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ORIGINAL ARTICLE

The Development and Relevant Factors of a Self-Care Scale for Young Females with Dysmenorrhea

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ABSTRACT

The number of females who complain of dysmenorrhea has increased compared to 30 years ago; however, they are not good at performing self-care. Hence, we attempted to create a self-care scale for dysmenorrhea, and examine related factors.

We investigated the factors which affect self-care for dysmenorrhea using qualitative surveys, and created 10 constituent concepts based on a revised Pender's health promotion model. Then, we conducted preliminary and main surveys, and a survey for the related factors.

We obtained 23 items in 6 elements for a self-care scale for young females with dysmenorrhea, and confirmed the validity and reliability in the main survey and the survey on its related factors.

In the survey for related factors, people with more serious dysmenorrhea were less willing to try to improve their symptoms and self-care. It became clear that their short weight loss plan was related to self-care. People who often eat many snacks or sweets had they felt it would be more difficult to improve their dysmenorrhea.

We obtained 23 items in 6 elements for a self-care scale for young females with dysmenorrhea, and its reliability and validity were confirmed. As relevant factors, it was implied that the degree of their dysmenorrhea, their eating habits, sleeping habits were all co-related.

＜Key-words＞
dysmenorrhea, young females, self-care, scale, relevant factors

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I. Introduction

The background of this research suggests that there has been a change in the life cycle of contemporary women in Japan. Due to women marrying later, giving birth later in life, and the declining birthrate, the range of time in a woman's life from menarche to giving birth has widened. Before World War 2, women typically experienced menarche at the age of 15, got married around the age of 20 and gave birth until about 40; so, the number of menstrual discharges a woman experienced in her lifetime was smaller (Tanebe, 2016).

However, currently they experience menarche at the age of 12 on average, they give birth for the first time at 30 years old on average, and the birth rate has declined; thus, the number of menstrual discharges a woman experiences in her lifetime has increased ten times compared to women in previous generations. As the number of menstrual discharges has increased, the number of women who experience dysmenorrhea has also increased. According to a survey of high school and university students conducted by Shibaki in 1983, about 30% of them reported such symptoms during menstruation (Shibaki, 1983). However, in a more recent survey by Okugawa, 94.7% of women felt menstrual pain (Okugawa, 2015). The number of women who complain of menstrual pain has more than tripled over the last 30 years.

We investigated the status of dysmenorrhea not only in Japan but also in other countries. As a result of an investigation involving 240 university students in Hong Kong, the prevalence of dysmenorrhea was revealed to be 80% (Chia, Lai, Cheung, et al., 2013). Cheng and Lin investigated 616 young females in Taiwan, and found that 570 females experienced menstrual pain at some point over a one year period, and 180 females had dysmenorrhea (Cheng & Lin, 2011). According to other research, the significant risk factors were as follows: the onset of dysmenorrhea in women in a wider range of ages, longer menstrual cycles, epimenorrhagia, and increased severity of dysmenorrhea (Sanctis, Soliman, Bernasconi, et al., 2015). This information shows that the number of cases of dysmenorrhea has increased in other countries as well.

Those with no causative disease are referred to as having "functional dysmenorrhea", and those with causative diseases such as uterine fibroids and endometriosis are referred to as having "organic dysmenorrhea" Furthermore, their menstrual pain is related to the action of prostaglandin. Its yield increases when hormone balance is disrupted due to stress or factors caused by environmental changes, causing symptoms to worsen. Since women do not experience ovulation in their menstrual cycles for the first few years after menarche, there are no hormonal fluctuations, and so prostaglandin is not produced (Tanebe, 2016). Therefore, women are more likely to experience functional dysmenorrhea in their later teens to early 20's. In this study, we focused on the age group that is most susceptible to functional dysmenorrhea.

The number of females who complain of dysmenorrhea has increased; however, at the same time, they are not performing good self-care. According to a survey on high school

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students, 45% of them "tolerate the pain", 37% of them "massage the painful area", and 33% of them "sleep" (Nagatsu, Nagatomo, Yoshida et al., 2012). Also, according to a survey on college students, 59% of them "take pain medication", 35.9% of them "sleep or take a rest", and 34.3% of them "keep themselves warm" (Okugawa, 2015). Although some of them took internal medicine, they used commercially available drugs only after pain had already developed intensely, which reduced its effectiveness by half.

Nearly 100% of schools have finished providing menstrual education by high school. However, it was found that the information the schools provided was not sufficient in arming students with knowledge on self-care, or that information on practical self-care has not been adequately provided (Hamada, Take, Fujita et al., 2015).Therefore, I thought that if a young woman with menstrual pain can measure her own ability to self-care, it would be useful for the self-development of her improving her menstrual pain.

However, menstruation occurs monthly, and it differs depending on the individual. It is therefore important for individuals to be able to perform self-care. Thus, I thought that if young women had a self-care tool for assessing menstrual pain, it would be useful in helping them monitor themselves to improve their menstrual pain condition.

The menstrual distress questionnaire (MDQ) by Moos is a well-known tool for measuring menstruation, but although it can measure symptoms during menstruation, it is not a scale that can evaluate the ability of self-care for menstrual pain. The adolescent dysmenorrhea self-care scale (ADSCS) was developed; however, it focuses on females aged 13 to 18 years old, and the age group in which functional dysmenorrhea is the most intense is not focused on. It mainly uses a psychological approach (Ching, Meei, Hsin et al., 2004). The premenstrual symptoms screening tool (PSST) was developed; however, it is a screening tool for severe PMS and PMDD (Steiner, Macdougall & Brown, 2003). Yamauchi and Takama created the "Nursing student's self-care measuring scale for menstruation" (Yamauchi & Takama, 2011); however, it is not a self-care scale for women with menstrual pain, and it is intended to be used by nursing students. Since the number of young women with menstrual pain is increasing, we aimed to develop a self-care scale which helps general women perform self-care for their menstrual pain, and then we examined its related factors.

II. Definition of terms

1. Menstrual pain: Lower abdominal pain and back pain which occurs just before menstruation and during menstruation.
2. Young female: Women in their late teens to early twenties who have an ovulation cycle and are prone to having menstrual pain.
3. Self-care: The selection of measures to cope with the condition of menstrual pain, and the performing of those measures so that daily life will not be interrupted by the pain.

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III. Subjects and Methods

1. We set the conceptual framework of the scale to be developed

Based on Pender's Revised Health Promotion Model, we modified our conceptual framework. The new elements we obtained were as follows:

1.Experiences of past self-care treatment, 2. Their menstrual situation and how they view menstruation, 3.Benefits of improving menstrual pain and its expected burden, 4. Perception of self-efficacy, 5. Feelings on self-care treatment, 6. Influence received from people in their life, 7.Influence from the internet, 8.Concrete self-care methods, 9.Intention to improve menstrual pain, and 10. Interruption or derailment from their planned self-care treatment (Pender, 2002).

2. The creation of question items for the scale

1) Preparing the draft of the scale with qualitative surveys

We conducted semi-structured interviews with 15 college students who had menstrual pain and who were between 18-22 years old. After analyzing the results, we obtained three categories, which were [Self-care Problems], [Lifestyle Problems], and [Menstrual related problems].

2) Creating a questionnaire sheet

Based on the 10 elements created from Pender's Revised Health Promotion Model, we created a scale draft of 65 items with reference to data obtained from the qualitative survey.

We used the 5-step Likert scale for our evaluations.

The terms for describing their level of agreement to the questions were "It is very true", "It is mostly true", "It is slightly true", "It is not very true" and "It is not true at all".

3. Consideration of the validity of results

1) Meeting with experts in the field

A professor who was involved in reproductive health studies in nursing and four doctoral students in the same field repeatedly engaged in the selection and correction of the question items for the scale.

We asked for advice and for confirmation of the contents from a professor of maternity nursing at another university, a doctor in a puberty outpatient department, and three teachers of epidemiology and statistics, and then revised the sentences.

2) Pre-test

Six female college students volunteered to answer the 65 items in the scale draft to check if there were any sentences in which the meaning was unclear, and then we adjusted the sentences.

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3) Preliminary survey

We conducted a questionnaire survey with 296 female college students who were in their first or second year in departments related to social sciences. The survey was a scale with 65 items and attributes related to menstruation (age when menarche occurred, menstrual cycle, duration of menstruation, amount of bleeding, presence or absence of menstrual pain), and then about thirty items were obtained through exploratory factor analysis.

4. Main survey

Menstruation periods are over in about a week, and the physical changes are remarkable around that period. Hence, it is necessary that the investigation window was as short as possible. Furthermore, the age group that we focused on in this study is from an internet-savvy generation, and we also considered that the answers would involve private subjects because the subject was menstruation; thus, we chose to perform internet surveys so that the respondents could comfortably answer these questions.

There were 30 scale items in the preliminary survey's exploratory factor analysis. However, we added nine items which were deleted during the analysis because we regarded them as important; thus, we conducted the main survey using these 39 items.

We conducted the internet surveys with women who had menstrual pain and were between 18 and 22 years old. Exclusion conditions were set as follows: women who do not have menstrual pain, pregnant women, women who take birth control pills, and women who are receiving treatment for gynecologic diseases at a clinic.

We distributed the screening survey earlier, and sent this survey to those who did not fit the exclusion conditions. After one week, the same main survey sheet was sent again to the same subjects and we carried out a retest. We collected all of this data in July 2017.

5. Investigation of related factors

Due to our wish that this scale would be used by young women as much as possible, we used subjects who were women between 16 and 24 years old. The exclusion conditions were the same as the main survey.

From the results of the confirmatory factor analysis of this survey, the scale had 23 items with 6 factors. Based on these 23 items and the qualitative survey for preparing the scale draft, we investigated items related to menstruation and lifestyle through the internet. We conducted a screening study earlier, and sent this related factor survey to those who do not fit the exclusion conditions. We collected all of this data in March 2018.

6. Method of analysis

We used SPSS ver.24.0J for Windows and Amos 25.0J to conduct our analysis with the following method:

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1) Analysis of items

For the ceiling and floor effects, when the average value ± standard deviation was greater than or equal to 5 or less than or equal to 1, they were set as a deletion criterion. For the IT correlation analysis, a value of less than 0.3 was set as the deletion criterion. For the GP analysis, we made sure that the average scores in the upper group were always higher for each item.

2) Factor analysis

In the exploratory factor analysis, some items were excluded based on the item analysis, and then we performed the factor analysis using the maximum likelihood method and a promax rotation. Items whose factor loading amount indicated 0.4 or more for plural questions and items whose factor loading amount for the same factor indicated less than 0.4 were deleted.

For the confirmatory factor analysis, we performed an analysis on model adaptation using a covariance structure analysis.

A model is considered acceptable,when two or more fit indices are met including RMSEA and CFI(Nakayama,2018). For adequately fitting models,these fit indices should meet the following criteria:GFI>0.9,AGFI>0.85(Nakayama,2018),GFI≧AGFI(Oshio,2016), CFI>0.9(Nakayama,2018)and RMSEA<0.1(Oshio,2016;Nakayama,2018).

In this research, maximum likelihood estimation was used for the parameter estimation.

3) Multiple regression analysis

In the related factors survey, we set items related to menstruation and lifestyle, which were categories obtained in the qualitative surveys, as independent variables. We then set average scores from the first to sixth subscale of the scale as dependent variables, and then performed a multiple regression analysis using the stepwise method.

7. Consideration of reliability

For both the main survey and the related factors survey, we obtained the Cronbach's α coefficient of the whole scale and each factor to confirm internal consistency.

In this survey, we conducted a retest after one week to confirm its stability, and calculated the intra-class correlation coefficient of each factor and the whole scale.

8. Consideration of validity

1) Criterion-related validity

In order to consider criterion-related validity, in this survey we referred to the "Menstruation self-care scale for nursing students" (Yamauchi & Takama) which we thought was partially related to our "Self-care scale for dysmenorrhea in young females", and then we calculated the Spearman's rank correlation coefficient between them.

2) Validity of structural concept

We conducted a confirmatory factor analysis of the main survey and of the related factors survey to confirm whether it constitutes the same structural concept or not.

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IV. Ethical considerations

For the semi-structured interview surveys and preliminary surveys, we explained our research to the participants, we mentioned the purpose, summary, significance, anonymity, freedom of discontinuation, how we were going to use the data, our report on the research results, and contact information, and then we obtained consent forms from them before conducting the research.

The internet survey was consigned to a research company; however, we created the agreement screen by ourselves and had them use it, and the questionnaire sheet was sent only to those who gave us consent. Prior to the survey, we explained the following matters to them on the computer form: the purpose, outline and significance of our research, that there was no conflict of interest with the consigned company, their retention of anonymity, that the main survey and retest are linked by a symbol, but passwords were set for access to the codes, and the passwords are changed periodically, as well as our contact addresses.

This research was carried out after obtaining consent from the Ethics Review Committee of the university (Approval number: 14-Io-63, 15-Io-139, 17-Io-7).

V. Results

1.The results of the main survey

1) Attributes of the subjects

The screening survey sheet was distributed to 67,996 women, and 2,000 women responded to it. 1,893 of them met our age requirements, the main survey sheet was sent to 1,404 women who did not fall under the exclusion conditions, and who had menstrual pain. Subsequently we obtained 1,000 effective responses (the effective response rate was 71.2%). A retest was conducted one week later, and effective responses were obtained from 705 women (the effective response rate was 70.5%).

2) Analysis of items

Of the 39 scale items, there were no items which showed ceiling and floor effects. Two items with r = 0.3 or less in the IT correlation analysis were deleted. There were no deleted items due to the GP analysis.

3) Factor analysis

After deleting the two items from the IT analysis, we performed an exploratory factor analysis using the Maximum Likelihood Method and Promax rotation. There was a fall in the scree plot and the cumulative contribution rate exceeded 50%; thus, it was determined to be a six factor structure. There were 13 items in which factor loading was 0.4 or less and three items in which intra-class correlation coefficients was 0.6 or less, so these items were deleted, which resulted in 23 items with 6 factors (see Table 1).

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<Table 1> Exploratory factor analysis of the main survey
Maximum likelihood method and Promax rotation Overall $\alpha = 0.864$

Table 1 Exploratory factor analysis of the main survey
Maximum likelihood method and Promax rotation Overall α=0.864

n=1,000

First factor: Perception of self-efficacy α = 0.860	First factor	Second	Third	Fourth	Fifth	Sixth
1) I am someone who prefers to do things thoroughly and without delay.	0.875	0.051	0.022	-0.006	0.008	-0.116
2) Once I start working on something, I follow it through to completion.	0.818	0.062	-0.014	-0.004	0.016	-0.044
3) Once I can plan things by myself, I am confident I can do them well.	0.698	-0.049	0.041	0.028	-0.014	0.072
7) I can achieve the things I have decided on my own.	0.635	-0.042	0.025	-0.013	0.003	0.209
Second factor: Intention to improve menstrual pain α=0.866						
34) From now on, I would like to consider my physical condition daily before my menstruation period.	0.003	0.866	0.050	-0.104	-0.023	-0.019
33) Before my menstruation period, I would like to take agreeable treatment actions.	0.056	0.842	0.004	0.030	-0.069	-0.092
36) I want to continue treatment actions until I can improve my menstrual pain.	0.016	0.698	0.087	0.063	-0.026	0.018
35) I would like to improve menstrual pain and enjoy my daily life more.	-0.050	0.690	-0.102	0.062	0.134	0.137
Third factor: Self-care that can be achieved by lifestyle changes α = 0.803						
27) I do not eat or drink cold food so as not to cool my body during my menstruation period.	-0.102	-0.006	0.832	0.016	0.024	0.043
28) During menstruation, I carefully select my clothing to stay warm.	-0.137	0.070	0.811	0.014	0.011	0.064
29) During menstruation, I'm engaged in light exercise to promote circulation around the pelvis.	0.122	-0.084	0.604	0.029	-0.006	-0.044
31) I am not a picky eater. I consider nutritional balance when I eat.	0.163	0.054	0.526	-0.097	-0.001	-0.026
30) During my menstruation period, I try to sleep for seven to eight hours to ensure I get enough sleep.	0.101	0.025	0.488	0.029	0.003	-0.072
Fourth factor: Self-care using medicine α=0.921						
24) If I have pain, I try to take painkillers as soon as possible.	0.036	-0.026	-0.003	0.928	0.000	-0.011
23) During my menstruation period, I try to take painkillers if I have them on hand.	-0.044	0.020	-0.044	0.899	0.004	0.033
25) As soon as menstrual pain appears, I try to take painkillers.	0.014	0.025	0.062	0.844	-0.018	-0.026
Fifth factor: Expected level of burden needed to improve menstrual pain α=0.814						
14) I do not want to spend time trying to improve my menstrual pain.	0.029	-0.053	0.034	0.003	0.837	-0.041
16) In order to improve my menstrual pain, I do not want to do anything that does not bring immediate re	0.050	-0.028	0.018	0.035	0.836	-0.034
17) I do not want to spend much money trying to improve my menstrual pain.	-0.075	0.072	-0.024	-0.057	0.657	0.060
Sixth factor: Feelings on self-care treatment α=0.761						
5) I want to find opportunities to try new things.	-0.140	0.026	0.009	-0.014	-0.007	0.841
4) I try to cope with things positively, even if it is my first attempt.	0.265	-0.061	0.065	-0.014	-0.046	0.587
6) If I decide to work through something, I prefer to start soon.	0.167	-0.088	0.006	0.037	-0.026	0.530
8) I think it is good to do things even if I need a lot of effort to achieve doing them.	0.156	0.161	-0.128	-0.008	0.065	0.470

Factor correlation matrix					
	0.257				
	0.333	0.455			
	0.098	0.361	0.374		
	-0.011	0.266	0.062	0.226	
	0.583	0.378	0.283	0.062	0.124

As a result of using the covariance structure analysis, the model adaptation in the 23 items with 6 factors was as follows: GFI = 0.912, AGFI = 0.889, CFI = 0.929, and RMSEA = 0.060 (See Figure 1).

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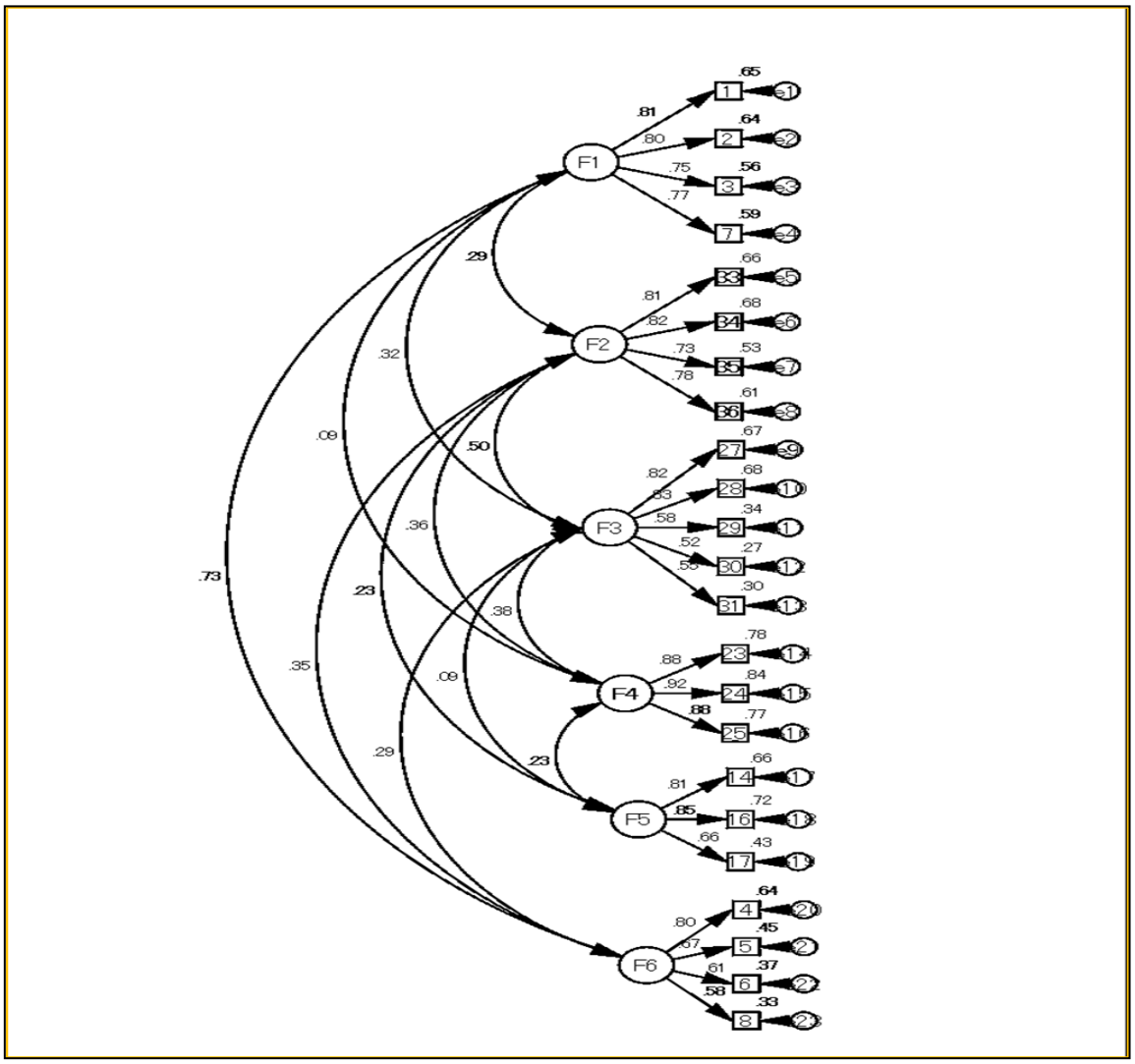

＜Figure 1＞Main survey Confirmatory factor analysis n=1,000

4) Consideration of validity

(1) Validity of our structural concept

In the exploratory factor analysis and the confirmatory factor analysis, 23 items with 6 factors were obtained. We named these factors as follows: the first factor was "perception of self-efficacy", the second factor was "intention to improve menstrual pain", the third factor was "self-care that can be achieved by lifestyle changes", the 4th factor was "self-care using medicine", the 5th factor was "expected level of burden needed to improve menstrual pain", and the 6th factor was "feelings on self-care treatment".

(2) Criterion-related validity

The scale created by Yamauchi and Takama is not a scale for women who have menstrual pain. In contrary, this scale is for women with menstrual pain. This scale is unique, but we predicted there would be similarities with the scale created by Yamauchi and Takama, so we used their scale to check criterion-related validity (see Table 2).

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Table2 Correlation between a self-care scale for young females with dysmenorrhea and scale of Yamauchi / Takama n=1,000

		Yamauchi/ Takama First factor	Yamauchi/ Takama Second factor	Yamauchi/ Takama Third factor	Yamauchi/ Takama Fourth factor
First factor Perception of self-efficacy	Correlation coefficient	0.267**	0.221**	0.186**	0.203**
	Significance probability(both sides)	0.000	0.000	0.000	0.000
Second factor Intention to improve menstrual pain	Correlation coefficient	0.442**	0.398**	0.186**	0.474**
	Significance probability(both sides)	0.000	0.000	0.000	0.000
Third factor Self-care that can be achieved by lifestyle changes	Correlation coefficient	0.406**	0.481**	0.475**	0.403**
	Significance probability(both sides)	0.000	0.000	0.000	0.000
Fourth factor Self-care using medicine	Correlation coefficient	0.206**	0.302**	0.227**	0.295**
	Significance probability(both sides)	0.000	0.000	0.000	0.000
Fifth factor Expected level of burden needed to improve menstrual pain	Correlation coefficient	0.152**	0.117**	−0.090**	0.105**
	Significance probability(both sides)	0.000	0.000	0.004	0.001
Sixth factor Feelings on self-care treatment	Correlation coefficient	0.259**	0.165**	0.102**	0.197**
	Significance probability(both sides)	0.000	0.000	0.001	0.000

** P<0.001 Spearman's rank correlation coefficient

There were moderate correlations in the second factor "intention to improve menstrual pain" and the third factor "self-care that can be achieved by lifestyle changes", and weak correlations were observed in other factors.

5) Consideration of reliability

As for its internal consistency, Cronbach's α = 0.864 for the whole scale, and the value of each factor was 0.860, 0.866, 0.803, 0.921, 0.814 and 0.761 in order from the first factor.

As for its stability, the intra-class correlation coefficient was 0.799 for the whole scale based on the results of the retest one week later, and the value of each factor was 0.833, 0.725, 0.725, 0.887, 0.720 and 0.785 in order from the first factor.

2. Results of the investigation on related factors

1) Attributes of the subjects

The screening survey sheet was distributed to 10,000 women, and 799 women responded to it. 783 of them met our age requirements. The related factor survey sheet was sent to 400 women who had menstrual pain and did not fall under our exclusion

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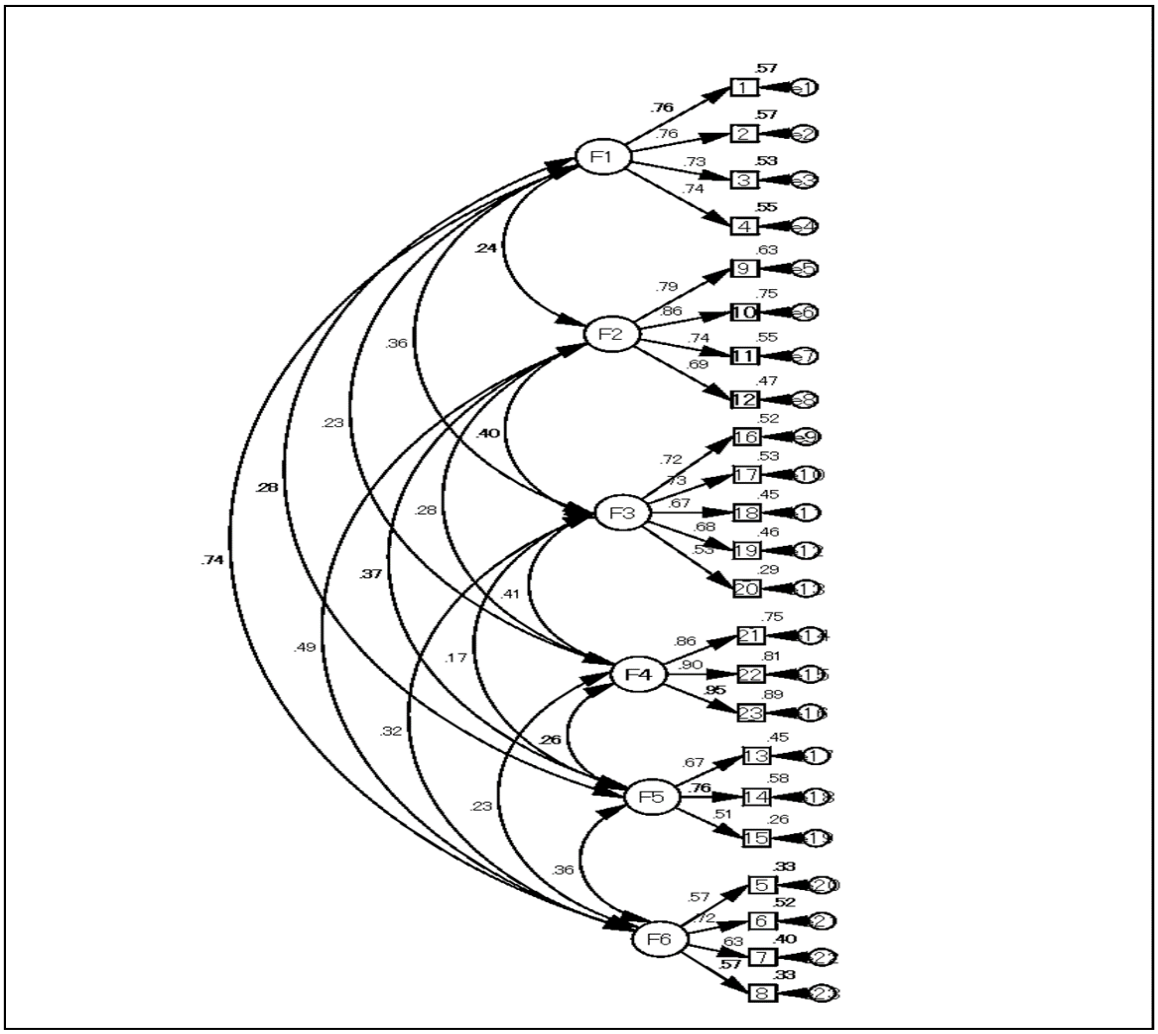
conditions. Subsequently, we obtained 300 effective responses (the effective response rate was 75.0%).

2) Factor analysis

As a result of the confirmatory factor analysis using the covariance structure analysis, the model adaptation was as follows: GFI = 0.873, AGFI = 0.837, CFI = 0.920, RMSEA = 0.061 in the 23 items with 6 factors (See Figure 2).



＜Figure 2＞Related factor investigation Confirmatory factor analysis n=300

3) Consideration of validity

Validity of the structural concept

As in the main survey, there were 23 items with 6 factors, and with the model adaptation, the GFI and AGFI dropped slightly; however, the CFI and RMSEA were almost identical; thus, the structural concept was confirmed.

4) Confirmation of reliability

For internal consistency, Cronbach's α= 0.869 for the whole scale, and the value of each factor was 0.834, 0.854, 0.799, 0.930, 0.683 and 0.718 in order from the first factor.

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5) The results of the multiple regression analysis (stepwise method) (See Table 3)

Table3 Relationship between factors 1 to 6 and menstruation and lifestyle(multiple regression analysis：stepwise) n=300

Dependent variable	Independent variable	R^2	AR^2	B	SE	β	p-value
First factor Perception of self-efficacy	Sleeping habits	0.079	0.07	0.146	0.045	0.184	0.001
	There are many snacks			-0.120	0.040	-0.168	0.003
	You are on a diet			0.086	0.035	0.136	0.016
Second factor Intention to improve menstrual pain	Degree of menstrual pain	0.117	0.105	-0.180	0.047	0.207	0.000
	Meel time is irregular every day			0.150	0.042	0.207	0.000
	You are on a diet			0.107	0.039	0.151	0.007
	Sleeping habits			0.126	0.052	0.141	0.016
Third factor Self-care that can be achieved by lifestyle changes	Degree of menstrual pain	0.097	0.088	-0.157	0.047	-0.185	0.001
	You are on a diet			0.151	0.039	0.215	0.000
	Bathing habits			0.069	0.031	0.125	0.025
Fourth factor Self-care using medicine	Degree of menstrual pain	0.306	0.301	-0.712	0.066	-0.526	0.000
	You are on a diet			0.159	0.054	0.142	0.004
Fifth factor Expected level of burden needed to improve menstrual pain	There are many snacks	0.019	0.016	0.100	0.042	0.137	0.017
Sixth factor Feelings on self-care treatment	You are on a diet	0.059	0.053	0.124	0.034	0.205	0.000
	Sleeping habits			0.113	0.043	0.149	0.009

R^2,Coefficient of determination R-squared;AR^2,Adjusted R-squared;B,Regression coefficients; SE,Standard error;ß,Standardized regression coefficients

(1) The relationship between the scores of the first factor "Perception of self-efficacy" and the lifestyle factor

The variables that were significantly related to the scores of the first factor "Perception of self-efficacy" were the lifestyle factors of sleeping habits, trying to lose weight and eating lots of snacks. The coefficient of determination R-squared was 0.079, and the adjusted R-squared was 0.070.

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(2) The relationship between the scores of the second factor "Intention to improve menstrual pain" and the menstruation and lifestyle factors

The variables that were significantly related to the scores of the second factor "Intention to improve menstrual pain" were the menstrual pain level in the menstruation factor, and the 3 lifestyle factors of irregular meal time, trying to lose weight and sleeping habits. The coefficient of determination R-squared was 0.117, and the adjusted R-squared was 0.105.

(3) The relationship between the scores of the third factor "Self-care that can be achieved by lifestyle changes" and the menstruation and lifestyle factors

The variables that were significantly related to the scores of the third factor "Self-care that can be achieved by lifestyle changes" were the menstrual pain level in the menstruation factor, and the two lifestyle factors of trying to lose weight and bathing habits. The coefficient of determination R-squared was 0.097, and the adjusted R-squared was 0.088.

(4) The relationship between the scores of the fourth factor "Self-care using medicine" and the menstruation and lifestyle factors

The variables that were significantly related to the scores of the fourth factor "Self-care using medicine" were the menstrual pain level in the menstruation factor, and the lifestyle factor of trying to lose weight. The coefficient of determination R-squared was 0.306, and the adjusted R-squared was 0.301.

(5) The relationship between the scores of fifth factor "Expected level of burden needed to improve menstrual pain" and the lifestyle factor

The variable that was significantly related to the scores of the fifth factor "Expected level of burden needed to improve menstrual pain" was the lifestyle factor of eating lots of snacks. The coefficient of determination R-squared was 0.019, and the adjusted R-squared was 0.016.

(6) The relationship between the scores of the sixth factor "Feelings on self-care treatment" and the lifestyle factor

The variables that were significantly related to the scores of the sixth factor "Feelings on self-care treatment" were the two lifestyle factors of trying to lose weight and sleeping habits. The coefficient of determination R-squared was 0.059, and the adjusted R-squared was 0.053.

IV. Discussion

1. Consideration of the validity of the developed scale

Based on the confirmatory factor analysis of the main survey and the related factors survey, it was confirmed that the validity of the structural concept had a six factor structure. From the covariance structure analysis, we obtained an overall good degree of conformity twice; thus, we were able to confirm the validity of the structural concept.

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Based on the Pender's Health Promotion Model, Mori et al. suggested the following: to motivate women by having them pay attention to the benefits of actions, to teach them how to overcome the burden related to actions, and to enhance their self-efficacy and facilitate them to have positive feelings for actions through their experiences of carrying out said actions, as well as positive feedback (Mori, Takahashi, Kudo et al., 2017). We think that these points were included in the six factors.

As for content validity, we conducted semistructured interviews with 15 university students who had menstrual pain and performed a qualitative analysis. Furthermore, we created our structural concept using Pender's Revised Health Promotion Model since the subjects were young woman, which helped to promote consciousness of young people's health.

As for criterion-related validity, we found that there was a moderate correlation between Yamauchi and Takama's "dysmenorrhea self-care scale for nursing students" and the 2nd and 3rd factors of this scale. The reason is because there are some things in common with feelings on menstruation and actions to deal with the pain.

This scale is for women who have menstrual pain; however, the scale created by Yamauchi and Takama is not for women who have menstrual pain. Due to the differences in the features of the two scales, there were only mild correlations outside of the 2nd and 3rd factors.

This scale referred to Pender's Revised Health Promotion Model (for 10 factors) for the conceptual framework; however, Yamauchi and Takama referred to prior literature for their six factors. Thus, the question items were also different, so there were only weak correlations in other factors.

The first factor "perception of self-efficacy", the fifth factor "expected level of burden needed to improve menstrual pain" and the sixth factor "feelings on self-care treatment" are the characteristics based on Pender's Revised Health Promotion Model. Although not important for women who do not have menstrual pain, these are important items to help improve menstrual pain for those who have it.

It is unnecessary for those without menstrual pain to take medication, so the fourth factor "self-care using medicine" is a distinctive feature of this scale which was created for women with menstrual pain.

2. Reliability and stability of the developed scale

Cronbach's α = 0.864 for the whole scale of this study (n = 1,000), and the Cronbach's α coefficient for each factor was between 0.761 and 0.921, which showed internal consistency. The intraclass correlation coefficient of the whole scale of the retest (n = 705) was 0.799, and the intraclass correlation coefficient for each factor was between 0.720 to 0.887, thus, stability was maintained.

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Since menstruation repeats for every ovulation period and the process of menstruation lasts for two weeks, we set the period of time for the retest to be one week, which was important to maintain stability.

Cronbach's α = 0.869 for the scale of the related factors survey (n = 300). The Cronbach's α coefficient for each factor was between 0.683 and 0.930, and only the fifth factor was 0.7 or less, but the overall internal consistency is considered to be high.

Only the fifth factor was a little lower in the results. There were quite a few women with weak menstrual pain in the related factors survey, 30.0% of them answered they had a little pain, but the pain was not serious enouch to need medicine, and 35.0% of them answered that if they took medicine for it they could live their daily life without problems. Totally 65.0% of them thought it was not a serious problem, so the fifth factor "expected level of burden needed to improve menstrual pain" decreased.

3. Examination of the developed scale and related factors

1) Relevant factors with menstrual attributes

Women with higher degrees of menstrual pain had lower scores in the 2nd, 3rd and 4th factors, which suggested that they did not perform self-care well. Those who had severe menstrual pain were likely to have "disastrous thinking" because of their experiences of failing to cope with it, and it was difficult for them to imagine overcoming their menstrual pain. (Uemura , Sakae & Matsumura, 2013). It is speculated that women who have stronger menstrual pain feel that it is more difficult to deal with the pain. Furthermore, in the accompanying symptoms of menstruation, the scores in the items regarding the "pain" area were high and there were many women who had problems with pain, so it is necessary to promote knowledge about pain management (Morishita, Asano, Ueda et al., 2015).

This scale has 23 items, so people can easily check their situation, and it also includes the fourth factor "Self-care using medicine" for pain management; thus, we believe it is a useful scale for women with menstrual pain.

2) Factors related to attributes of lifestyle habits

"Trying to lose weight" was relevant in all of the factors outside the 5th factor. "Trying to lose weight" and "irregular meals" were thought to be causes of stress associated with menstruation symptoms (Akamatsu, Shiinomiya & Yoshimoto, 2005). Women who were trying to lose weight are likely to have accompanying symptoms of menstruation, and since they were sensitive to changes in their bodies, they had a stronger desire to "improve their menstrual pain (the 2nd factor)". Thus they performed "self-care that can be achieved by lifestyle changes (the 3rd factor)" and "self-care using medicine (the 4th factor)". They performed self-care on a daily basis, so their "feelings on self-care treatment (the 6th factor)" was also significantly related. They continued to routinely perform self-care; thus, we believe that "Perception of self-efficacy (the 1st factor)" was significantly related.

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In a paper focusing on college students, the influence that trying to lose weight had on menstruation was measured. About 85% of the subjects had ordinary body types; however, more than 80% of them "hoped to have skinnier bodies" (Hososaka, Nukita & Kayashima , 2010). Many women in this age rage are trying to lose weight. However, it is necessary to make them understand that by eating less, they will feel stressed and worsen their menstrual pain.

The results showed that women who frequently eat snacks had a slightly lower self-efficacy and they felt it would be more difficult to improve their dysmenorrhea. The reverse phenomenon was observed in women who were trying to lose weight. In the background, there is that tendency that "they want to be skinny", so they felt guilty when eating snacks, thus I believe that is a reason for a decrease in their self-efficacy. In addition, women who frequently eat snacks have the characteristic of being impatient on a regular basis. Thus, it is speculated that they felt more of a burden for self-care because it is required until they can improve their menstrual pain.

Regarding sleeping habits, women who stay up until 2:00 or 3:00 am were more likely to feel self-efficacy, have more intention to improve their menstrual pain, and have more feelings on self-care treatment compared to those who go to sleep at around 11:00 pm. This is because since they were staying up late, their sleep rhythm was disturbed, and their menstrual pain became stronger. Thus, they wanted to improve their pain and thought more about self-care treatment. It was observed that such feelings were co-related.

Furthermore, because they come from an internet-savvy generation, self-efficacy may have been higher because women who stayed awake until late at night and were involved in SNS such as twitter and blogs were more likely to have higher senses of self-satisfaction.

Bathing habits were only related to "self-care that can be achieved by lifestyle changes". This suggests that women who did not have good bathing habits had worse circulation and their bodies were colder, so their menstrual pain became stronger. Thus, they strived to perform self-care while paying attention to keeping themselves warm on a daily basis.

4. Practicality of the scale we developed

This scale has only 23 items, and allows women to confirm the state of their self-care for menstrual pain. Thus, if it is kept in healthcare rooms in schools or working places, it can be used by women with menstrual pain.

It can also be distributed to women when they have group medical checkups at places, including schools and companies, and it can be used to check their conditions.

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5. Limits of this research and future issues

Certain levels of reliability and validity were confirmed in the "self-care scale for dysmenorrhea in young females" created through this study. In the future, its practical use should be utilized in many groups, and modified accordingly.

In order to increase the sophistication of this scale, it is important to investigate further issues while also expanding the age-range of the subjects and checking whether or not similar results can be obtained; doing so can increase the accuracy of the scale.

The age range that we covered in this study in the related factors survey was 16 to 24 years old. Seven women aged 16 to 17 years old in the screening stage fell under the exclusion conditions due to their absence of menstrual pain, and they did not become subjects of this study. As a future issue, it will be necessary to conduct follow-up surveys with this age group, and confirm their trends.

The level of their menstrual pain, intention to lose weight, eating snacks, sleeping habits, and bathing habits are thought to be related to this scale; thus, it will be necessary to further investigate these details and discuss their relationship in the future.

VI. Conclusion

1. It was verified that this self-care scale for young women with menstrual pain contains 23 items with 6 factors based on the confirmatory factor analysis of the main study and the related factors survey.
2. Women with higher degrees of menstrual pain had lower intention to improve their pain, which suggested that they did not perform self-care well.
3. Women who tried to lose weight performed self-care because they had menstrual pain; however, it was shown that eating less causes stress and had negative effects on menstrual pain.
4. Women who frequently ate snacks had a lower self-efficacy, suggesting that they felt it would be more difficult to improve their menstrual pain.
5. It was shown that women who did not have good sleeping and bathing habits performed self-care because they had menstrual pain.

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We declare that there are no conflicts of interest associated with this manuscript.

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