

Gender Differences in the Degree of Complaints and Frequency of Subjective Symptoms of Fatigue and Relationships among Their Domains in High School Students

Hidetsugu Kobayashi* and Shinichi Demura**

*Fukui National College of Technology
Geshi, Sabae, Fukui 916-8507 Japan
hkoba@fukui-nct.ac.jp

**Kanazawa University, Faculty of Education
Kakuma-machi, Kanazawa, Ishikawa 920-1192 Japan
[Received September 14, 2005 ; Accepted July 19, 2006]

Purpose: A previous study examining subjective symptoms of fatigue (SSF) suggested the existence of a gender difference and reported that the SSF complaint level of females was higher than of males. However, investigations into the degree and frequency of SSF complaints have not been carried out in detail. The purpose of this research was to survey high school students in order to examine gender differences in the degree SSF complaints, the frequency of SSF, and the relationships between domains as represented by subscales. **Methods:** The questionnaire surveyed male and female students between 15 and 18 years of age; 2,980 effective replies were obtained. The questionnaire obtained data regarding personal information (school name, grade, course, age and gender), the Subjective Fatigue Scale for Young Adults (SFS-Y) and lifestyle. Student's *t* tests and confirmatory factor analysis using the structural equation model (SEM) were applied to males and females, respectively, to determine the gender differences in subjective symptoms of fatigue. Multi-group simultaneous analysis by SEM examined the gender difference in relationships between factors. **Results:** It was found that there were significant gender differences in the degree of SSF complaints in five domains, with the exception of "reduced motivation," and that females had higher scores than males in each of those sub-scales. Significant gender differences in correlation coefficients for frequency of SSF complaints were found in four domains, with "languor" and "reduced motivation" being exceptions. Females had higher scores than males in each of the sub-scales. Gender differences between 15 combinations of the 6 domains were recognized in 8 sets with regard to degree and 2 sets with regard to frequency, with the relationships being greater for males. **Conclusions:** The relationships among SSF sub-scales are probably not the major cause of gender difference. Since the gender difference in SSF complaints is not derived from the perception of subjective symptoms, it may be associated with physiological susceptibility or cognitive appraisal.

Keywords: cognitive appraisal, factor structure, structural equation model

[School Health Vol.2, 33-37, 2006]

1. Introduction

Generally, there are three approaches to measuring fatigue: subjective fatigue, performance degradation, and reduced physiological functioning (Hockenberry-Eaton, et al., 1998). Subjective fatigue, that is subjective symptoms of fatigue

(SSF), is considered to be an index of physical stress (Hockenberry-Eaton, et al., 1998), and there have been many reports on health evaluation using the SSF scale (Takakura, 1993; Takakura, et al., 1998; Alberts, et al., 1997; Smets, et al., 1995).

A number of reports have shown that SSF complaints are greater in females than in males.

Table 1 Sample size

Grade	1	2	3	Total
Male	636	657	427	1720
Female	493	555	295	1343
Total	1129	1212	722	3063

Monden (1990) suggested a higher rate of SSF complaints in females compared to males, and that the rate was markedly high with regard to difficulties with attention and concentration. Moreover, Takakura (1997) reported a higher rate of SSF complaints for junior high school females compared to males. Kobayashi, et al., (1998) reported the existence of a gender difference in SSF complaints in adolescents at a cognitive level, and that females had higher scores than males. However, the reasons for the gender differences are not completely understood.

SSF complaints can be inconsistent. Although it is generally expected that SSF complaints for people who are physically fit would be fewer than for those with a low level of physical fitness, this is not always true. For example, in previous studies comparing the SSF levels of young people and laborers, the number of complaints made by young people was higher (Yoshitake, 1978). In order to explain the difference between complaints in elderly people and young people, Yoshitake (1978) pointed out differences in how people recognize SSF. That is, a young person does not experience the specific symptoms of fatigue that a laborer does, but they are aware of indistinct symptoms that may be interpreted as symptoms of fatigue. For this reason, there is a possibility that they will have the same response as if the condition actually existed. The issue of gender differences presents similar problems.

When evaluating SSF, the problem of gender difference should be taken into consideration. This can be examined by the SSF complaints of the relationship between factors in SSF by use of a questionnaire. It can be hypothesized that the correlation between factors is greater in females than in males.

The purpose of this research was to survey high school students in order to examine gender differences in the degree of SSF complaints, the frequency of SSF, and the relationships between factors as represented by the subscales.

2. Methods

2.1. Subjects and data collection

The questionnaire was sent to 24 of the 30 high schools of Fukui Prefecture in Japan after consent was obtained. The questionnaire surveyed 3,680 males and females aged between 15 and 18 years. Effective replies were obtained from 3,063 students (valid response rate was about 83%, **Table 1**). The survey was conducted in 2003, avoiding times immediately before examinations and after physical education.

Prior to the survey teachers explained the following to the subjects: 1) The purpose of this survey was to determine the actual status of various symptoms of fatigue in daily life; 2) It was not necessary for subjects to write their own name on the survey; 3) Information gained from the survey would not be related to the subject's class within the school; 4) Collected data would be statistically analyzed and privacy would be protected. In addition, the subjects were given a routine medical check-up for serious illness and their degree of fatigue was determined according to Performance Status (PS) for the diagnosis of chronic fatigue (Minowa and Jiamo, 1996). Ethical approval for the study was granted by the Kanazawa University Institutional Review Board, Japan.

2.2. Questionnaire

The questionnaire obtained information on students' personal characteristics (school name, grade, course, age and gender), their lifestyle (Breslow, 1977), and their SSF level (Subjective Fatigue Scale for Young Adults (SFS-Y)) (Kobayashi, et al., 2000). To check the reliability of the data, two items with the same content were included in the SFS-Y; if the answers for both were in agreement the data were judged to be acceptable for analysis.

The SFS-Y (Kobayashi, et al., 2000) consists of 24 items making up a total of six factors (**Table 2**). With regard to the degree of SSF complaint (at the time of the survey), each item was assessed on a 7-point scale (1=not at all to 7=extremely). Each item for the frequency of complaints of SSF (over a period of about one week) was assessed on a 4-point scale (1=never, 2=rarely, 3=sometimes, 4=often).

Table 2 Mean and standard deviation of subjective symptoms of fatigue for males and females, result of t test of gender difference

	Male		Female		difference	t value	p value	ES	
	Mean	SD	Mean	SD					
Complaint	F1 Difficulty with concentrated thinking	15.8	5.59	16.4	5.16	-0.59	-2.13	0.0330	-0.255
	F2 Languor	13.2	5.77	13.9	5.31	-0.73	-2.53	0.0110	-0.308
	F3 Reduced motivation	13.0	5.14	13.0	5.06	0.04	0.14	0.8910	0.016
	F4 Reduced activity	14.3	5.96	15.3	5.39	-0.95	-3.24	0.0010	-0.399
	F5 Drowsiness	20.0	5.26	20.8	4.66	-0.81	-3.16	0.0020	-0.363
	F6 Feeling of physical disintegration	14.1	5.54	15.5	5.32	-1.35	-4.81	<0.0001	-0.580
Frequency	F1 Difficulty with concentrated thinking	5.3	3.00	5.8	2.69	-0.51	-3.49	<0.0001	-0.304
	F2 Languor	3.7	3.27	3.9	2.99	-0.23	-1.45	0.1470	-0.133
	F3 Reduced motivation	3.7	2.97	3.9	2.85	-0.19	-1.29	0.1980	-0.113
	F4 Reduced activity	4.6	3.28	5.3	3.14	-0.68	-4.11	<0.0001	-0.380
	F5 Drowsiness	7.7	3.06	8.4	2.68	-0.71	-4.81	<0.0001	-0.422
	F6 Feeling of physical disintegration	4.4	3.23	5.2	3.09	-0.84	-5.15	<0.0001	-0.473

Note: ES = effect size

2.3. Statistical analysis

Student's *t* tests were used for examination of gender differences in the average of a factor score. The amount of effect in that case (effect size (ES)) was computed.

To examine gender differences in SSF the structural equation model (SEM) of confirmatory factor analysis was used. The goodness-of-fit-index (GFI), adjusted goodness of fit index (AGFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA) were used to examine the goodness-of-fit of the model. Multi-group simultaneous analysis using SEM examined gender differences in the relationship between factors.

3. Results

Table 2 shows gender differences with regard to the degree and frequency of SSF in each of the 6 factors. Significant differences in degree were recognized in five factors with the exception being "reduced motivation". All had high values for females, and the differences in factor score and ES were 0.59 to 1.35, and 0.26 to 0.58, respectively. Significant differences in frequency were recognized in four factors, with the exception of "languor" and "reduced motivation", with all values for females being high. The differences in factor score and ES were 0.51 to 0.84, and 0.30 to 0.47, respectively.

The fit indices in the degree of a complaint were GFI=0.898, AGFI=0.876, CFI=0.895, and

RMSEA=0.049 as a result of factor analysis. Moreover, fit indices were GFI=0.903, AGFI=0.882, CFI=0.885, and RMSEA=0.046 for frequency. Gender differences in the relationship between 6 factors of 15 combinations were recognized in 8 sets for degree (**Figure 1**) and 2 sets for frequency (**Figure 2**). Scores for males were higher than for females.

4. Discussion

There have been a number of reports made on gender differences in SSF, with females generally scoring higher than males. In this study, significant gender differences were noted except for "reduced motivation" in the degree of the complaint at the time of the survey and also in the frequency of the complaint for about one week prior to the survey. Also, females had more complaints, in accordance with previous research. Namely, the gender differences in SSF not only involve a high degree of complaints but also a higher frequency of complaints in females than in males in everyday life.

It has also been reported that mental stress response in females is higher than in males (Ozeki, et al., 1994). Lazarus (1985) reported that even if a comparable stressor is added to a human body, when cognitive appraisal differs (not taking into account the degree of the stressor), the mental stress response also differs. Kobayashi, et al., (1998) reported on gender differences in SSF using cognitive appraisal and found the tendency to be high in females. Namely, if the same level of load is added to the

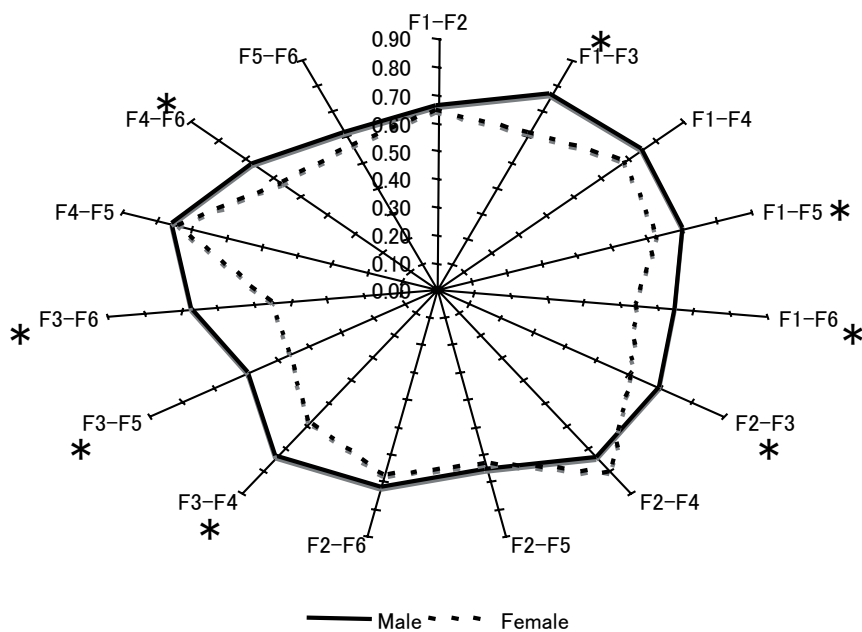


Figure 1 The gender differences in correlation coefficients between 6 factors of 15 combinations for degree
 Number of factors (F1~6) as shown in **Table 2**.
 * $p < 0.05$

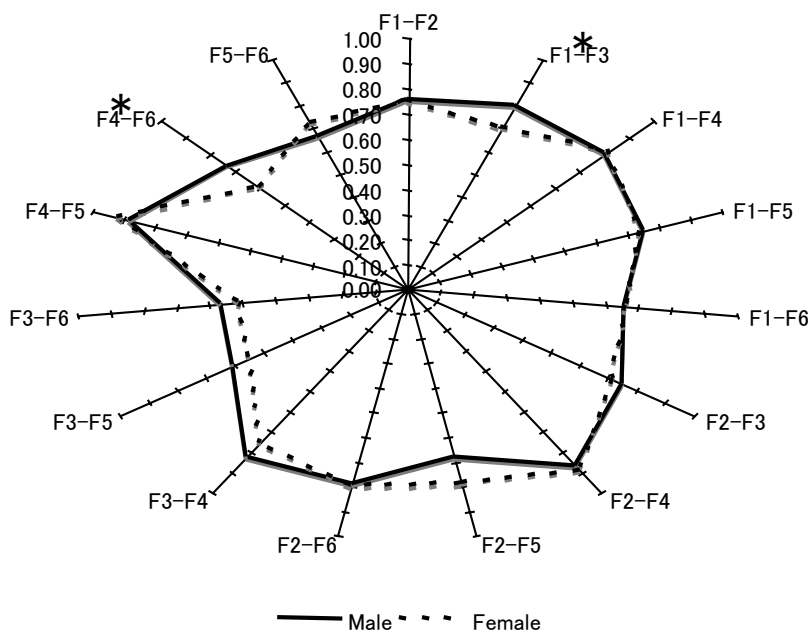


Figure 2 The gender differences in correlation coefficients between 6 factors of 15 combinations for frequency
 Number of factors (F1~6) as shown in **Table 2**.
 * $p < 0.05$

body of both a male and a female, SSF complaints in females are greater than in males. Therefore, generally speaking, the degree of SSF complaints is high in females. However, taking in to account previous research on cognitive appraisal, this may

gender difference in the factor structure of SSF.

From the above, it is thought that the gender difference in SSF complaints originates not from the perception of SSF but from physiological susceptibility or cognitive appraisal. When

mean that consciousness of fatigue differs.

Our current working hypothesis is that the reasons for gender differences are based on the relationship among factors and that the relationships among factors were greater in females than in males. Thus, we predict that SSF is in an undifferentiated state in females. Results in this study show that gender differences in the relationship between 6 factors of 15 combinations were recognized in 8 sets in degree (**Figure 1**) and in 2 sets in frequency (**Figure 2**), and were higher in males than females.

While a remarkable gender difference in frequency was not recognized, male relationships between factors were higher than females in degree. If the female relationship between factors is higher than the male, it may indicate that the cause of gender difference in SSF is based on the relationship among factors. However, this result rejects the hypothesis of this study, and rather shows higher relationships in males than in females.

Kobayashi, et al., (2003) used explanatory factor analysis to examine the gender difference in the factor structure of SSF for males and females. As a result, since the same six factors with the same name were interpreted for both genders, and the similarity coefficient between males and females was higher for those factors with the same name than for those factors given the other name, he noted that there is no

evaluating fatigue using subjective symptoms, generally a questionnaire is used. This method does not have an absolute standard, and it is difficult to judge whether the subject is actually suffering from fatigue. Although many researchers have attempted to evaluate SSF, the results of this study implied that an absolute standard may not evaluate SSF because of gender differences.

The results of this research suggest that gender differences need to be considered when SSF is evaluated in the field of school health. Consequently, even if females show higher scores than males it does not necessarily mean that the degree of fatigue in females is higher than that of males.

Acknowledgment

This work was supported in part by a Grant-in-Aid for Young Scientists (B) (No.17700540) from The Ministry of Education, Cululture, Sports, Science and Technology (MEXT).

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Name:

Hidetsugu Kobayashi

Affiliation:

Fukui National College of Technology

Address:

Geshi, Sabae, Fukui 916-8507 Japan

Brief Biographical History:

1995-2002 Assistant Professor, Fukui National College of Technology

2002- Associate Professor, Fukui National College of Technology

Main Works:

- Time series analysis of subjective fatigue symptoms in young male students. *The Journal of Education and Health Science*, 50(3):151-158, 2005
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