

# The Relationship between Life Stressors and Subjective Fatigue Symptoms in High School Students Before and after Examination

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**This study was designed as a longitudinal survey of life stressors and subjective fatigue symptoms in students before and after examinations and examined the correlation between the stressors and fatigue symptoms while taking any causal relationships into consideration. Three hundred and eighty-four students of both sexes ranging in age from 15 to 18 years were selected as subjects by capable extraction. The subjective symptoms of fatigue scale for youth (SFS-Y) was used to evaluate the severity of subjective fatigue symptoms. To evaluate stressors in daily life, the ADES-20 (Adolescent Daily Events Scale-20) was used. Subjective fatigue symptoms and stressor values obtained before and after an examination were compared using a paired Student's *t*-test. We tested the moderating effect of subjective fatigue symptoms and stressors by a multiple-indicator model in structural equation modeling, and analyzed its causal structure. Three subjective fatigue symptoms decreased in severity after the examination: "difficulty in concentrating on thinking", "weariness", and "reduced vitality". In contrast the "feeling of physical disorder", increased in severity afterwards. It was confirmed that achievement examinations were stress events which influenced subjective fatigue symptoms. It was also confirmed that life stressors changed after the examination, and that these modified the environment rather than personal cognitive appraisal. With regard to the causal relationship between life stressors and subjective fatigue symptoms before and after the examination, subjective fatigue symptoms before the examination most profoundly influenced those after it. The subjective fatigue symptoms caused by unusual life stressors before the examination probably persisted and influenced the subjective fatigue symptoms after the examination.**

**Keywords:** Longitudinal study, SFS-Y, ADS-20, Structural Multilevel Models

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## 1. Introduction

The number of adolescents who complain of fatigue has been increasing recently. It is consequently considered to be important to cope with the factors such as decreases in physical strength and disturbed daily life which seem to be the cause of such fatigue (Kobayashi, et al., 1999a; Kobayashi, et al., 1999b; Kobayashi and Demura, 2002). Fatigue in adolescents has also attracted considerable attention as a possible cause of long-lasting truancy (Miike, 2003). Fatigue is a kind of stress response, and stresses around students are important factors

to be taken into consideration when the causes of psychosomatic diseases in adolescents are explored (Okayasu, et al., 1992).

Takakura, et al., (1998) devised a stressor scale for junior high school students to evaluate the magnitude of stresses they experience in school life. Using such a scale the researchers found that stresses concerning close relationships with friends led to occurrences of depression and anxiety, whereas those concerning school work led to asthenic recognition and thinking. Nakamura, et al., (1997) examined stressors in teenagers including students from the fifth grade of primary school to the third grade of senior high

**Table 1** Sample size

	Age				Total
	15	16	17	18	
Female	23	21	24	17	85
Male	92	90	93	24	299
Total	115	111	117	41	384

school. They showed that stressors in these students consisted of three factors: trivial disorders in daily life, distress about themselves, and events in daily life that put a great strain on them.

Okayasu, et al., (1992) reported that stressors derived from school life could account for 20 to 30% of the variance of all stress responses in adolescents, and that the remaining 70-80% of the variance resulted from other factors. Humphrey (1998) classified the stressors in adolescents into two groups, one deriving from problems in school life and the other deriving from problems in their homes, such as abuse and neglect by their parents, and parental divorce. In the life event scale for junior high school students by Coddington (1972), items concerning domestic human relationships and the home environment accounted for about 50%.

The research referred to above indicates that the stressors influencing adolescents are quite variable, and so stressors should be examined individually while also considering their respective meaning for adolescents. Subjective symptoms of fatigue occur as a result of the mutual interactions of various factors. Although the relationships between daily life factors and subjective fatigue symptoms were examined in several previous studies, there are few studies on how life stressors and intervening cognitive appraisal influence subjective fatigue symptoms. Subjective fatigue symptoms should be evaluated on the basis of a general model of the stress process. In this the reception of stimuli from the environment is followed in succession, firstly, by the appraisal of the stimuli and adaptation ability, then by the recognition of receiving the stress, and finally by emotional, physiological and behavioral responses.

In this sense, clues to understanding the causes of long-lasting truancy might be obtained from a full examination of the subjective fatigue symptoms with which life stressors are closely correlated. The purpose of this study, therefore, was to examine stressors in adolescents before and after an achievement examination in school, and to examine the causal relationship between life stressors and

subjective fatigue symptoms.

## 2. Methods

### 2.1. Subjects

Three-hundred and eighty-four students in a national college of technology in Fukui Prefecture of both sexes ranging in age from 15 to 18 years were selected by capable extraction. We collected questionnaires filled in by the, examined whether there were any unfilled items or were unclear concerning sex and age (school year), and found all of the 384 were effective (**Table 1**).

### 2.2. Survey

The students have four examinations a year: midterm and term examinations in the first and second terms, respectively. Our survey was done twice, once within the week immediately preceding the midterm examination in the second term and once within the week immediately following the same examination (in the first week of December). The survey was made before the school lesson, in order to negate the possibility that physical and mental fatigue due to a lesson would influence the results.

Immediately before the survey, the teacher responsible for the lesson orally outlined the survey, its purpose, and other points as follows. The teacher explained that the survey would be made to determine various subjective symptoms perceived by the students in their daily lives in order to improve their health. The students were told not to write their names in the questionnaire, that what they wrote in the questionnaire would not influence their school records, that the collected data would be treated statistically, and that there was no possibility that their privacy would be invaded. The teacher did not tell the students that they could refuse to participate in this study.

The questionnaire was comprised of questions about the basic attributes of individuals and their habits in daily life, and those related to subjective fatigue symptoms and those related to stressors in daily life.

The subjective symptom of fatigue scale for youth (SFS-Y) (Kobayashi and Demura, 2002) was used to evaluate the severity of subjective fatigue symptoms. The SFS-Y consists of six sub-scales: "difficulty

**Table 2** Means, significant differences for subjective symptoms of fatigue and life stressor between exams and correlation coefficients

		before exam		after exam		differences		t value	p value	r
		Mean	SD	Mean	SD	Mean	SD			
Subjective symptoms of fatigue	Difficulty in concentrating on thinking	12.2	3.95	11.4	4.11	0.8	3.26	4.720	0.000	0.673 **
	Weariness	10.4	4.28	9.9	4.15	0.5	3.74	2.404	0.017	0.606 **
	Reduced motivation	9.9	4.06	9.7	3.93	0.3	3.19	1.543	0.124	0.681 **
	Reduced activity	11.4	4.16	10.8	4.22	0.6	3.30	3.601	0.000	0.689 **
	Drowsiness	14.0	3.62	13.8	3.97	0.3	3.27	1.585	0.114	0.633 **
	Feelings of physical disorder	9.9	4.00	10.4	4.01	-0.5	3.25	-2.715	0.007	0.670 **
Life stressor	Relationship with teachers	2.7	4.54	2.0	3.86	0.7	4.18	3.322	0.001	0.514 **
	Extracurricular activities	1.3	4.05	0.9	2.81	0.4	3.22	2.144	0.033	0.614 **
	Class work	6.8	6.97	7.8	7.69	-1.0	6.83	-2.622	0.009	0.570 **
	Relationship with family members	3.9	5.57	4.3	6.00	-0.4	4.48	-1.873	0.062	0.702 **
	Relationship with friends	1.3	2.79	1.3	3.60	0.0	3.40	0.000	1.000	0.457 **

\*\*  $p < 0.01$

in concentrating on thinking" (F1), "languor" (F2), "reduced vitality" (F3), "reduced motivation" (F4), "drowsiness" (F5), and "feeling of physical disorder" (F6). The students were requested to indicate on a five-point scale for 24 individual questions to what extent each particular statement applied to him or her at the time of the survey.

To evaluate stressors in daily life, the ADES-20 (Adolescent Daily Events Scale-20) (Takakura, et al., 1998) was used. The scale has five sub-scales (extracurricular activities, class work, relationship with teachers, relationship with family members, and relationship with friends) and 20 questions. The students were requested to indicate on a four-point scale for individual items how frequently they had experienced any stressors during the previous week before the survey. Scores of 0, 1, 2, and 3 were assigned respectively to "not experienced", "experienced very rarely", "experienced sometimes", and "experienced frequently". This score is hereafter referred to as the "frequency score". Except for cases where the students experienced no stresses, they were then requested to indicate on a four-point scale how much they disliked the stress experience. Scores of 0, 1, 2, and 3 were assigned to "not unpleasant", "slightly unpleasant", "considerably unpleasant", and "very unpleasant". This score is hereafter referred to as the "dislike score". We calculated the "life stressor score" by multiplying the value of the frequency score by the value of the dislike score. To calculate an overall score on the SFS-Y and that on the ADES-20 for each student, his or her scores for individual items were summed.

### 2.3. Analyses

Scores for individual items on the SFS-Y and

ADES-20 were calculated, and a paired 't-test' was performed between the scores before and after the examination. In order to examine the effect of life stressors on subjective fatigue symptoms, we constructed a multiple-indicator model including causal relationships between potential variables, and analyzed its latent structure model by Structural Multilevel Models.

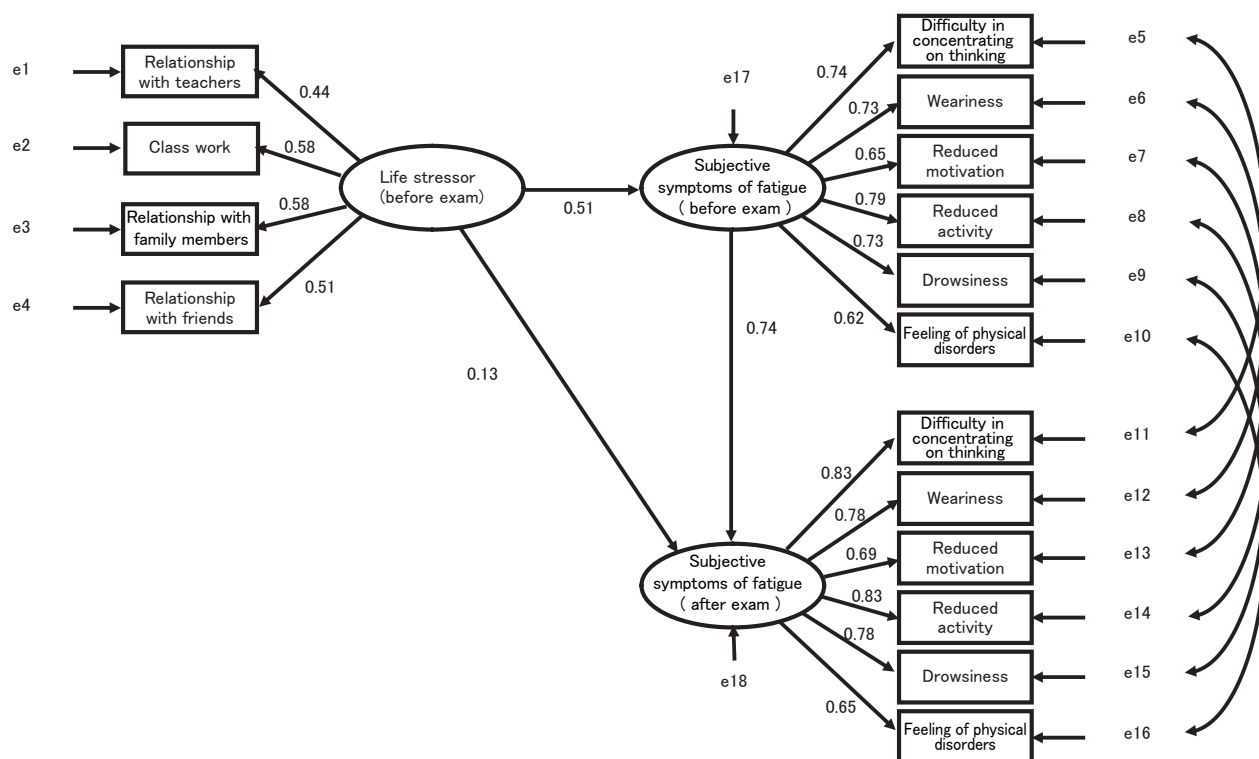
### 3. Results

**Table 2** shows the means, standard deviations, results of the paired t-test, and the correlation coefficients for the individual sub-scales in the SFS-Y and ADES-20 before and after the examination.

Differences between the average scores before and after the examination were found to be significant for four of the six sub-scales of the SFS-Y. These were: "difficulty in concentrating on thinking", "languor", "reduced vitality", and "feelings of physical disorder". The mean score for "feelings of physical disorder" was higher after the examination than before, whereas those for the remaining three sub-scales were higher before the examination than after it.

Differences between the average scores before and after the examination were found to be significant for three of the five sub-scales of the ADES-20: "extracurricular activities", "class work" and "relationship with teachers". The mean score for "class work" was higher after the examination than before, whereas those for "extracurricular activities" and "relationship with teachers" were higher before the examination than after it.

**Figure 1** shows a structural model representing the relationship between life stressors and subjective fatigue symptoms, in which the correlation between



**Figure 1** Structure with life stressor and subjective symptoms of fatigue

individual factors before and after the examination was examined. The values of the indices of this model were as follows:  $\chi^2 = 226.115$  ( $p < 0.001$ ), GFI = 0.928, and AGFI = 0.897. All actual variables composed of the three latent variables (stressors before the examination, and subjective fatigue symptoms before and after the examination) were found to be significant.

A regression analysis indicates that the magnitude of the effect of pre-examination stressors on pre-examination subjective fatigue symptoms (the standard partial correlation coefficient) was significant ( $0.5, p < 0.01$ ). In addition, the magnitude of the effect of pre-examination subjective fatigue symptoms on post-examination subjective fatigue symptoms was 0.74, which was also significant. The standard estimation value from pre-examination stressors to post-examination subjective fatigue symptoms was not significant ( $r_p = 0.13, p = 0.28$ ).

#### 4. Discussion

Life stressors in junior high and high school students have been studied mainly in terms of their relationship with stress responses (Coddington, 1972; Compas, et al., 1987). Subjective fatigue symptoms are a kind of stress response, and have been thought

to have a causal relationship with long-lasting truancy, and consequently to be important stressors.

In order to reduce the magnitude of stress intervention by teachers that have daily contact with students has been considered necessary. If teachers cannot detect signs of stress, however, they cannot intervene. If the relationship between subjective fatigue symptoms and stressors is clarified, we expect it might be possible to cope with the stressors that lead to the occurrence of subjective fatigue symptoms, and at times to prevent long-lasting truancy.

The strength of stressors concerning "extracurricular activities" and "relationship with teachers" decreased markedly after the examination. The latter result may be explained by the assumption that the students had an unpleasant feeling towards their teachers before the examination because it is the teachers who give information and instructions concerning examinations to the students.

The decrease in the strength of the stressor concerning "extracurricular activities" after the examination may be ascribed to the dissatisfaction of the students in the pre-examination period with the fact that they were restricted from exercising immediately before the examination. The students who dared to exercise immediately before the

examination certainly had dissatisfaction with their delay in their study. The strength of the stressor concerning "class work" decreased markedly after the examination. This result probably reflected the students' feelings of liberation after the examinations.

The following subjective fatigue symptoms, decreased significantly in severity after the examination: "difficulty in concentrating on thinking", "languor" and "reduced vitality". This probably resulted from a decrease in psychological tension and the normalization of the habits in daily life, which had been disturbed during the examination. On the other hand, "feelings of physical disorder" increased in severity after the examination. This probably reflected the physical and psychological fatigue remaining after the examination, such as stiffness of the shoulders and asthenopia.

Pre-examination stressors had a significant effect on the severity of subjective fatigue symptoms ( $r_p=0.50$ ) before the examination, and are consequently considered to have modified the environment so profoundly that they changed the severity of subjective fatigue symptoms. Pre-examination stressors were without effect on post-examination stressors.

Since stressors before the examination had a significant effect on pre-examination subjective fatigue symptoms, we expected that pre-examination stressors would have a significant effect on post-examination subjective fatigue symptoms. However, the standard estimation value from pre-examination stressors to post-examination subjective fatigue symptoms was insignificant ( $r_p = 0.13$ ,  $p = 0.28$ ). Life stressors were therefore considered to have no significant effect on post-examination subjective fatigue symptoms. On the other hand, the standard estimation value indicating how great was the influence of subjective fatigue symptoms before the examination on those after the examination was 0.74, which was moderately significant. Fatigue that is so severe that it influenced subjective fatigue symptoms before the examination was probably persistent and influenced those after the examination.

Takakura, et al., (1998) reported that high school students could be divided into six groups on the basis of the patterns according to which their life stressors were expressed, and that, of the six groups, the group that expressed stress concerning relationships with

friends had the most severe symptoms of depression. It was further pointed out in this research that in order to alleviate the symptoms of depression in high school students, it was most effective to comprehend the expression pattern of life stressors, and to provide intervention for the most vulnerable group, namely the one with stress concerning relationships with friends. The results of the present study show that stress concerning relationships with friends before the examination was almost identical in magnitude with that after the examination, and that the stressor had only a minor effect on subjective fatigue symptoms after the examination. It may be concluded, therefore, that the stressor concerning relationships with friends has no marked effect on subjective fatigue symptoms in an achievement examination, a stress event. This suggests that subjective fatigue symptoms expressed during an examination are not a good predictor of long-lasting truancy.

## 5. Conclusions

This study was designed as a longitudinal survey of life stressors and subjective fatigue symptoms before and after examinations in students. It examined the correlation between these stressors and fatigue symptoms and also attempted to take causal relationships into consideration.

Three subjective fatigue symptoms decreased in severity after the examination ("difficulty in concentrating on thinking", "languor", and "reduced vitality"), whereas one symptom increased in severity afterwards ("feelings of physical disorder"). It was confirmed that achievement examinations were stress events, which influenced subjective fatigue symptoms. It was also confirmed that life stressors changed after the examination, and modified the environment rather than personal cognitive appraisal.

With regard to the causal relationship between life stressors and subjective fatigue symptoms before and after the examination, subjective fatigue symptoms before the examination most profoundly influenced those after. The subjective fatigue symptoms caused by unusual life stressors before the examination probably persisted, and influenced subjective fatigue symptoms after the examination.

It is important to suppress pre-examination subjective fatigue symptoms early so that they do not leave a lasting effect after the termination of the examination. For such a purpose, measures against

life stressors deriving from students' relations with teachers, family members and friends should be taken before examinations.

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