd	3rd					
Social Support	<i>Mdn</i>	4.0	4.0	4.0	4.0	4.0	4.0	4.0	8.99	.174	.043	
	<i>Q1</i>	3.0	4.0	4.0	4.0	3.0	3.0	3.0	(6)			
	<i>Q3</i>	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Satisfaction-Oriented Achievement Motivation	<i>Mdn</i>	4.0	3.5	3.5	3.5	3.5	3.5	3.5	6.90	.330	.033	
	<i>Q1</i>	3.0	3.0	3.0	3.0	3.0	3.0	3.0	(6)			
	<i>Q3</i>	4.0	4.0	4.0	4.0	4.0	4.0	3.8				
Competitive Achievement Motivation	<i>Mdn</i>	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.78	.939	.008	
	<i>Q1</i>	3.0	3.0	3.0	3.0	3.0	3.0	3.0	(6)			
	<i>Q3</i>	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Athletic Competence	<i>Mdn</i>	4.0	4.0	3.5	3.5	3.0	3.0	3.0	49.21	< .001	.234	E3, E4 > J1, J2, J3
	<i>Q1</i>	3.5	3.0	2.5	2.5	2.0	2.0	2.0	(6)			E5, E6 > J1, J3
	<i>Q3</i>	4.0	4.0	4.0	4.0	3.5	3.8	3.8				
Physical Robustness	<i>Mdn</i>	3.5	2.5	3.0	3.0	3.0	3.0	2.5	64.35	< .001	.306	E3 >
	<i>Q1</i>	3.0	2.0	2.5	2.5	2.5	2.3	2.0	(6)			E4, E5, E6, J1, J2, J3
	<i>Q3</i>	4.0	3.0	3.0	3.0	3.0	3.0	3.0				
Psychological Robustness	<i>Mdn</i>	3.0	2.0	2.0	2.0	2.3	2.0	2.0	42.28	< .001	.201	E3 >
	<i>Q1</i>	2.5	1.7	1.3	1.5	1.5	1.7	1.5	(6)			E4, E5, E6, J1, J2, J3
	<i>Q3</i>	3.3	2.7	2.7	2.3	2.9	2.3	2.3				
Problem-Focused Coping	<i>Mdn</i>	3.5	3.5	3.0	3.0	3.5	3.0	3.0	7.68	.263	.037	
	<i>Q1</i>	3.0	2.5	3.0	2.5	2.5	3.0	3.0	(6)			
	<i>Q3</i>	4.0	4.0	3.5	3.5	3.5	3.5	3.5				
Emotion-Focused Coping	<i>Mdn</i>	3.5	3.0	3.0	2.5	3.0	3.0	3.0	6.14	.408	.029	
	<i>Q1</i>	2.5	2.3	2.5	2.0	2.0	2.5	2.5	(6)			
	<i>Q3</i>	3.5	3.5	3.5	3.5	3.5	3.5	3.5				
Existential Sense	<i>Mdn</i>	3.5	3.0	3.5	3.5	3.5	3.0	3.0	7.70	.261	.037	
	<i>Q1</i>	3.0	2.0	2.8	2.8	2.0	2.3	3.0	(6)			
	<i>Q3</i>	4.0	3.5	4.0	4.0	4.0	3.8	4.0				
Self-Esteem	<i>Mdn</i>	3.5	3.0	3.5	3.5	3.0	3.0	3.0	4.61	.595	.022	
	<i>Q1</i>	3.0	2.8	3.0	3.0	2.5	2.5	2.8	(6)			
	<i>Q3</i>	3.5	3.5	4.0	4.0	4.0	4.0	3.5				
Group Living Skills	<i>Mdn</i>			2.5	2.3	3.2	3.0	3.0	36.92	< .001	.264	
	<i>Q1</i>			2.2	2.2	2.9	2.6	2.8	(4)			E5, E6 < J1, J2, J3
	<i>Q3</i>			2.8	2.7	3.5	3.3	3.2				

Note. *N* = 35. *Q1* = 25th percentile, *Q3* = 75th percentile. Post-hoc analysis indicates that the Durbin-Conover test with Bonferroni correction was significant between the groups at the 5% level. E = elementary school grade. J = junior high school year.

**Table 3**  
Comparative Results of Item Ratings in Girls

Dimensions		Elementary				Junior high			$\chi^2$ ( <i>df</i> )	<i>p</i>	<i>W</i>	Post-hoc analysis
		3rd	4th	5th	6th	1st	2nd	3rd				
Social Support	<i>Mdn</i>	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.29 (6)	.637	.015	
	<i>Q1</i>	3.0	3.0	3.0	4.0	3.0	3.0	3.0				
	<i>Q3</i>	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Satisfaction-Oriented Achievement Motivation	<i>Mdn</i>	4.0	3.5	3.5	3.5	3.5	3.5	4.0	9.07 (6)	.170	.032	
	<i>Q1</i>	3.5	3.5	3.0	3.3	3.0	3.0	3.0				
	<i>Q3</i>	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Competitive Achievement Motivation	<i>Mdn</i>	4.0	4.0	4.0	4.0	4.0	4.0	4.0	22.85 (6)	< .001	.081	
	<i>Q1</i>	3.0	4.0	3.0	3.0	3.0	3.0	3.0				
	<i>Q3</i>	4.0	4.0	4.0	4.0	4.0	4.0	4.0				E3, E4 > J1
Athletic Competence	<i>Mdn</i>	3.5	3.5	2.5	2.5	2.5	2.0	2.5	74.46 (6)	< .001	.264	E3, E4 > E6, J1, J2, J3
	<i>Q1</i>	3.0	2.5	2.3	2.0	1.8	1.5	1.5				E5 > J1, J3
	<i>Q3</i>	4.0	3.5	3.5	3.0	3.0	3.0	3.0				
Physical Robustness	<i>Mdn</i>	3.5	3.0	3.0	2.5	3.0	3.0	2.5	70.99 (6)	< .001	.252	E3 >
	<i>Q1</i>	3.0	2.0	2.5	2.5	2.0	2.0	2.0				E4, E5, E6, J1, J2, J3
	<i>Q3</i>	4.0	3.0	3.0	3.0	3.0	3.0	3.0				
Psychological Robustness	<i>Mdn</i>	2.7	2.3	2.0	1.7	2.0	2.0	2.0	51.95 (6)	< .001	.184	E3 >
	<i>Q1</i>	2.0	1.7	1.3	1.0	1.2	1.3	1.3				E4, E5, E6, J1, J2, J3
	<i>Q3</i>	3.3	2.7	2.3	2.0	2.3	2.7	2.3				E4 > E6
Problem-Focused Coping	<i>Mdn</i>	3.5	3.0	3.0	3.5	3.5	3.0	3.5	4.14 (6)	.658	.015	
	<i>Q1</i>	3.0	2.5	3.0	3.0	3.0	3.0	3.0				
	<i>Q3</i>	4.0	4.0	4.0	4.0	4.0	3.5	4.0				
Emotion-Focused Coping	<i>Mdn</i>	3.0	3.0	3.0	3.5	3.0	3.0	3.0	6.39 (6)	.381	.023	
	<i>Q1</i>	2.5	2.5	2.5	2.5	2.1	2.5	2.5				
	<i>Q3</i>	3.5	3.5	3.5	4.0	3.9	4.0	3.5				
Existential Sense	<i>Mdn</i>	3.0	3.5	3.0	3.5	3.0	2.5	3.0	24.96 (6)	< .001	.089	
	<i>Q1</i>	3.0	2.5	2.5	2.5	2.0	2.0	2.3				E4, E5, E6 > J2
	<i>Q3</i>	3.8	4.0	4.0	4.0	3.8	3.5	3.5				
Self-Esteem	<i>Mdn</i>	3.0	3.5	3.0	3.5	3.0	2.5	3.0	25.90 (6)	< .001	.092	
	<i>Q1</i>	3.0	2.5	3.0	2.8	2.5	2.0	2.5				E3, E4, E5, E6 > J2
	<i>Q3</i>	3.5	3.5	3.5	3.8	3.5	3.5	3.5				
Group Living Skills	<i>Mdn</i>			2.2	2.3	3.2	3.2	3.3	88.80 (4)	< .001	.472	
	<i>Q1</i>			2.2	2.0	2.8	2.8	2.9				E5, E6 < J1, J2, J3
	<i>Q3</i>			2.7	2.7	3.5	3.7	3.5				

Note. *N* = 47. *Q1* = 25th percentile, *Q3* = 75th percentile. Post-hoc analysis indicates that the Durbin-Conover test with Bonferroni correction was significant between the groups at the 5% level. E = elementary school grade. J = junior high school year.

boys for *Satisfaction-Oriented Achievement Motivation* in the third year of junior high school ( $U = 591, p = .022, r = .28$ ), *Emotion-Focused Coping* in the sixth grade of elementary school ( $U = 593.5, p = .029, r = .28$ ), and *Group Living Skills* in the second year of junior high school ( $U = 607, p = .043, r = .26$ ).

### Summary and Future Directions

This paper demonstrated that *Physical Robustness* and *Athletic Competence* change around the fourth grade in elementary school. It is hypothesized that these changes reflect developmental challenges associated with the so-called “Fourth-Grade Wall” and shifts in the educational curriculum during grade-level transitions. Furthermore, the gender differences observed in the developmental trajectory from the third grade of elementary school to the third year of junior high school—along with those evident in the sixth grade of elementary school and from the second year of junior high school onwards—may be influenced by gender differences related to developmental spurts (including secondary sexual characteristics) and emotional and behavioral development in peer relationships (e.g., Rose & Rudolph, 2006). Conversely, no such changes or gender differences were clearly observed for *Social Support*, *Competitive Achievement Motivation*, and *Problem-Focused Coping*. Particularly for *Social*

*Support* and *Competitive Achievement Motivation*, the nature of the item questions suggests that item ratings are prone to a ceiling effect, in addition to the fact that only one item was analyzed for each dimension.

*Kokoron-Thermo* serves as a tool for measuring balance across 12 distinct dimensions, as a standard developed to evaluate how well an individual possesses the various elements required for self-regulating stress. In this sense, it is not primarily intended for comparing the psychological states of school-aged children among individuals. However, examining the changes in each perspective among individuals as they develop, along with underlying factors such as gender, is essential for understanding the developmental changes in children's and adolescents' resilience.

The process or phenomenon that reflects relatively positive adaptation despite significant risk or adversity is called resilience (Luther et al., 2015). According to the definition, assessing resilience should include both aspects: the challenges or threats faced by the individual and the quality of adaptation or developmental outcome (Resnick & Taliaferro, 2011). However, resilience does not function solely in the face of extremely difficult and threatening circumstances, such as maltreatment by caregivers, family poverty, natural disasters, or war, but also responds to daily hassles and the stress elicited from events that may seem trivial. In particular, for school-aged children,

events experienced at school and home often serve as stressors. Therefore, assessment often focuses on the resulting stress response rather than the difficulties or threats themselves that hinder resilience. Moving forward, changes in resilience would be better understood by clarifying how other factors, including stress within the JCS framework, relate to indicators of adaptation as outcomes.

Research on resilience in children and adolescents in Japan, from elementary school to high school, has primarily focused on developing resilience scales for specific developmental stages, and exploring the links between intrapersonal factors (e.g., self-esteem, mental health) and environmental factors (e.g., social support, family environment). Most of these studies are cross-sectional (Kobayashi, 2021). Because longitudinal studies that measure resilience over time are lacking, it has been suggested that monitoring developmental trajectories from elementary school to high school with consistent standards is necessary, along with studies involving children in third grade or younger (Kobayashi, 2021; Kobayashi et al., 2024). However, if resilience is assessed based on the challenges a child has experienced and the developmental outcome, the factors that constitute resilience may vary considerably across developmental stages. Regarding the SSI, which serves as the basis for *Kokoron-Thermo*, Kawai et al. (2020) note that the underlying structural factors may differ between upper elementary and junior high school students.

Elucidating individual fluctuations and their underlying factors through longitudinal studies using identical adaptation indicators must occur alongside efforts to understand the factors that constitute and function as resilience at each developmental stage.

## References

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