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Original article

Significance evaluation of Anti-Aging QOL Common Questionnaire

Yuko Oguma [1)], Kenji Iida [2)], Yoshikazu Yonei [3)], Toshihiko Satoh [4)]

1) Sports Medicine Research Center, Keio University, Kanagawa, Japan
2) Keio Research Institute at SFC, Keio University, Kanagawa, Japan
3) Anti-Aging Medical Research Center, Doshisha University, Kyoto, Japan
4) Graduate School of Social Informatics, Aoyama Gakuin University, Kanagawa, Japan

Abstract

***Objective*:** Questionnaires are used for a broad range of purposes, including the collection of inference materials for disease screening and diagnostic processes, the verification and interpretation of test results, and the choice of post-diagnostic interventions, as well as for the evaluation of the severity of certain diseases. The Japanese Society for Anti-Aging Medicine provides its members with the "Anti-Aging QOL Common Questionnaire" (hereinafter referred to as the "AAQOL Questionnaire") so as to help improve the quality of anti-aging medical checkups. The present study was conducted to verify the validity and efficacy of the AAQOL Questionnaire using data obtained using the questionnaire and the functional age data calculated through various tests, and to prepare for future revisions for more effective utilization.

***Methods and results*:** An analysis of data from 5,827 persons (3,364 men, mean age 55.4 ± 12.9 years; 2,463 women, 54.8 ± 13.7 years) who underwent anti-aging medical checkups for the first time at 30 facilities in Japan identified that the following items that tended to increase with aging in both sexes: 7 of 33 "physical symptom" items (palpitations, shortness of breath, gray hair, hair loss, tinnitus, arthralgia, and frequent urination) and 3 of 21 "mental symptom" items (shallow sleep, difficulty in falling asleep and lapse of memory). A factorial analysis of physical and mental symptoms, when the number of factors prescribed in 5, revealed that the former converged to 12 items, and the latter to 21 items. A Structural Equation Modeling (SEM) including four additional lifestyle factors (amount of smoking, amount of exercise, sleeping hours, and VDT screen gazing time) suggested that lifestyle-related items influence the body, and in turn influence mentality. Amount of exercise was identified as the most influential lifestyle item. An analysis for correlations between each of the five "physical symptom" and the five "mental symptom" factors and the five functional ages showed that the partial correlation coefficient was generally not so high, suggesting that it is difficult to estimate the functional ages only from the results obtained using the AAQOL Questionnaire. However, it is interesting to note that a relatively high correlation was found between hormone age / blood vessel age and some physical and mental symptom items and overall score; it is hoped that further investigations will yield new findings.

***Conclusion*:** The results from the present study suggested that the AAQOL Questionnaire is worth using in the field of antiaging medicine but has some points to modify. For further research, it will be necessary to set a definite goal and select items to focus on, and, if aiming to evaluate the influence of aging on QOL, it will also be necessary to consider the adoption of other health-related QOL rating scales.

***KEY WORDS*:** questionnaire, sign prevalence rate, functional age, correlation, aging, quality of life (QOL)

Introduction

Questionnaires are used for a broad range of purposes, including the collection of inference materials for disease screening and diagnostic processes, the verification and interpretation of test results, and the choice of post-diagnostic interventions, as well as the evaluation of the severity of certain diseases [1-8]. The Japanese Society for Anti-Aging Medicine provides its members with the "Anti-Aging QOL Common Questionnaire" (AAQOL Questionnaire) so as to help improve the quality of anti-aging medical checkups. The current version of the AAQOL Questionnaire consists of 33 questions items concerning physical symptoms, 21 questions items concerning mental symptoms (each evaluated on a 5-point scale), and lifestyle-related questions, such as sleep habits, exercise habits, smoking, and drinking. When questionnaire was made, items are arranged in consideration of the Theory

Corresponding to: Toshihiko Satoh, MD, PhD, MPH
Graduate School of Social Informatics, Aoyama Gakuin University,
Address: 5-10-1 Fuchinobe, Chuo-ku, Sagamihara, Kanagawa, Japan
TEL: +81-42-759-6115 E-mail: t_satoh@si.aoyama.ac.jp
Co-authors: Oguma Y, yoguma@keio.jp; Iida K, keniida@sfc.keio.ac.jp;
Yonei Y, yyonei@mail.doshisha.ac.jp

of Yin-Yang and the Five Elements.

The term anti-aging medical checkup refers to "a complete medical check-up focusing on assessing the degree of aging and an advanced form of the conventional *ningen dock* (annual health check-up)" [9,10], including tests for the early detection of signs and risk factors of senescence. Therefore, the AAQOL Questionnaire should be evaluated in terms of its associations with test data on the degree of senescence, i.e., blood vessel age, hormone age, muscle age, bone age, and other age parameters, as well as findings related to senescence risk factors, such as oxidative stress, mental and physical stress, immune function, glycative stress, lifestyle, and harmful heavy metal contents.

The present study was conducted by descriptive statistics to summarize the results of the AAQOL Questionnaire using data obtained via the questionnaire and functional age data calculated through various tests, to verify its adequancy and efficacy, and to prepare for future revisions for more effective utilization.

Methods

Subjects

The study population comprised 5,827 effective respondents (3,364 men, 55.4 ± 12.9 years [mean ± standard deviation]; 2,463 women, 54.8 ± 13.7 years) out of 6,016 persons (3,364 men and 2,652 women) who underwent anti-aging medical checkups for the first time at 30 facilities in Japan. Analysis data were handled with unlinkable anonymization.

Analytical procedures

1. Evaluation of sign prevalence rates by item- and age-related increasing tendencies

The AAQOL Questionnaire consists of 33 "physical symptom" items, 21 "mental symptom" items, and six "lifestyle" items [11,12]. For all symptom-related items, subjects were asked to answer questions on a 5-point scale (1. None, 2. Little, 3. Mild, 4. Moderate, 5. Severe). The proportion of respondents who answered 4 or 5 for each item was calculated as "sign prevalence rate" by sex and analyzed by chi-square test. Thereafter, the ratio was calculated by sex and age stratum (every 10 years) to examine for a tendency for the ratio to increase with aging by trend test for proportion.

2. Correlations between "physical symptom" items and "mental symptom" items

Correlations between the 33 "physical symptom" items and the 21 "mental symptom" items were evaluated for each pair with a bivariate analysis using partial correlation coefficient with age as the control variable.

3. Categorization of symptoms

A factorial analysis was performed on the 33 "physical symptom" items and the 21 "mental symptom" items to categorize these question items. Factors were identified using the maximum likelihood method in combination with varimax rotation. The extraction factor was set as 5 factors being conscious of the Theory of Yin-Yang and the Five Elements. When any of factor loading amounts was less than 0.4, data were eliminated and a re-analysis was conducted repeatedly.

4. Evaluation of causality for each category

Relationships between the "physical symptom" and "mental symptom" factors identified by factorial analysis and four lifestyle-related items, *i.e.*, amount of smoking (/day), amount of exercise (day/week), sleeping hours (hour/day), and visual display terminal (VDT) screen gazing time (hour/day) were analyzed using a covariance structure analysis known as structural equation modeling (SEM). As a results of preliminary analysis, "water intake" and "alcohol drinking amounts" were excluded from lifestyle-related items of the questionnaire. Model fitting was determined using the comparative fit index (CFI), goodness of fit index (GFI), degree of freedom-adjusted goodness of fit index adjusted GFI (AGFI), and root mean error of approximation (RMSEA). The model was judged as being fitting when the following criteria were met: CFI, (GFI), and AGFI > 0.90 and RMSEA < 0.05. The notation of each index is as follows. CFI: An index combining the Bentler-Bonett normed fit index (NFI) (influenced by the number of cases) and the Tucker-Levis index (TLI) (sometimes deviating from the range 0-1) with corrections of their drawbacks; the goodness increases as this index approaches 1. GFI/AGFI: An index that can be interpreted like R^2 (coefficient of determination) in regression analysis. The GFI ranges from 0 to 1, and is desirably not lower than 0.9. AGFI can be interpreted like adjusted R^2 in regression analysis, working to correct GFI drawbacks and exert penalties on complex models with multiple parameters. Although the AGFI is smaller than GFI, GFI and AGFI have similar values if the model is not complex. RMSEA is an index of the difference between the model distribution and true distribution taking into account model complexity. The fit is good if this index is not higher than 0.05, and the fit is poor if this index is not lower than 0.1 [13].

5. Associations between questionnaire items and functional ages

Associations between various questionnaire items and the scores for the five "physical symptom" factors and the five "mental symptom" factors and differences of five functional ages (blood vessel age, muscle age, hormone age, bone age, and nerve age calculated through various tests) from actual age [14,15] were evaluated by means of partial correlation coefficient with age as a control variable. Functional age was calculated using Age Management Check^R (Ginga Kobo, Nagoya, Aichi, Japan) [16].

Data were statistically processed using IBM SPSS Statistics 19 and Amos 19 (IBM, New York, NY, USA) except for the trend test of aging effect on symptoms; R version 3.1.2 (R Foundation for Statistical Computing, Vienna, Austria) was used for these analysis. A significance level of 5% ($p < 0.05$) was set in each analyses.

Ethical Considerations

The present study was conducted after examination and approval for the ethics and appropriateness of the study at a meeting of the Doshisha University Ethics Committee for

Scientific Research Involving Human Subjects (Application Numbers: #0832 and #14089).

Results

Table 1 shows data on the proportion of subjects with subjective symptoms by item and the presence/absence of aging-related increasing symptom tendency. For most of the 33 "physical symptom" items, a sex-related difference was observed. The items ranked highest in terms of sign prevalence rate were hair loss (41.4%), stiff shoulder (38.7%), and tendency to gain weight (32.0%) in men, and stiff shoulder (57.7%), hair loss (48.9%), and tendency to gain weight (43.7%) in women. The three highest ranked items were constant between the two sexes, although the ranking order differed. The lowest ranked items were anorexia (1.2%), hot flash (2.3%), and weight loss / thin (2.6%) in men, and anorexia (2.0%), weight loss / thin (3.2%), and diarrhea (5.4%) in women. An aging-related increasing tendency in symptoms was found in 11 items in men and 10 items in women, with the following 7 items found in both sexes: palpitations, shortness of breath, gray hair, hair loss, tinnitus, arthralgia, and frequent urination.

For the majority of the 21 "mental symptom" items, a sex-related difference was observed in sign prevalence rate. The highest ranked items in terms of sign prevalence rate were lapse of memory (22.8%), shallow sleep (17.7%), and irritability (15.7%) in men, and lapse of memory (28.1%), shallow sleep (17.7%), and irritability (14.8%) in women, with the three top ranked items shared by both sexes. On the other hand, the sign prevalence rate was lowest for vague feeling of fear (2.1%), feeling of uselessness (2.4%), and depressed (2.5%) in men, and vague feeling of fear (3.8%), reluctance to talk with others (4.2%), and depressed (4.6%) in women. An aging-related increasing symptom tendency was found in only a few items with shallow sleep, difficulty in falling asleep and lapse of memory identified as such items in both sexes.

Table 2 shows combinations of items with high associations between the 31 "physical symptom" items and the 22 "mental symptom" items according to sex in descending order, excluding those associated with no feeling of good health and lethargy at a correlation coefficient of 0.4 or lower.

A partial correlation coefficient > 0.4 was found for the combination of no feeling of good health and lethargy in both sexes. Other "physical symptom" items with high correlations (partial correlation coefficient > 0.34) were hot flash, anorexia, early satiety, and tired eyes in men, and thirst alone in women.

Thereafter, a factorial analysis was performed on the 33 "physical symptom" items and the 21 "mental symptom" items to identify five factors for each category. Whereas all of the 21 items of the latter were categorized in five factors, only 12 of the 33 items of the former were incorporated in various factors. The five factors of "body" consisted of i) ocular symptoms (tired eyes, blurry eyes, and eye pain), ii) palpitations / shortness of breath, iii) gastrointestinal problems (anorexia, early satiety, and epigastralgia), iv) stiffness (stiff shoulder and muscular pain / stiffness), and v) weight problems (tendency to gain weight and weight loss / thin). The five factors of "mind" consisted of i) depression, ii) mental anxiety, iii) mental confusion, iv) insomnia, and v) irritation.

Of the 6 "lifestyle" items, 2 were excluded because of the absence of a significant influence found in preliminary analysis. The remaining 4 items, amount of smoking, amount of exercise, sleeping hours, and VDT screen gazing time, were used (data on amount of exercise and sleeping hours were input in reversion) for covariance structure analysis. *Fig. 1* shows a hypothetical model on the relationship between lifestyles and physical and mental health. A preliminary analysis based on a hypothetical model revealed significance for the path from lifestyles to "body" but did not show significance for the path to "mind." Therefore, data were re-analyzed using a model modified to remove the path from "lifestyles" to "mind," and to newly include a path from "body" to "mind." The analytical results from the modified model are shown in *Fig. 2*.

The results suggested that "lifestyles" characterized by high scores for amount of smoking and VDT screen gazing time and low scores for amount of exercise and sleeping hours influence "body" problems, which in turn influence "mind" illness. The goodness of the modified model was determined to be GFI = 0.97, AGFI = 0.96, CFI = 0.95, and RMSEA = 0.049, showing good applicability to the data.

Table 3 shows the questionnaire items and the partial correlation coefficients for the scores of the five "physical symptom" factors and the scores of the five "mental symptom" factors and the differences between the various functional ages (blood vessel age, muscle age, hormone age, bone age, nerve age) and actual ages. Although no factor showed a high correlation, a relatively high correlation was found between stiffness and muscle age in women (r = 0.283). The all-item score was found to have a relatively high correlation with hormone age and blood vessel age (r = 0.142 to 0.165) in both sexes. Muscle age in women was also found to have a relatively high correlation (r = 0.133).

Discussion

First, the background for the establishment of the AAQOL Questionnaire is described here. In 2000, a review committee for developing a common questionnaire was organized in the Japan Society of "Ningen Dock" (annual health check-up), with the aim of formulating a common questionnaire to be used in annual health check-ups in Japan. At that time, the committee advised the Japan Society of Ningen Dock to adopt the AAQOL Questionnaire as their common questionnaire. However, the proposal was not accepted. To date, no such questionnaire has been developed in the Japan Society of Ningen Dock.

To date, a variety of common questionnaires have been proposed, including "SF-36" [17-21], which is commonly used worldwide as a rating scale for health-related QOL, the "home healthcare score" and "regional healthcare capacity score" developed through the Ministry of Health and Welfare Integrated Research for Aging and Health Science by the "Research group for the Development of Home Healthcare Systems and Techniques" [21], the "Quality of Life Questionnaire for Cancer Patients Treated with Anticancer Drugs" developed by the Kurihara Group in the Ministry of Health and Welfare [22], the WHO/QOL-26 developed by the World Health Organization (WHO), the EuroQol (EQ-5D) Health Scores [23,24], the Occupational Health Surveillance Form [25,26], and the Climacteric and Senescence Scores for Japanese Subjects [27]. Although these questionnaires appear

Table 1. Proportion of subjects with physical / mental symptoms by item in the Anti-Aging QOL Common Questionnaire and presence/absence of aging-related increasing symptom tendency

Question item	Proportion (%) of respondents with score 4 or 5		Sex-related difference	Aging-related increasing symptom tendency	
	Men	Women		Men	Women
Physical symptoms					
Tired eyes	25.3	36.0	<0.001	n.s.	n.s.
Blurry eyes	14.6	18.2	<0.001	n.s.	0.020
Eye pain	4.2	7.2	<0.001	n.s.	n.s.
Stiff shoulders	38.7	57.7	<0.001	n.s.	n.s.
Muscular pain / stiffness	25.8	33.8	<0.001	n.s.	n.s.
Palpitations	4.7	5.6	n.s.	<0.001	0.003
Shortness of breath	5.2	5.6	n.s.	<0.001	<0.001
Tendency to gain weight	32.0	33.7	n.s.	n.s.	n.s.
Weight loss; thin	2.6	3.2	n.s.	n.s.	n.s.
Lethargy	13.6	17.8	<0.001	n.s.	n.s.
No feeling of good health	11.1	14.6	<0.001	n.s.	n.s.
Thirst	8.9	10.3	n.s.	n.s.	0.009
Skin problems	7.3	13.6	<0.001	n.s.	n.s.
Anorexia	1.2	2.0	0.017	n.s.	n.s.
Early satiety	6.0	7.5	0.025	n.s.	n.s.
Epigastralgia	3.8	6.3	<0.001	n.s.	n.s.
Liable to catch cold	5.5	7.3	0.003	n.s.	n.s.
Coughing and sputum	11.4	7.5	<0.001	0.020	n.s.
Diarrhea	10.6	5.4	<0.001	n.s.	n.s.
Constipation	7.7	21.1	<0.001	<0.001	n.s.
Gray hair	13.7	11.6	0.020	0.004	<0.001
Hair loss	41.4	48.9	<0.001	<0.001	<0.001
Headache	6.5	16.4	<0.001	n.s.	n.s.
Dizziness	3.6	7.1	<0.001	n.s.	n.s.
Tinnitus	11.0	8.1	<0.001	<0.001	<0.001
Lumbago	29.7	30.4	n.s.	n.s.	n.s.
Arthralgia	12.2	17.0	<0.001	<0.001	<0.001
Edematous	6.1	17.6	<0.001	n.s.	n.s.
Easily breaking into a sweat	26.4	20.8	<0.001	n.s.	n.s.
Frequent urination	17.8	13.7	<0.001	<0.001	<0.001
Hot flash	2.3	7.4	<0.001	0.016	n.s.
Cold skin	10.1	33.9	<0.001	<0.001	n.s.
Mental symptoms					
Irritability	15.7	14.8	n.s.	n.s.	n.s.
Easily angered	13.9	11.0	0.001	n.s.	n.s.
Loss of motivation	6.1	10.4	<0.001	n.s.	n.s.
No feeling of happiness	4.3	6.1	0.002	n.s.	n.s.
Nothing to look forward to in life	4.2	6.1	0.001	n.s.	n.s.
Daily life is not enjoyable	3.7	5.4	0.001	n.s.	n.s.
Loss of confidence	2.9	7.2	<0.001	n.s.	n.s.
Reluctance to talk with others	3.1	4.2	0.026	n.s.	n.s.
Depressed	2.5	4.6	<0.001	n.s.	n.s.
Feeling of usefulness	2.4	4.7	<0.001	n.s.	n.s.
Shallow sleep	8.0	10.5	0.001	<0.001	<0.001
Difficulty in falling asleep	10.4	14.5	<0.001	0.003	<0.001
Pessimism	5.7	11.0	<0.001	n.s.	n.s.
Lapse of memory	22.8	28.1	<0.001	<0.001	<0.001
Inability to concentrate	7.2	11.0	<0.001	n.s.	n.s.
Inability to solve problems	2.6	6.1	<0.001	n.s.	n.s.
Inability to make judgments readily	3.0	6.4	<0.001	n.s.	n.s.
Inability to sleep because of worries	5.4	8.3	<0.001	n.s.	n.s.
A sense of tension	11.0	11.9	<0.001	n.s.	n.s.
Feeling of anxiety for no special reason	3.8	6.4	<0.001	n.s.	n.s.
Vague feeling of fear	2.1	3.8	<0.001	n.s.	n.s.

1. None, 2. Little, 3. Mild, 4. Moderate, 5. Severe; n.s., not significant.

Table 2. Associations between "physical symptom" items and "mental symptom" items controlled by age.

Partial correlation coefficient	Men	Women
> 0.5		No feeling of good health-loss of motivation (0.501)
> 0.4	No feeling of good health-pessimism (0.463)	Lethargy-loss of motivation (0.463)
	Lethargy-loss of motivation (0.448)	No feeling of good health-depressed (0.432)
	Lethargy-irritability (0.435)	No feeling of good health-daily life is not enjoyable (0.431)
	Lethargy-Inability to concentrate (0.433)	Lethargy-irritability (0.427)
	No feeling of good health-Inability to concentrate (0.422)	No feeling of good health- no feeling of happiness (0.415)
	No feeling of good health- no feeling of happiness (0.421)	Lethargy-depressed (0.414)
	No feeling of good health-depressed (0.409)	No feeling of good health-pessimism (0.411)
	No feeling of good health-daily life is not enjoyable (0.401)	
> 0.34*	Hot flash-vague feeling of fear (0.362)	Thirst-Inability to concentrate (0.341)
	Hot flash-Inability to concentrate (0.351)	
	Anorexia-depressed (0.349)	
	Early satiety-vague feeling of fear (0.348)	
	Hot flash-depressed (0.345)	
	Early satiety-inability to concentrate (0.343)	
	Tired eyes-irritability (0.343)	

*; Correlations with lethargy or no feeling of good health are excluded.

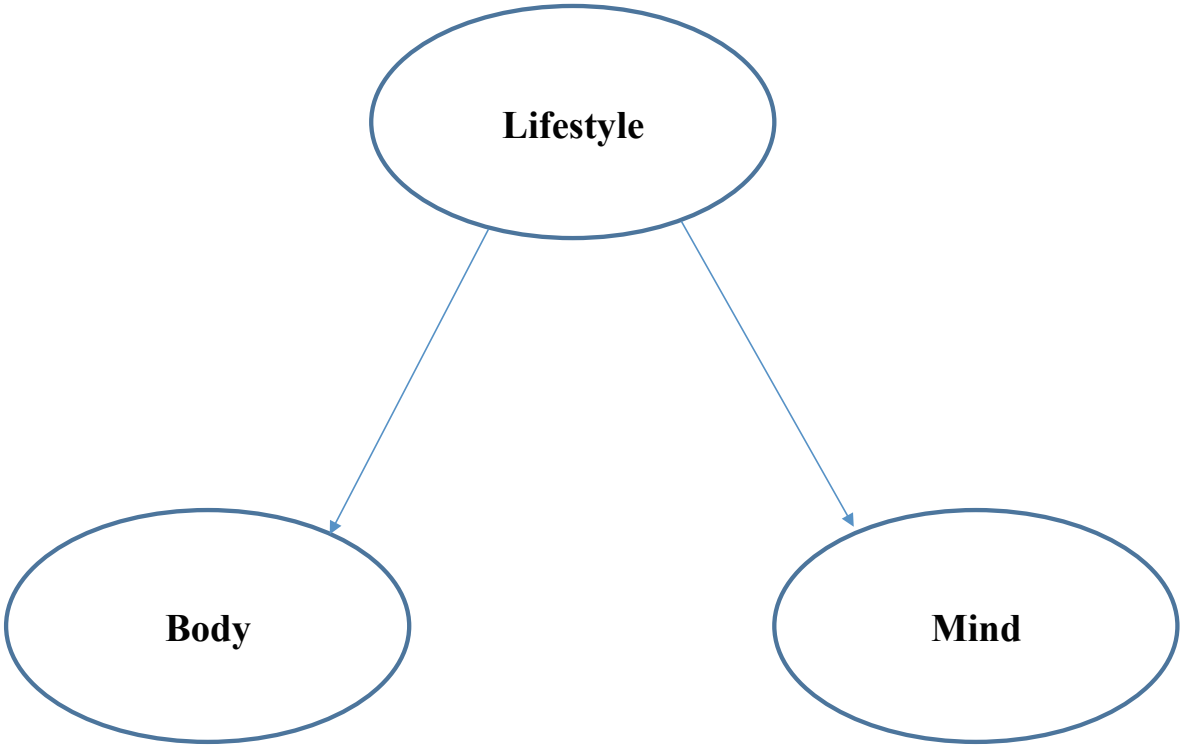

Fig. 1. **A hypothetical model of relationship between lifestyles and physical and mental health.**
A structural model alone is represented, with observed variables and error variables omitted.

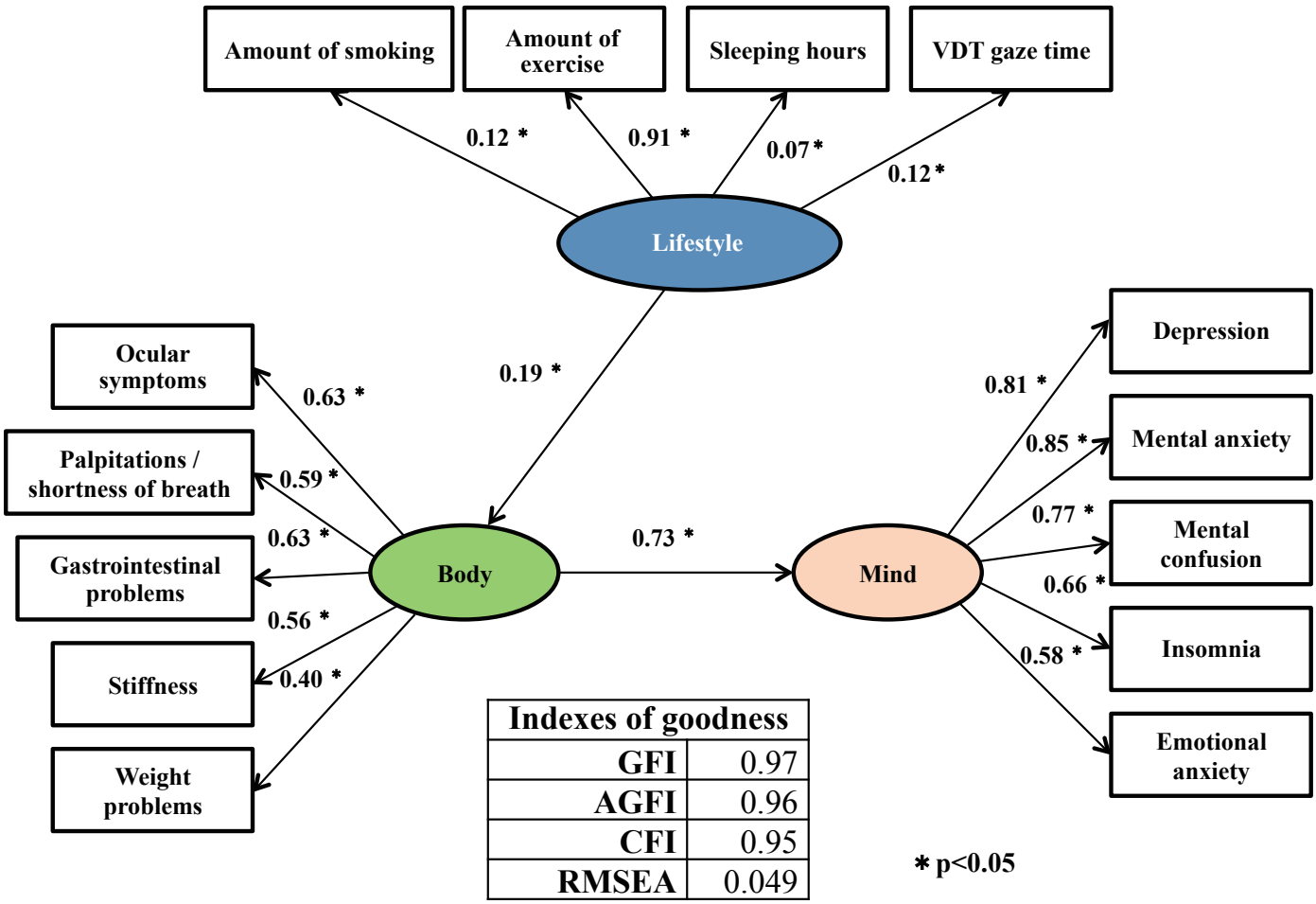

Fig. 2. **Modified model of causality of lifestyle to physical and mental parameters.**

* Root Mean Square Error of Approximation (RMSEA); an index of model goodness. Generally, it is considered that the fit is good if this index is 0.05 or lower, and that the fit is poor if this index is 0.1 or higher. VDT, visual display terminals; GFI, goodness of fit index; AGFI, degree of freedom-adjusted GFI; CFI, comparative fit index.

Table 3. Partial correlation coefficients between physical and mental symptom factors and functional ages controlled by age.

Men

		Muscle age	Bone age	Hormone age	Nerve age	Blood vessel age
The 5 physical factors	Ocular symptoms	0.071	0.034	**0.114**	0.060	0.087
	Palpitations / shortness of breath	0.032	-0.005	0.085	0.025	0.096
	Gastrointestinal problems	**0.120**	0.053	**0.113**	0.063	**0.183**
	Stiffness	**0.162**	0.001	0.082	0.066	**0.113**
	Weight problems	0.033	0.046	0.089	0.077	**0.100**
	SUBTOTAL SCORE	**0.110**	0.039	**0.143**	0.083	**0.164**
The 5 mental factors	Depression	0.035	0.013	0.059	0.066	**0.116**
	Mental anxiety	0.079	0.048	**0.128**	0.081	0.062
	Mental confusion	0.051	0.037	0.099	0.043	0.056
	Insomnia	0.031	0.031	0.086	0.062	0.068
	Emotional anxiety	0.053	0.044	**0.102**	0.082	0.085
	SUBTOTAL SCORE	0.068	0.047	**0.125**	0.085	0.089
TOTAL SCORE		0.095	0.037	**0.143**	0.086	**0.158**

Women

		Muscle age	Bone age	Hormone age	Nerve age	Blood vessel age
The 5 physical factors	Ocular symptoms	0.094	0.039	**0.105**	0.044	0.086
	Palpitations / shortness of breath	0.056	0.031	**0.111**	0.069	0.092
	Gastrointestinal problems	**0.149**	0.055	**0.126**	0.077	**0.183**
	Stiffness	**0.283**	-0.050	0.058	0.030	**0.144**
	Weight problems	-0.009	0.026	0.092	0.072	0.078
	SUBTOTAL SCORE	0.054	0.041	0.076	0.065	0.078
The 5 mental factors	Depression	0.061	0.070	0.085	0.057	0.053
	Mental anxiety	0.045	0.066	**0.112**	0.049	0.051
	Mental confusion	0.019	0.063	0.073	0.066	0.041
	Insomnia	0.030	0.040	0.085	0.066	0.075
	Emotional anxiety	**0.143**	0.037	**0.147**	0.087	**0.161**
	SUBTOTAL SCORE	0.054	0.073	**0.107**	0.073	0.070
TOTAL SCORE		**0.133**	0.052	**0.165**	0.073	**0.142**

Bold type; $p < 0.05$.

in scientific papers, they have not been widely used in the clinical setting largely because of the difficulty of use. Another reason seems to be the fixed method of calculating scores [11]. Hence, the manner of interpreting and weighing individual items varies widely among different studies. With regard to the handling of health status QOL scores, it is necessary to collect data for a sufficient number of samples, and to have fair and highly transparent arguments involving a large number of researchers.

Records indicate that the AAQOL Questionnaire was developed with reference to the aforementioned questionnaires [11,28], with a focus on the items pational health surveillance form that largely reflects health status changes in healthy persons aged 20 to 80 years [25,26]. It is characterized by two aspects: symptoms are classified into two categories, "physical symptoms" and "mental symptoms", and the items that are most commonly found in the field of occupational hygiene [26] are included.

The Japanese Society for Anti-Aging Medicine is joined not only by those in a broad range of medical and surgical fields, but also by many people in the fields of dentistry and Oriental medicine. Although there is some concern about the lack of order for presentation of the contents and discussions, "the Anti-Aging QOL Common Questionnaire" was expected to serve as a standard leader. The AAQOL Questionnaire is available for download from the Japanese Society for Anti-Aging Medicine (http://www.anti-aging.gr.jp/), Society for Glycation Stress Research (http://www.toukastress.jp), and the Laboratory of Anti-Aging Medicine at the Faculty of Life and Medical Sciences, Doshisha University (http://www.yonei-labo.com).

In addition to the Japan Society of Ningen Dock, currently, a broad range of facilities, including clinical studies, labor health, and other areas related to foods, cosmetics, and exercise

devices, both in Japan and abroad, have been encouraged to use the AAQOL Questionnaire. It is also used at clinics in Taiwan and Switzerland. In addition, items are arranged in consideration of the Theory of Yin-Yang and the Five Elements to allow oriental medical professionals to readily accept the items, and to enable clinical studies on "kampo" (traditional Chinese herbal) medicines, herbs, acupuncture and moxibustion, qigong, and other alternative medicines.

First, to evaluate the adequacy of the contents of the AAQOL Questionnaire, sex- and age-related quantitative differences were evaluated in terms of the sign prevalence rate for each item. The results identified hair loss, stiff shoulder, and tendency to gain weight as the top three highest ranked "physical symptom" items in terms of sign prevalence rate in both sexes. According to the 2013 Comprehensive Survey of Living Conditions [3], lumbago (on the order of 10-20%, increased with aging), stiff shoulder (10% to 20%, no tendency to increase with aging), dullness (approximately 5%, common in the middle-aged), and arthralgia (5% to 20%, increased with aging) were subjective symptom items of high prevalence in the middle-aged and older subjects. When limiting the population to elderly persons aged 70 years or older, "Have a Desire to Urinate", "Hard to Hear", "Dimness of Sight", "Forget Things", and other types of symptoms were prevalent. Although "hair loss", an item characteristic of the AAQOL Questionnaire used in the present survey, was not included in the Comprehensive Survey of Living Conditions, there was a consistency between the two surveys that the sign prevalence rate of "stiff shoulder" was high but did not tend to increase with aging.

A total of 7 "physical symptom" items tended to increase with aging in both sexes: palpitations, shortness of breath, gray hair, hair loss, tinnitus, arthralgia, and frequent urination. Four items tended to increase with aging in men only: coughing and sputum constipation, hot flash, and cold skin. The absence of a tendency to increase with aging in women is attributable to the fact that all these items are subjective symptoms that are commonly experienced by middle-aged women. Although the proportions were low, it is of interest that hot flash and cold skin increased with aging in men.

Three "mental symptom" items tended to increase with aging: shallow sleep, difficulty in falling asleep and lapse of memory, and this finding for these 3 items was well anticipated as it was consistent with a previously reported study [4]. Interestingly however, it was a new finding that many other "mental symptoms" did not tend to increase with aging.

Factorial analysis revealed that only 12 of the 33 "physical symptom" items were adopted, and that the 33 physical symptom items were composed of diverse and independent symptoms. It seems to be compatible with the original purpose of this questionnaire that completely includes items with high frequencies in the field of the occupational health [26].

On the other hand, all "mental symptom" items were assigned to any of the five factors; many "mental symptoms" were found to have higher mutual associations than "physical symptoms." A covariance structure analysis for the relationships between lifestyles and the five "physical symptom" factors and five "mental symptom" factors identified by factorial analysis showed that lifestyles influence the body, demonstrating the applicability of a model in which "physical symptoms" influence "mental symptoms." In addition, when comparing path coefficients, the lifestyle item amount of exercise was ranked distinguishedly highest among the four items with a path coefficient of 0.91, suggesting the greatest influence of "amount of exercise." In addition, while the path coefficient for "lifestyles" to "body" was 0.19, the path coefficient for "body" to "mind" was 0.73, a nearly 4-fold higher level; the latter linkage was stronger than the former.

In the present study, the lifestyle items "alcohol consumption" and "water intake" were not adopted. Each lifestyle item is prepared by the system on which the numerical value is input as a continuous variable. Individual variability in an answer is supposed not to be small and a possibility of misclassification is high.

Especially in items "alcohol consumption" and "water intake," their values were widely variable by individual respondents and it is highly possible that the questionnaire author cannot get correct answers as originally expected. It is needed to re-consider for improving the questionnaire, *i.e.*, by adding the question items for which the validity has been secured or objective evaluation especially to lifestyle items. It should also be taken up in the question item about eating habit.

An analysis for correlations between each of the various physical and mental symptom factors and the five functional ages revealed partial correlation coefficients that were in general not too high, suggesting that it is difficult to estimate the functional ages only from the results of the AAQOL Questionnaire. However, it is interesting to note that a relatively high correlation was found between hormone age/blood vessel age and some items and overall score of mental and physical symptoms; it is hoped that further investigations will provide new findings.

As stated at the beginning of this article, questionnaires are used for a wide variety of purposes. Given that the AAQOL Questionnaire is essentially intended to evaluate the physical and mental effects of aging, only the items showing aging-related increasing symptom tendencies, as shown in ***Table 1***, may be adopted. It seems, however, that the AAQOL Questionnaire is actually also used to provide basic data for estimations in disease screening and diagnostic processes, and information for health advice for care seekers. In this regard, the AAQOL Questionnaire must include a broad range of items.

Conclusion

Data from 5,827 effective respondents (3,364 men and 2,463 women) out of 6,016 persons (3,364 men and 2,652 women) who underwent Anti-Aging Medical Checkups were analyzed for associations between the findings in a survey using the Anti-Aging QOL (AAQOL) Common Questionnaire and lifestyles and functional ages. The results suggested the validity of the AAQOL Questionnaire and some points to modify. For further research, it will be necessary to set a definite goal and select items upon which to focus, and, if a future aim is the relationship between aging and QOL, it will be important to consider including other health-related QOL rating scales.

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Conflict of Interest Statement

The authors state that the performance of this study entailed no issues representing a conflict of interest.

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