The Impact of Naturopathic Activities on Constipation and Health Promotion of High School Girls in Korea

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Objective: This study aims to investigate the factor influencing on constipation and health, and the effect of 7-day naturopathic activities on constipation and health.

Methods: This uncontrolled intervention study evaluated the risk factors on constipation and health by multiple linear regression with five indices from 138 high school girls in Korea by a self-reporting survey conducted on November 2nd, 2008. Moreover after 7-day naturopathic activities for a week, it analyzed their effect on constipation and health by analysis of covariance (ANCOVA) and multiple linear regression on November 8th, 2008.

Results: Lifestyle and stress significantly influenced constipation and health. The risk factors on constipation were daily water intake ($p=0.010$), favorite foods ($p=0.011$), exercise per day ($p=0.008$) and school stress ($p=0.011$). The risk factors on health were the frequency of snack per week ($p=0.005$), the volume of daily water intake ($p=0.017$), exercise per day ($p=0.021$), school stress ($p=0.001$) and home stress ($p=0.001$). 7-day naturopathic activities made significant decrease in constipation assessment scale ($p=0.012$), of which main effector was the volume of daily water intake ($p=0.034$). These activities made significant increase in health index ($p=0.016$), of which main effector was not in lifestyle index but might be in stress index. Meanwhile, they did not make significant fluctuation in defecation frequency per week and constipation self-awareness.

Conclusion: These results propose that constipation and health were significantly influenced by lifestyle and stress, and that 7-day naturopathic activities directly had significant effect on constipation and might indirectly have effect on health through connecting with stress reduction. These findings suggest the applicability of naturopathy for constipation care and health promotion.

Key words: high school girls, constipation, naturopathic activities, health promotion, health education

I Introduction

Constipation is one of the most frequent and chronic digestive disorders occurring in 5 to 20% of the world’s population1,2. More than 80% of women experience constipation for the first time during adolescence, which lasts into adulthood and is harmful to adolescent’s learning and health3. The prevalence of constipation among high school students in Korea is 12.5% for boys and 30.1% for girls, and the higher the grade, the higher the prevalence4. Moreover, 56.6% of senior high school girls are self-aware of constipation, and 25.1% of high school girls have taken laxative

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pills previously\textsuperscript{3}.

In Korea, the frequency of patients having constipation with gastrointestinal symptoms visiting medical facilities is only 7% in primary care clinics and 4% in tertiary hospitals\textsuperscript{6}. Furthermore, most of them take food and tea for constipation care without seeking medical help\textsuperscript{7}.

Generally, constipation is not a disease but a symptom like a fever, and can be caused by many different conditions\textsuperscript{8}. Common causes of constipation are not enough fiber in diet, not enough liquids, lack of exercise, medication, irritable bowel syndrome, abuse of laxatives, changes in routine such as pregnancy and so on\textsuperscript{9,10}. In most cases, dietary and lifestyle changes will help relieve symptoms and prevent constipation although treatment depends on the cause, severity and duration\textsuperscript{11}.

The high school girls in Korea are not sufficiently taking care of their health, because of increase in no-breakfast in order to arrive early at school\textsuperscript{12}, impossible individual control in taking dietary fiber when eating from school\textsuperscript{13}, lack of exercise\textsuperscript{14} and so on. Nevertheless, there are hardly any studies on constipation care and health promotion taking the actual situations of high school girls into consideration. The findings based on this context would be useful to carry out self-health care easily for constipation care and health promotion.

Thus, this study aims to investigate the factors influencing on constipation and health in high school girls, and the effect of 7-day naturopathic activities on constipation and health, based on the actual situations, composed with simple and daily health-promotive behavior modification for self-health care, and to suggest the applicability of naturopathy for constipation care and health promotion without taking professional learning and skill.

II Methods

1. Study design

This uncontrolled intervention study by a structured self-reporting survey was designed as shown in Fig. 1. The conception of the relation of constipation with health in this study was based on that impact of constipation is not only functional limitation in everyday life but also mental suffering and the decline of health-related QOL\textsuperscript{15}. Comparative surveys before and after the implementation of naturopathic activities for a week were carried out to evaluate the factors influencing on constipation and health with lifestyle index, BMI, stress index, constipation index and health index, and to analyze the effect of 7-day naturopathic activities on constipation care and health promotion by comparing pre-to-post constipation index and health index.

The present study followed the Nuremberg Code with ten basic ethical principles and Belmont Report of 1979 with four guidelines\textsuperscript{16} for participants’ right, i.e. voluntary consenting to research, avoiding unnecessary physical and mental suffer-
ing, necessity of proper environment and protection for participants, terminating the experiment in case of being harmful, and so on.

2. Participants and data collection

This study was reviewed and approved by Institutional Review Board of Seoul Jangshin University in April, 2008. After permission of the principal and teachers at the B girls’ high school in Bucheon city, Korea, the present investigation was conducted by obtaining the consent for ensuring confidentiality from a total of 138 high school girls in randomly selected four classes of the first year.

A structured self-reporting survey was carried out with the sample twice, i.e. before and after the implementation of 7-day naturopathic activities. Pre-survey before the implementation was obtained from 138 participants on November 2nd, 2008. Post-survey after the implementation was obtained from 132 participants on November 8th. Six dropouts did not turn out or fill out their questionnaire in post-survey with personal choice or emotional change without specific reasons through naturopathic activities.

3. 7-day naturopathic activities

7-day naturopathic activities as lifestyle modification against common causes of constipation such as lack of exercise and not enough liquids were composed with three elements: 1) implementation of kingyo undo (swing the hips horizontally like fish swimming) and mokan undo (after lying on the back, raising and shaking the arms and legs) of Nishi Health System for one minute each immediately after waking up and just before sleeping, 2) consuming about 1.8 liters of water daily (approximately 100 ml (1/2 to 1/3 cup) at a time), and 3) frequent abdomen massage with the hand in a clockwise rotation based on traditional Korean treatment. These naturopathic activities were introduced to 138 participants, and were self-implemented voluntarily by them for constipation care and health promotion from November 2nd to November 8th, 2008.

4. Survey

Lifestyle index was composed with daily components, i.e. sleeping time, the frequency of having breakfast per week, the portion of school food, eating speed, snacking habits, the frequency of snack per week, picky eating habits, favorite foods, the volume of daily water intake, and the amount of exercise per day.

Body mass index (BMI) was calculated by weight (kg) / height (m)^2, and adjudicated by the criteria of Korean Obesity Society: underweight is less than 18.5, normal weight 18.5 to 22.9, overweight 23.0 to 24.9, and obesity 25.0 or more.

Stress index was evaluated by using the stress awareness scale with five-level Likert, by which Jeong evaluated stress awareness of middle school students. The higher the score, the higher the stress. The stress awareness scale was composed of five items (50 questions): school stress, relationship stress, self-stress, circumstances stress and home stress each consisting of 10 questions. Cronbach’s alpha (α) on five items of the stress awareness scale in present study was school stress 0.75, relationship stress 0.76, self-stress 0.69, circumstances stress 0.71 and home stress 0.81.

Constipation index was composed with three scales: defecation frequency per week, constipation assessment scale and constipation self-awareness. Fewer than three defecations per week was adjudicated as constipation based on the functional constipation definition of Rome Criteria. The mean of defecation frequency per week in pre-survey was 3.80 (SD = 2.68). The constipation assessment scale, originally consisting of 8 questions with three-level Likert, i.e. (1) No problem, (2) Some problem, (3) Severe problem, for measuring the defecation condition by McMillan and Williams.
(1989)\textsuperscript{24}, was modified to 10 questions with four-level Likert, i.e. (1) No problem, (2) Some problem, (3) Serious problem, (4) Absolute problem, according to Likert-Type Scale Response Anchors\textsuperscript{25–27}. The mean of constipation assessment scale in pre-survey was 2.23 (SD = 0.56). Cronbach’s alpha (\(\alpha\)) of the constipation assessment scale modified in present study was 0.84. Finally, constipation self-awareness was determined by one being aware that they have constipation, which was evaluated with four-level Likert, i.e. (0) Not aware, (1) Somewhat aware, (2) Usually aware, (3) Very much aware\textsuperscript{27}. The mean of constipation self-awareness in pre-survey was 1.81 (SD = 0.72).

Health index, consisting of 15 questions for measuring the daily physical and mental condition, was evaluated by using simple daily biorhythmic health check\textsuperscript{28} developed by Daewoong pharmaceutical company. The score range of measure was one to fifteen, and the higher the score, the better the condition of body and mind. The mean of health index in pre-survey was 5.83 (SD = 2.72). Cronbach’s alpha (\(\alpha\)) of this health scale in present study was 0.73.

5. Statistical analysis

The statistical analyses of the collected data were performed by using SPSS 20. The unit non-responses of six dropouts and the item non-responses of participants in both surveys were imputed by regression imputation for missing values.

First and foremost, frequencies and descriptive statistics were performed to analyze the characteristics of participants (Table 1). Secondly, multiple linear regression using stepwise variable selection method was performed to evaluate the risk factors on constipation and health with lifestyle index, BMI and stress index obtained in pre-survey (Table 2). Thereafter, paired samples t-test was performed to evaluate the effect of 7-day naturopathic activities by comparing regression estimated mean of pre-to-post constipation index and health index (Table 3). Finally, analysis of covariance (ANCOVA) and multiple linear regression were performed to analyze the effect of 7-day naturopathic activities and main effector of lifestyle index on constipation care and health promotion after controlling for the scales in pre-survey (Table 4s).

III Results

1. Characteristics of the participants (Table 1)

Most of participants are 17 (85.5%) and 16 (10.9%) years old. Most (96.4%) of participants are living at home with their family. In the case of lifestyle index, average sleeping time was 5.80 hrs. The frequency of having breakfast per week was 1.99. Portion of school feeding was one or more times in 92.1%. Eating speed was 13.9 min, and fast 33.3% in their own opinion. The frequency of snack per week was 2.77, and below normal 47.1% in their own opinion. The picky eating habits were above normal 17.4% in their own opinion. Favorite foods were cookie and bread 47.8%, fruit and vegetable 31.9%. The volume of daily water intake was 4.28 cups, and below normal 41.3% in their own opinion. The amount of exercise per day was 20.65 min, and below normal 55.8% in their own opinion. As for BMI, participants were in normal weight 71.7%, underweight 20.3%, overweight 5.1% and obesity 2.9%. In the score of stress index, school stress was 2.90, self-stress 2.78, circumstances stress 2.49, home stress 2.23, and relationship stress 2.11 in order.

2. Risk factors on constipation index and health index (Table 2)

Constipation and health were significantly influenced by lifestyle and stress. The risk factors on the defecation frequency per week was daily water intake (\(p=0.010\)), of which unstandardized coefficients (B) was 0.819. The risk factors on constipation assessment scale were favorite foods (\(p=\)
### Table 1  Characteristics of the participants  \((n=138)\)

| Category                                                                 | Mean±SD or n (%) |
|--------------------------------------------------------------------------|------------------|
| **Age**                                                                  |                  |
| 15                                                                       | 2 (1.4)          |
| 16                                                                       | 15 (10.9)        |
| 17                                                                       | 118 (85.5)       |
| 18                                                                       | 3 (2.2)          |
| **Living**                                                               |                  |
| at home with family                                                      | 133 (96.4)       |
| at relative’s house                                                      | 1 (0.7)          |
| at others                                                                | 4 (2.9)          |
| **Lifestyle**                                                            |                  |
| Sleeping time (hr)                                                       | 5.80±0.88        |
| Frequency of having breakfast per week                                   | 1.99±1.16        |
| Portion of school feeding                                               |                  |
| <1/3                                                                     | 7 (4.7)          |
| 1/2                                                                      | 4 (2.9)          |
| 1.0                                                                      | 63 (45.7)        |
| >1.5                                                                     | 64 (46.4)        |
| Eating speed (min)                                                       | 13.9±6.0         |
| Eating speed                                                             |                  |
| slow                                                                     | 16 (11.6)        |
| normal                                                                   | 76 (55.1)        |
| fast                                                                     | 46 (33.3)        |
| Frequency of snack per week                                             | 2.77±1.66        |
| Snacking habits                                                          |                  |
| below normal                                                             | 65 (47.1)        |
| normal                                                                   | 48 (34.8)        |
| above normal                                                             | 25 (18.1)        |
| Picky eating habits                                                      |                  |
| below normal                                                             | 52 (37.7)        |
| normal                                                                   | 62 (44.9)        |
| above normal                                                             | 24 (17.4)        |
| Favorite foods                                                           |                  |
| meat                                                                     | 23 (16.6)        |
| cookie and bread                                                         | 66 (47.8)        |
| fruit and vegetable                                                      | 44 (31.9)        |
| others                                                                   | 5 (3.6)          |
| Volume of daily water intake (cup)                                       | 4.28±3.95        |
| Daily water intake                                                       |                  |
| below normal                                                             | 57 (41.3)        |
| normal                                                                   | 62 (44.9)        |
| above normal                                                             | 19 (13.7)        |
| Amount of exercise per day (min)                                         | 20.65±13.41      |
| Exercise per day                                                         |                  |
| below normal                                                             | 77 (55.8)        |
| normal                                                                   | 50 (36.2)        |
| above normal                                                             | 11 (8.0)         |
| BMI                                                                       |                  |
| <18.5                                                                    | (underweight) 28 (20.3) |
| 18.5–22.9                                                                | (normal weight) 99 (71.7) |
| 23.0–24.9                                                                | (overweight) 7 (5.1) |
| 25.0–29.9                                                                | (obesity I) 3 (2.2) |
| >30.0                                                                    | (obesity II) 1 (0.7) |
| **Stress**                                                                |                  |
| School stress                                                            | 2.90±0.62        |
| Relationship stress                                                      | 2.11±0.48        |
| Self stress                                                              | 2.78±0.65        |
| Circumstances stress                                                     | 2.49±0.54        |
| Home stress                                                              | 2.23±0.65        |
Table 2  Risk factors of lifestyle index, BMI and stress index on constipation index and health index

| Lifestyle index | Defecation frequency per week | Constipation assessment scale | Constipation self awareness | Health index |
|-----------------|-------------------------------|-------------------------------|----------------------------|--------------|
|                 | $B$ | $\beta^b$ | $t$ | $p$ | $B$ | $\beta^b$ | $t$ | $p$ | $B$ | $\beta^b$ | $t$ | $p$ | $B$ | $\beta^b$ | $t$ | $p$ |
| Sleeping time (hr) | 0.024 | 0.281 | 0.779 | -0.078 | -0.942 | 0.348 | -0.092 | -0.963 | 0.337 | 0.135 | 1.638 | 0.104 |
| Frequency of having breakfast per week | -0.065 | -0.774 | 0.440 | 0.050 | 0.610 | 0.543 | -0.042 | -0.479 | 0.632 | 0.044 | 0.534 | 0.594 |
| Portion of school feeding | 0.009 | 0.107 | 0.915 | -0.012 | -0.146 | 0.884 | 0.102 | 1.124 | 0.263 | 0.025 | 0.307 | 0.759 |
| Eating speed (min) | -0.113 | -1.342 | 0.182 | 0.126 | 1.535 | 0.127 | 0.034 | 0.332 | 0.740 | -0.150 | -1.799 | 0.074 |
| Eating speed | 0.109 | 1.311 | 0.192 | -0.066 | -0.795 | 0.428 | 0.012 | 0.124 | 0.902 | 0.010 | 0.117 | 0.907 |
| Frequency of snack per week | 0.040 | 0.479 | 0.633 | 0.035 | 0.412 | 0.681 | 0.080 | 0.530 | 0.597 | -0.384 | -0.231 | -2.841 | 0.005 **|
| Snacking habits | 0.051 | 0.610 | 0.543 | 0.041 | 0.482 | 0.630 | -0.168 | -1.095 | 0.276 | 0.199 | 1.441 | 0.152 |
| Picky eating habits | -0.048 | -0.574 | 0.567 | 0.151 | 1.810 | 0.073 | -0.086 | -0.890 | 0.375 | -0.105 | -1.270 | 0.206 |
| Favorite foods | 0.017 | 0.203 | 0.839 | -0.158 | -0.214 | -2.800 | 0.111 * | 0.086 | 0.930 | 0.354 | -0.010 | -0.117 | 0.907 |
| Volume of daily water intake (cup) | 0.114 | 1.057 | 0.292 | 0.046 | 0.555 | 0.580 | -0.113 | -0.905 | 0.367 | 0.138 | 0.196 | 2.419 | 0.017 *|
| Daily water intake | 0.819 | 0.218 | 2.602 | 0.010 * | -0.036 | -0.428 | 0.669 | 0.100 | 0.834 | 0.406 | 0.059 | 0.556 | 0.579 |
| Amount of exercise per day (min) | 0.061 | 0.718 | 0.474 | -0.007 | -0.064 | 0.949 | 0.039 | 0.351 | 0.726 | -0.005 | -0.049 | 0.961 |
| Exercise per day | 0.090 | 1.064 | 0.289 | -0.193 | -0.222 | -2.675 | 0.008 ** | 0.068 | 0.603 | 0.547 | 0.817 | 0.090 | 2.342 | 0.021 *|

adjusted $R^2=0.040$ F=6.769 *  adjusted $R^2=0.071$ F=6.202 *  adjusted $R^2=-0.028$ F=0.710  adjusted $R^2=0.103$ F=6.226 *

BMI

|                      | adjusted $R^2=0.000$ F=1.017 | adjusted $R^2=-0.006$ F=0.195 | adjusted $R^2=0.020$ F=3.752 |
|----------------------|-------------------------------|-------------------------------|-------------------------------|
|                      | $0.044$ | $1.008$ | $0.315$ | $0.009$ | $0.318$ | $0.751$ | $0.012$ | $0.442$ | $0.659$ | $0.046$ | $1.937$ | $0.055$ |

Stress index

|                      | adjusted $R^2=-0.005$ F=0.852 | adjusted $R^2=0.040$ F=6.040 * | adjusted $R^2=-0.007$ F=0.820 | adjusted $R^2=0.201$ F=18.250 *** |
|----------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| School stress        | -0.084 | -0.769 | 0.443 | 0.254 | 0.216 | 2.577 | 0.011 * | -0.118 | -1.077 | 0.283 | -1.238 | -0.278 | -3.339 | 0.001 *** |
| Relationship stress  | -0.096 | -0.898 | 0.371 | 0.126 | 1.311 | 0.192 | 0.094 | 0.881 | 0.380 | 0.058 | 0.656 | 0.513 |
| Self-stress          | 0.144 | 1.147 | 0.253 | 0.070 | 0.700 | 0.485 | 0.130 | 1.041 | 0.300 | -0.098 | -0.962 | 0.338 |
| Circumstances stress | -0.131 | -1.096 | 0.275 | 0.024 | 0.256 | 0.798 | -0.047 | -0.392 | 0.696 | 0.136 | 1.339 | 0.183 |
| Home stress          | 0.010 | 0.084 | 0.933 | 0.065 | 0.738 | 0.462 | -0.120 | -1.060 | 0.291 | -1.175 | -0.274 | -3.289 | 0.001 ** |

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*a The collected data was analyzed by multiple linear regression using stepwise variable selection method.

*b The coefficient of excluded variables in the computation was marked with only standardized $\beta$ without unstandardized B.

*p < 0.05, **p < 0.01, ***p < 0.001
0.011), exercise per day (p = 0.008) and school stress (p = 0.011), of which standardized coefficients (β) were -0.214, -0.222 and 0.216, respectively. The risk factors on health index were the frequency of snack per week (p = 0.005), the volume of daily water intake (p = 0.017), exercise per day (p = 0.021), school stress (p = 0.001) and home stress (p = 0.001), of which standardized coefficients (β) were -0.231, 0.196, 0.090, -0.278 and -0.274, respectively.

3. Effect of 7-day naturopathic activities (Table 3, 4s)

7-day naturopathic activities made significant decrease in regression estimated mean of constipation assessment scale (p = 0.012) and significant increase in regression estimated mean of health index (p = 0.016) (Table 3). The decrease of constipation assessment scale in paired samples t-test was significantly influenced by the volume of daily water intake (p = 0.013) of lifestyle index, of which effect size (ɳ²) was 0.151, observed power 0.294 and unstandardized B 0.198 (Table 4–2). However, the increase of health index in paired samples t-test was not significantly influenced by lifestyle index (Table 4–4). Meanwhile, 7-day naturopathic activities did not make significant fluctuation in regression estimated mean of defecation frequency per week and constipation self-awareness between the pre-survey and the post-survey (Table 3). Even so, defecation frequency per week appeared to be influenced by the volume of daily water intake (p = 0.034) (Table 4–1), and constipation self-awareness appeared to be influenced by some effectors, i.e. the frequency of having breakfast per week (p = 0.001), eating speed (p = 0.008), the frequency of snack per week (p = 0.030), favorite foods (p = 0.025) and the amount of exercise per day (min) (p = 0.038) (Table 4–3).

IV Discussion

This study ultimately aimed to show the applicability of naturopathic activities composed with three elements, i.e. exercise, water intake and abdomen-massage, with simple and daily health-promotive behavior modification on constipation and health.

1. Characteristics of the participants

Exercise and water intake among the characteristics of the participants are related with three major common causes of constipation. In present study, the amount of exercise per day was 20.65 min, and below normal 55.8% in their own opinion.

| Table 3 | Pre-to-post comparison of constipation index and health index |
|---------|---------------------------------------------------------------|
|         | Regression estimated mean (SD)       | n    | Change (%) | t     | p     |
| Defecation frequency per week | Pre–survey | 3.80 (2.68) | 138 | 97.63 | 0.335 | 0.738 |
|         | Post–survey | 3.71 (2.53) | 138* |         |       |       |
| Constipation assessment scale | Pre–survey | 2.23 (0.56) | 138 | 92.83 | 2.532 | 0.012* |
|         | Post–survey | 2.07 (0.55) | 138* |         |       |       |
| Constipation self-awareness | Pre–survey | 1.81 (0.72) | 138 | 101.68 | -0.425 | 0.672 |
|         | Post–survey | 1.84 (0.69) | 138* |         |       |       |
| Health index | Pre–survey | 5.83 (2.77) | 138 | 113.55 | -2.446 | 0.016* |
|         | Post–survey | 6.62 (3.11) | 138* |         |       |       |

* The unit non–responses, six dropouts were imputed by regression imputation for missing values, thus the subjects were converted from n = 132 to n = 138.

* p < 0.05
The volume of daily water intake was 4.28 cups, and below normal 41.3% in their own opinion. According to other studies, over 50% of high school girls in Korea took exercise only during physical education class and did not consume adequate amounts of water \( (p < 0.05) \)\(^{14} \). Furthermore, many high school students in Korea are replacing water with soda pop or soft drinks\(^{29} \). These can cause constipation symptom such as irregular defecating \( (p < 0.01) \), defecating frequency decrease \( (p < 0.01) \), long defecating time \( (p < 0.01) \), difficult defecation \( (p < 0.01) \) and defecating residue \( (p < 0.01) \)\(^{14} \). These

### Table 4-1 Main effector of lifestyle index on defecation frequency per week

| Source                              | Type III Sum of Squares | df | F   | \( p^0 \) | Partial Eta Squared | Observed\(^b \) Power | B     | t    | \( p^c \) |
|-------------------------------------|-------------------------|----|-----|---------|---------------------|-----------------------|-------|------|---------|
| Corrected Model                     | 644.719                 | 103| 0.925 | 0.628   | 0.737               | 0.740                 |
| Intercept                           | 0.824                   | 1  | 0.122| 0.729   | 0.004               | 0.063                 |
| Pre–Defecation frequency per week   | 5.837                   | 1  | 0.863| 0.360   | 0.025               | 0.147                 | 0.161 | 1.896| 0.060   |
| Sleeping time (hr)                  | 5.907                   | 3  | 0.291| 0.832   | 0.025               | 0.100                 | 0.231 | 0.849| 0.398   |
| Frequency of having breakfast per week | 30.586                | 3  | 1.507| 0.230   | 0.117               | 0.361                 | 0.110 | 0.579| 0.563   |
| Portion of school feeding           | 6.529                   | 2  | 0.482| 0.621   | 0.028               | 0.122                 | 0.007 | 0.024| 0.981   |
| Eating speed (min)                  | 141.445                 | 13 | 1.608| 0.131   | 0.381               | 0.728                 | -0.018| -0.420| 0.675   |
| Eating speed                        | 24.311                  | 2  | 1.796| 0.181   | 0.096               | 0.349                 | 0.426 | 1.118| 0.266   |
| Frequency of snack per week         | 86.061                  | 7  | 1.817| 0.116   | 0.272               | 0.637                 | -0.074| -0.324| 0.747   |
| Snacking habits                     | 6.900                   | 2  | 0.510| 0.605   | 0.029               | 0.127                 | -0.162| -0.319| 0.751   |
| Picky eating habits                 | 10.812                  | 2  | 0.799| 0.458   | 0.045               | 0.175                 | 0.606 | 1.796| 0.075   |
| Favorite foods                      | 31.252                  | 6  | 0.770| 0.599   | 0.120               | 0.202                 | 0.102 | 0.336| 0.737   |
| Volume of daily water intake (cup)  | 32.230                  | 12 | 0.397| 0.955   | 0.123               | 0.181                 | -0.102| -1.279| 0.203   |
| Volume of daily water intake        | 50.427                  | 2  | 3.726| 0.034*  | 0.180               | 0.643                 | 0.320 | 0.756| 0.451   |
| Amount of exercise per day (min)    | 149.380                 | 29 | 0.761| 0.772   | 0.394               | 0.475                 | 0.011 | 0.525| 0.600   |
| Amount of exercise per day          | 1.880                   | 2  | 0.139| 0.871   | 0.008               | 0.070                 | -0.273| -0.625| 0.533   |
| Error                               | 230.076                 | 34 |      |         |                     |                       |       |      |         |
| Total                               | 2771.981                | 138|      |         |                     |                       |       |      |         |
| Corrected Total                     | 874.796                 | 137|      |         |                     |                       |       |      |         |

Adjusted \( R^2 = 0.737 \) Adjusted \( R^2 = 0.060 \)

*The value was analyzed by analysis of covariance (ANCOVA).

\(^b\)The value was computed by using alpha = 0.05.

\(^c\)The value was analyzed by multiple linear regression.

\(^*\) \( p < 0.05 \)
findings suggest that the expansion of physical education class and health education for students is necessary at school.

2. Risk factors on constipation index and health index

In other studies, constipation did not have significant correlation with obesity (p=0.81) and stress awareness (p=0.07). In this study, constipation and health were influenced by lifestyle and stress more than BMI. The risk factors on constipation index were daily water intake (p=0.010), favorite foods (p=0.011), exercise per day (p=0.008) and

| Source                                    | Type III Sum of Squares | df | F   | p   | Partial η Squared | Observed Power | B   | t   | p   |
|-------------------------------------------|-------------------------|----|-----|-----|-------------------|----------------|-----|-----|-----|
| Corrected Model                           | 27.529                  | 103| 0.670| 0.936 | 0.670             | 0.544          |
| Intercept                                 | 2.003                   | 1  | 5.020| 0.032 | 0.129             | 0.586          |
| Pre-Constipation assessment scale          | 0.977                   | 1  | 2.449| 0.127 | 0.067             | 0.330          | 0.132| 1.480| 0.141|
| Sleeping time (hr)                        | 0.667                   | 3  | 0.557| 0.647 | 0.047             | 0.152          | 0.016| 0.272| 0.786|
| Frequency of having breakfast per week    | 0.476                   | 3  | 0.398| 0.755 | 0.034             | 0.120          | 0.009| 0.229| 0.819|
| Portion of school feeding                 | 0.499                   | 2  | 0.625| 0.541 | 0.035             | 0.146          | -0.039| -0.665| 0.507|
| Eating speed (min)                        | 3.967                   | 13 | 0.765| 0.689 | 0.226             | 0.359          | -0.015| -1.671| 0.097|
| Eating speed                              | 0.131                   | 2  | 0.164| 0.849 | 0.010             | 0.073          | -0.064| -0.789| 0.431|
| Frequency of snack per week               | 2.392                   | 7  | 0.856| 0.550 | 0.150             | 0.311          | 0.021| 0.431| 0.667|
| Snacking habits                           | 0.488                   | 2  | 0.611| 0.548 | 0.035             | 0.143          | -0.152| -1.394| 0.166|
| Picky eating habits                       | 0.115                   | 2  | 0.145| 0.866 | 0.008             | 0.070          | -0.089| -1.223| 0.224|
| Favorite foods                            | 0.904                   | 6  | 0.378| 0.888 | 0.062             | 0.141          | -0.035| -0.528| 0.598|
| Volume of daily water intake (cup)        | 1.531                   | 12 | 0.320| 0.981 | 0.101             | 0.150          | -0.016| -0.912| 0.363|
| Volume of daily water intake              | 0.725                   | 2  | 4.908| 0.013*| 0.151             | 0.294          | 0.198| 2.184| 0.031*|
| Amount of exercise per day (min)          | 7.611                   | 29 | 0.658| 0.873 | 0.359             | 0.405          | -0.006| -1.375| 0.171|
| Amount of exercise per day                | 1.879                   | 2  | 2.355| 0.110 | 0.122             | 0.444          | 0.041| 0.433| 0.666|
| Error                                     | 13.567                  | 34 |      |      |                   |                |      |      |      |
| Total                                     | 631.750                 | 138|      |      |                   |                |      |      |      |
| Corrected Total                           | 41.096                  | 137|      |      |                   |                |      |      |      |

*The value was analyzed by analysis of covariance (ANCOVA).

b The value was computed by using alpha = 0.05.

* The value was analyzed by multiple linear regression.

*p < 0.05
school stress ($p = 0.011$). In sorting for constipation, lifestyle index had similar standardized coefficients ($\beta$) with stress index. Meanwhile, the risk factors on health index were the frequency of snack per week ($p = 0.005$), the volume of daily water intake ($p = 0.017$), exercise per day ($p = 0.021$), school stress ($p = 0.001$) and home stress ($p = 0.001$). In sorting for health, stress index had stronger strength than lifestyle index in standardized coefficients ($\beta$). These results support that common causes of constipation are not enough fiber in diet, not enough liquids, lack of exercise\textsuperscript{8,9,10}, and

### Table 4–3 Main effector of lifestyle index on constipation self-awareness

| Source                                           | Type III Sum of Squares | df | F  | $p^a$ | Partial Eta Squared | Observed\textsuperscript{b} Power | B    | t     | $p^c$ |
|--------------------------------------------------|-------------------------|----|----|-------|---------------------|-----------------------------------|------|-------|-------|
| Corrected Model                                  | 54.785                  | 103| 1.746 | 0.033 | 0.841               | 0.982                             |      |       |       |
| Intercept                                        | 8.070                   | 1  | 26.486 | 0.000 | 0.438               | 0.999                             |      |       |       |
| Pre-Constipation self-awareness                  | 0.000                   | 1  | 0.001 | 0.974 | 0.000               | 0.050                             | 0.029 | 0.340 | 0.734 |
| Sleeping time (hr)                               | 1.492                   | 3  | 1.632 | 0.200 | 0.126               | 0.389                             | -0.051 | -0.686 | 0.494 |
| Frequency of having breakfast per week           | 6.471                   | 3  | 7.079 | 0.001**| 0.384               | 0.967                             | -0.015 | -0.290 | 0.772 |
| Portion of school feeding                        | 0.253                   | 2  | 0.414 | 0.664 | 0.024               | 0.112                             | 0.031 | 0.418 | 0.676 |
| Eating speed (min)                               | 6.902                   | 13 | 1.743 | 0.096 | 0.400               | 0.771                             | 0.005 | 0.425 | 0.672 |
| Eating speed                                     | 3.441                   | 2  | 5.647 | 0.008**| 0.249               | 0.828                             | 0.025 | 0.240 | 0.811 |
| Frequency of snack per week                      | 5.526                   | 7  | 2.591 | 0.030* | 0.348               | 0.816                             | 0.108 | 1.741 | 0.084 |
| Snacking habits                                   | 1.445                   | 2  | 2.372 | 0.109 | 0.122               | 0.446                             | -0.134 | -0.968 | 0.335 |
| Picky eating habits                               | 0.944                   | 2  | 1.550 | 0.227 | 0.084               | 0.306                             | 0.084 | 0.912 | 0.364 |
| Favorite foods                                    | 5.124                   | 6  | 2.803 | 0.025* | 0.331               | 0.814                             | 0.197 | 2.381 | 0.019*|
| Volume of daily water intake (cup)               | 4.815                   | 12 | 1.317 | 0.254 | 0.317               | 0.600                             | 0.014 | 0.672 | 0.503 |
| Volume of daily water intake                     | 1.067                   | 2  | 1.750 | 0.189 | 0.093               | 0.341                             | -0.204 | -1.781 | 0.077 |
| Amount of exercise per day (min)                 | 16.723                  | 29 | 1.893 | 0.038* | 0.617               | 0.937                             | -0.001 | -0.164 | 0.870 |
| Amount of exercise per day                       | 0.359                   | 2  | 0.589 | 0.560 | 0.034               | 0.140                             | 0.083 | 0.700 | 0.485 |
| Error                                            | 10.360                  | 34 |      |      |                    |                                   |      |       |       |
| Total                                            | 535.770                 | 138 |      |      |                    |                                   |      |       |       |
| Corrected Total                                  | 65.145                  | 137 |      |      |                    |                                   |      |       |       |

\textsuperscript{a}The value was analyzed by analysis of covariance (ANCOVA).
\textsuperscript{b}The value was computed by using alpha $= 0.05$.
\textsuperscript{c}The value was analyzed by multiple linear regression.
\textsuperscript{*}p < 0.05, \textsuperscript{**}p < 0.01
that health is influenced by mental action as well as physical action. Furthermore, these results showed that constipation and health are not the action of a single factor but the interaction of the various factors, and that lifestyle modification is necessary in constipation care and health promotion.

These are connected to the fact that the average rate of the stress awareness among high school students is 49.9% (boys 44.0%, girls 56.6%), and the higher the grade, the higher the stress awareness rate. In addition, the stress levels among high school students in Korea are annually increasing due to the educational environment that mainly focuses on school records and college entrance exams. Thus, high school students in Korea are suffering from not only psychiatric problems but

| Source                                    | Type III Sum of Squares | df | F     | pα | Partial Eta Squared | Observed Power | B     | t     | pβ  |
|-------------------------------------------|-------------------------|----|-------|----|---------------------|----------------|-------|-------|-----|
| Corrected Model                           | 1056.253                | 103| 1.297 | 0.196 | 0.797               | 0.910          |
| Intercept                                 | 17.627                  | 1  | 2.229 | 0.145 | 0.062               | 0.306          |
| Pre–Health index                          | 2.748                   | 1  | 0.347 | 0.559 | 0.010               | 0.088          | 0.128 | 1.204 | 0.231 |
| Sleeping time (hr)                        | 12.140                  | 3  | 0.512 | 0.677 | 0.043               | 0.143          | 0.355 | 1.049 | 0.296 |
| Frequency of having breakfast per week    | 47.339                  | 3  | 1.995 | 0.133 | 0.150               | 0.468          | 0.090 | 0.382 | 0.703 |
| Portion of school feeding                 | 14.393                  | 2  | 0.910 | 0.412 | 0.051               | 0.194          | 0.255 | 0.757 | 0.451 |
| Eating speed (min)                        | 111.527                 | 13 | 1.085 | 0.403 | 0.293               | 0.515          | −0.081| −1.514| 0.132 |
| Eating speed                              | 15.940                  | 2  | 1.008 | 0.376 | 0.056               | 0.211          | −0.099| −0.210| 0.834 |
| Frequency of snack per week               | 45.787                  | 7  | 0.827 | 0.572 | 0.145               | 0.300          | −0.077| −0.268| 0.789 |
| Snacking habits                           | 12.285                  | 2  | 0.777 | 0.468 | 0.044               | 0.171          | 0.142 | 0.226 | 0.822 |
| Picky eating habits                       | 1.822                   | 2  | 0.115 | 0.892 | 0.007               | 0.066          | −0.031| −0.075| 0.940 |
| Favorite foods                            | 73.167                  | 6  | 1.542 | 0.195 | 0.214               | 0.515          | −0.190| −0.507| 0.613 |
| Volume of daily water intake (cup)        | 97.182                  | 12 | 1.024 | 0.450 | 0.265               | 0.470          | 0.116 | 1.163 | 0.247 |
| Volume of daily water intake              | 12.221                  | 2  | 0.773 | 0.470 | 0.043               | 0.171          | −0.252| −0.483| 0.630 |
| Amount of exercise per day (min)          | 320.900                 | 29 | 1.399 | 0.173 | 0.544               | 0.815          | −0.041| −1.606| 0.111 |
| Amount of exercise per day                | 35.324                  | 2  | 2.233 | 0.123 | 0.116               | 0.424          | 0.439 | 0.804 | 0.423 |
| Error                                     | 268.903                 | 34 |       |      |                     |                |
| Total                                     | 7378.321                | 138|       |      |                     |                |
| Corrected Total                           | 1325.156                | 137|       |      |                     |                |

\[\text{adjusted } R^2 = 0.182\quad \text{adjusted } R^2 = 0.016\]

\(^a\) The value was analyzed by analysis of covariance (ANCOVA).
\(^b\) The value was computed by using alpha = 0.05.
\(^c\) The value was analyzed by multiple linear regression.
also many physical problems resulting from stress\(^3\). These various daily stressors can cause serious physiological, psychiatric and behavioral disorders if stress-coping mechanisms are not properly applied\(^5\). Since how to cope with adolescent stress has great influence on adolescent development and adulthood lifestyle, these results suggest that school health education for adolescents should include knowledge and skills for stress management.

3. **Effect of 7-day naturopathic activities**

During the implementation of 7-day naturopathic activities, the practice rate assessed by participants themselves was 42.1% (SD = 16.1) in total, 52.2% (SD = 15.6) for abdomen massage, 39.5% (SD = 18.7) for water intake, and 34.7% (SD = 12.8) for kingyo undo and mokan undo. Participants thought that the most effective method was abdomen massage 51.9%, followed by water intake 35.6%, and kingyo undo and mokan undo 17.1% (data not shown). These results seem to reflect that participants prefer simple and easy methods, and suggest that the best policy for adolescents' naturopathic activities had better to be simple and easy to practice by oneself.

7-day naturopathic activities made significant decrease in regression estimated mean of constipation assessment scale \((p = 0.012)\) and significant increase in regression estimated mean of health index \((p = 0.016)\) (Table 3). The decrease of constipation assessment scale in paired samples t-test was significantly influenced by the volume of daily water intake \((p = 0.013)\) of lifestyle index, of which effect size \((\eta^2)\) was 0.151, observed power 0.294 and unstandardized B 0.198 (Table 4-2). However, the increase of health index in paired samples t-test was not significantly influenced by lifestyle index (Table 4-4). This may be because stress index was apt to have relatively stronger influence than lifestyle index as the influence factor on health (Table 2). It is inferred that 7-day naturopathic activities may directly have statistically significant influence on the constipation assessment scale through lifestyle, and may indirectly have influence on health index through connecting with stress reduction. This inference has relevance to the study of Wald et al.\(^1\) that the impact of constipation is not only functional limitation in everyday life but also mental suffering and the decline of health-related QOL.

7-day naturopathic activities did not make significant fluctuation in regression estimated mean of defecation frequency per week and constipation self-awareness between the pre-survey and the post-survey (Table 3). Even so, defecation frequency per week appeared to be influenced by the volume of daily water intake \((p = 0.034)\) (Table 4-1), and constipation self-awareness appeared to be influenced by some effectors, i.e. the frequency of having breakfast per week \((p = 0.001)\), eating speed \((p = 0.008)\), the frequency of snack per week \((p = 0.030)\), favorite foods \((p = 0.025)\) and the amount of exercise per day (min) \((p = 0.038)\) (Table 4-3). This may be associated with the shortage of information and misconception about constipation, i.e. that defecation every day is necessary\(^8\). Actually in this study, the case of self-diagnosing with constipation despite not being constipated by constipation assessment scale increased from 6.5% in pre-survey to 9.9% in post-survey \((p < 0.001)\). On the contrary, the case of self-diagnosing without constipation despite being constipated by constipation assessment scale decreased from 34.1% in pre-survey to 27.3% in post-survey \((p < 0.001)\) (data not shown). These are connected with other studies that 47.4% of high school girls and 56.6% high school senior girls diagnosed themselves with constipation\(^5,14\), and suggest that health education for accurate diagnosis of constipation is necessary at school.
4. Limitations and options

This uncontrolled intervention study has some limitations; constraint on inferring causality of the effect of 7–day naturopathic activities on constipation and health without control group, difficulty in finding the factors affecting constipation and health, necessity to analyze the long term influence as well as the short term influence of 7–day naturopathic activities, and possibility of the error by the self–reported survey through individual memory and feeling.

Among these limitations, constraint on inferring causality of the effect of 7–day naturopathic activities is considered to be related to the number of participants, which is generally required about five to ten times as large as the number of questions. In this study, the stress awareness scale with 50 questions was the obstacle in statistical analyzing. Moreover difficulty in finding the factors affecting constipation and health is considered to be related to the one group pretest–posttest design in this study. In addition, necessity to analyze the long term influence of naturopathic activities is considered to be related to the no–effect on defeation frequency per week and constipation self–awareness. For these reasons, 7–day naturopathic activities are considered to make the narrow effect and low adjusted R square of the analytic model.

In spite of these limitations, this study has the following significance and suggestions. First, during the implement of 7–day naturopathic activities, the participants have changed their attitude toward constipation and health. That is, the results showed a positive change in selection for constipation care. Inclination toward exercise increased from 35.5% to 47.0%, water intake from 33.3% to 34.8%, the laxative pills decreasing from 14.5% to 12.9%, and others from 16.7% to 5.3% (data not shown). Second, 7–day naturopathic activities in present study might have a beneficial influence on constipation and health, and suggested the applicability of naturopathy for constipation care, health promotion, self–health care, and further for improving health–related QOL.

Popularizing naturopathy, of course, requires the scientific, experimental tests and statistical analyses. Naturopathy has to take the cooperation with conventional medicine into consideration. Lee (2008) defined that naturopathy pursuits not only physical treatment but also mental, social and environmental holistic–cure through various medical resources to improve immunity and resilience, including promoting health, preventing disease, curing and healing by all available medical systems such as modern medicine, oriental medicine, traditional medicine, holistic medicine, complementary alternative medicine, racial medicine, and so on. Furthermore, naturopathy is the part of promoting health, preventing disease, and curing and healing by improving natural healing power. This definition is connected to the WHO’s definition regarding traditional medicine as medical resources, namely, that traditional medicine is the comprehensive knowledge and activity used in diagnosis and prevention of physical, mental and social imbalance whether it is available or not for treatment, and traditional medicine is the medicine wholly depending on actual experiment and observation having been handed down by document or orally.

V Conclusion

The results of present study propose the followings. Constipation and health were significantly influenced by lifestyle and stress. The risk factors on constipation were daily water intake, favorite foods, exercise per day, and school stress. The risk factors on health were the frequency of snack per week, the volume of daily water intake, exercise per day, school stress and home stress. The 7–day naturopathic activities, which were composed with
exercise, drinking water and abdomen massage, directly had significant effect on constipation, and might indirectly have effect on health through connecting with stress reduction. These findings suggest the applicability of naturopathy for constipation care and health promotion.

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The Impact of Naturopathic Activities on Constipation and Health Promotion of High School Girls in Korea

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和文抄録

目的：本研究の目的は、韓国の女子高校生の便秘と健康への影響要因と、7日間の自然治療活動が便秘と健康に及ぼす影響を調査分析することである。

方法：非対照介入試験である本研究では、韓国・富川市の公立高校1年生の女子高生138人を対象者に自己報告調査に基づき、便秘と健康への影響要因を分析した。また7日間の自然治療活動後に同じ調査を行い、便秘指標と健康指標から便秘と健康への効果を分析した。一連の統計処理にはANCOVAと重回帰分析を用いた。

結果：生活習慣とストレスは、便秘と健康に統計学的に有意な影響を及ぼした。便秘への影響要因は、1日当たりの水分摂取（p<0.01）, 好きな食べ物（p<0.01）, 1日当たりの運動（p<0.008）, 学校でのストレス（p<0.01）であった。健康への影響要因は、1週間当たりの間食の頻度（p<0.005）, 1日当たりの水分摂取量（p<0.017）, 1日当たりの運動（p<0.021）, 学校でのストレス（p<0.001）, 家でのストレス（p<0.001）であった。

7日間の自然治療活動により便秘評価尺度が有意に減少し（p<0.012）、その主な効果要因は1日当たりの水分摂取量であった（p<0.034）。また、この活動は健康指標を有意に増加させたが（p<0.016）、その主な効果要因は生活習慣ではなく、ストレスであると考えられた。一方、1週間当たりの排便回数や便秘の自己認識に有意な変動はみられなかった。

結論：以上の結果により、便秘と健康が生活習慣やストレスによって統計学的に有意に影響を受けており、また7日間の自然治療活動は便秘評価尺度の減少により便秘に直接もたらすものであり、ストレスの減少を通して健康にも間接的に影響をもたらした可能性があると提唱するものである。したがって、便秘改善と健康増進に対して自然治療活動が適用できる可能性を示唆している。