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Can Data-Driven Analysis Demonstrate the Plausibility of Traditional Medical Typology?

Han Chae, Siwoo Lee*, Soo Jin Lee [†]

School of Korean Medicine, Pusan National University, *KM Data Division, Korea Institute of Oriental Medicine, [†]Department of Psychology, Kyungsung University

Correspondence to
Soo Jin Lee
Department of Psychology,
Kyungsung University, 309,
Suyeong-ro, Nam-gu, Busan, Korea.
Tel: +82-51-663-4328
Fax: +82-51-663-4328
E-mail: leesooj@gmail.com

Objectives: Although medical typologies based on indigenous biopsychological ideas have been described, their integrity has been questioned due to its theory-driven nature in categorization. Therefore, studies on the Sasang typology, a temperament-based traditional Korean medicine, are needed to examine whether it is possible to classify types of specific biopsychological profiles using data-driven analysis.

Methods: Psychological measures of the Eastern Sasang Personality Questionnaire (SPQ) and Western NEO-Personality Inventory (NEO-PI) along with physical measures and Sasang types were acquired from 2,049 participants. Latent groups based on the SPQ and NEO-PI subscale scores were extracted using Latent Profile Analysis. Their psychosomatic features were then compared with those of Sasang types.

Results: Three SPQ-based latent groups showed distinctive psychological and physical features consistent with those of Sasang types. However, four NEOPI-based latent groups presented only psychological features. Furthermore, SPQ-High and SPQ-Low latent groups demonstrated similar psychosomatic profiles to those of So-Yang and So-Eum Sasang types, respectively.

Conclusions: This study illustrates that biopsychological profiles of Sasang types are supported by psychosomatic features of latent groups based on SPQ of Eastern psychology, signifying that the categorization of Sasang typology have acceptable validity and reliability.

Key Words: Data-driven analysis, Latent profile analysis, NEO-Personality Inventory, Psychosomatic complex, Sasang Personality Questionnaire, Sasang typology.

I. INTRODUCTION

There has been a long history of medical typologies categorizing humans based on their psychological and physical features and treating diseases with type-specific treatments both in the West and the East[1], including humoral type of Hippocrates and Galen[2-4], physique type of Kretschmer[5], and somatotype of Sheldon[6], as well as five-phase type in China[7], Ayurvedic dosha type in India[8], and Korean Sasang typology[4].

The Sasang typology[1,4,9] divides human into four biopsychological Sasang types of Tae-Yang, So-Yang, Tae-Eum, and So-Eum based on the temperament theory of Confucianism and Yin-Yang, which provide efficient and safe type-specific treatments with medical herbs[10] and acupuncture[11]. The So-Eum type is introverted, inhibited, calm, and consistent with a skinny or lean body shape, while the So-Yang type is extroverted, pro-active, carefree, and sociable with a developed or muscular body[10,12,13]. The Tae-Eum type lies is in between the So-Yang and So-Eum types as for the psychological features with a bigger or obese body; however, the characteristics of the Tae-Yang type are not well known for its rarity.

Although the Sasang typology showed objective psychological[3,14,15], physical[16,17] and pathological[15,18-21] characteristics of each Sasang type, and advocated its clinical validity and usefulness in the treatment of depression[22], problem behaviors[15], metabolic disease, hypertension[23], and osteoporosis[24], it has often been considered a merely hypothetical typology that is difficult to attest. Therefore, skepticism and questions on the rationality of Sasang typology have prevailed, although its reliability and clinical value have been repeatedly reported with substantial evidence from clinical studies.

For this reason, this study examined the plausibility of temperament theory-based Sasang typology using data-driven analysis with objective psychological and physical measures with the following procedures. This would elucidate the association between the psychosomatic characteristics of the Sasang types and those of data-driven latent groups, and then may show that the Sasang typology is not an arbitrary classification with accidental clinical usefulness, but a medical theory proven by objective clinical data and statistics.

First, the psychosomatic characteristics of each Sasang type were explored. The psychological characteristics of Sasang typology were examined using objective measures of the Sasang Personality Questionnaire (SPQ) of the East[12,13,25,26] and NEO-Personality Inventory (NEO-PI) of the West[27] which were supposed to delineate universal psychological characteristics and were shown to reveal distinctive personality profiles of each Sasang type[12]. The SPQ is a personality assessment that captures the biopsychological characteristics of Yin-Yang with three subscales of behavior, emotion, and cognition; the NEO-PI presenting five fundamental domains is a widely used personality measure based on the five-factor model.

Further, the physical characteristics of Sasang typology can be also determined using Body Mass Index (BMI), Ponderal Index (PI), Waist Hip Ratio (WHR), and Basal Metabolic Rate (BMR)[1,9], calculated using height, weight, and eight circumference measures. These physical characteristics are known to present corporal development, body shape, obesity, and the rate of metabolism. The results were expected to confirm that the Sasang typology is based on a mind-body monistic perspective and therefore has unique physical and psychological features[1,16].

Second, latent groups based on the SPQ and NEO-PI dimensions were extracted using Latent Profile Analysis (LPA) to reveal veiled classes with specific psychological profiles. As the Sasang typology asserts that its types with unique psychosomatic and clinical

features are categorized based on temperament, their theoretical integrity might be attested by examining the resemblance between the Sasang types and extracted latent groups based on Eastern and Western personality theories previously reported relevant[4,12].

The LPA is a data-driven statistical analysis that can extract latent profiles or hidden groups[28] from observed variables based on the homogeneity of characteristics and complex interaction of variables[29]. In addition, it provides the estimated probability of individuals classified into a certain group. It has not been generalized for the lack of computing power, statistical software, and research experiences; however, nowadays, researchers are able to reveal hidden groups sharing common characteristics that were previously unavailable[29,30]. The established clinical database of Korean medicine[31] was used to acquire the SPQ and NEO-PI measures for the LPA to avoid potential sampling bias considering the nature of data-driven analysis.

Third, the psychosomatic characteristics of Sasang typology were compared with those of SPQ-based latent groups and NEOPI-based latent groups after examining the distribution of Sasang types in SPQ- and NEOPI-based latent groups to validate whether the extracted latent groups resemble Sasang types.

The psychosomatic characteristics of Sasang types, SPQ-based latent groups, and NEOPI-based latent groups were presented using NEO-PI and SPQ subscales for psychological characteristics and BMI, PI, WHR, BMR, and circumference measures for physical characteristics. The corroborated associations between theory-based Sasang types and data-driven latent groups for both psychological and physical approaches would provide scientific substantiation on the integrity of group classification in addition to preceding empirical evidence. Previous studies on medical typologies or constitutional theories of the world have mainly focused on delivering distinctive

type-specific physiological, pathological, physical, and genetic features along with the clinical usefulness of type-specific treatments, while the scientific integrity of type differentiation based on their philosophical and medical theory is a challenging issue to be tackled in a scientific way.

The current study suggests the possibility of a research methodology for attesting the group classification of medical typology scientifically plausible by using data-driven LPA with reliable clinical measures. It further provides an insight in the future objective evaluation of traditional typologies with type-specific biopsychological characteristics and clinical treatments of their own. Considering that traditional typologies or constitutional theories in the world have shown theoretical and clinical resemblances even with significant ethnic and sociocultural differences[1,4,32], the findings in this study might be useful for further investigation of the plausibility of their classification system and their psycho-physiological features.

II. METHODS

1. Participants

The psychological and physical data of participants were obtained from the Korean Medicine Data Center (KDC)[31] with a reference number 20200702. The written informed consent was acquired by the KDC when the clinical data of the participants were collected as a database. This study was conducted in accordance with the Declaration of Helsinki Ethical Principles for medical research involving human subjects and was approved by the Institutional Review Board of Kyungsung University (KSU-2010001) before obtaining and analyzing the clinical data.

Out of 2,185 original participants, the data of 2,049 participants who completed both psychological tests of the SPQ and NEO-PI were used for the analysis[12].

The physical characteristics of weight, height, and eight circumference measures of the participants were acquired, and anthropometric measures were calculated. The Sasang type of participants were diagnosed using a series of theory-based formulas using physical and psychological features and pathophysiological symptoms[33,34], and its clinical validity and reliability was reported acceptable in previous studies[35,36].

2. Psychological characteristics

1) Sasang Personality Questionnaire (SPQ)

The SPQ is a 14-item self-report questionnaire designed to measure Yin-Yang temperament[25] and is reported to be useful in Sasang typology with proven clinical validity[12,22,25,26,37,38]. Each item is composed of two opposing words describing specific personality traits and requires the selection of one of three answers (e.g., 1=easy-going, 2=not sure, 3=meticulous).

It has three subscales of SPQ-Behavior (SPQ-B) for pro-active and extroverted behavior, SPQ-Cognition (SPQ-C) for cognitive easy-going and flexibility, and SPQ-Emotion (SPQ-E) for emotional and empathy-related characteristics[12]. The SPQ-Total (SPQ-T) is a sum of three subscales, and a person with a high SPQ-T score exhibits proactive behaviors expressing their opinions and dynamic changes in their emotions[25]. The internal consistency of the SPQ-T, SPQ-B, SPQ-C, and SPQ-E as Cronbach's alpha in previous studies were reported as 0.722, 0.769, 0.581, and 0.641, respectively[12].

2) NEO-Personality Inventory (NEO-PI)

The NEO-PI is a 60-item self-report inventory with a 5-point Likert scale (1=not at all to 5=very true) based on factor analysis designed to assess a wide spectrum of individual psychological differences. The NEO-PI has five stable and universal subscales: neu-roticism, extraversion, openness to experience, agreeableness, and conscientiousness[39].

The internal consistency of neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness scales as Cronbach's alpha in the Korean version were reported as 0.850, 0.766, 0.691, 0.644, and 0.720, respectively[40].

3. Physical characteristics

Anthropometric measures of height (m), weight (kg), and eight circumference measures (cm) were obtained from the KDC. Eight circumference measures of the forehead, neck, axillary, chest, rib, waist, pelvic, and hip were measured using tapelines (150 cm/ 60 inch, Hoechstmass Balzer GmbH, Germany) with the participants standing straight with both arms lowered naturally[41].

The forehead circumference is a horizontal line connecting the glabella and the opisthion; the neck circumference is a horizontal line around the neck passing between the thyroid cartilage and the cricoid cartilage, the axillary circumference is a horizontal line passing right and left axilla, the chest circumference is a horizontal line passing through the right and left nipple, the rib circumference is a horizontal line passing through the right and left 7th and 8th prominence of the costochondral joint, the waist circumference is a horizontal line around the abdomen passing belly button, the pelvic circumference is a horizontal line passing through the right and left anterior superior iliac spine, and the hip circumference is a horizontal line passing through the upper side of the symphysis pubis. Previous studies[41] showed that the measure of eight circumferences in the current study had acceptable reliability.

The anthropometric indices of Body Mass Index (BMI, kg/m^2), Ponderal Index (PI, kg/m^3), Waist Hip Ratio (WHR) and Basal Metabolic Rate (BMR, kcal/day) were calculated based on height, weight, and sex[4,9,42-44].

The BMI was calculated as weight divided by the square of height for measuring obesity and body shape[4], the PI as weight divided three times the height for corporal development[42,43], and the WHR of waist circumference divided by hip circumference for obesity[4]. The BMR were calculated using the formula of 11.3*weight+0.16*height+901 for men and 8.7*weight-0.25*height+865 for women, following the suggestion by the World Health Organization (1985)[44].

4. Statistical analysis

Significant differences in age, education, marital status, psychological characteristics, and anthropometric features between male and female participants were examined using x^2 and t-tests. Correlations between psychological characteristics and anthropometric features were examined using Pearson's correlation analysis.

1) Psychosomatic characteristics of each Sasang type

The psychological and physical characteristics of each Sasang type were compared using Analysis of Covariance (ANCOVA) with age and sex as covariates.

2) Extraction of latent psychological groups using NEO-PI and SPQ subscales

The Latent Profile Analysis (LPA) was used to explore the latent groups in five subscales of the NEO-PI and three subscales of the SPQ[28,30,45]. The number of latent profiles or subgroups was determined by comparison of fit statistics. More specifically, LPA models are estimated with profiles added repeatedly to determine the model demonstrating the best fit to the current data until the addition of profiles no longer demonstrates significant improvement in model fit statistics.

The criteria of model fit were as follows[46]: (1) the smaller the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and adjusted BIC, the better the model; (2) the more significant the probability values of Vuong-Lo-Mendell-Rubin Likelihood Difference Test (VLMR), Lo-Mendell-Rubin Likelihood Difference Test (LMR), or Bootstrap Likelihood Ratio Test (BLRT), the better the model; and (3) an Entropy index greater than 0.8, which reflects that the distinctiveness of latent profiles is assumed to be good[47]. If the criteria fit more than one profile, the interpretation of the researcher is important in selecting the number of profiles.

3) Psychosomatic characteristics of latent groups attained using SPQ and NEO-PI subscales

After the determination of latent psychological groups using the SPQ and NEOPI subscales, the ANCOVA with age and sex as covariates was performed to compare psychological and physical characteristics among the extracted SPQ-based and NEOPI-based latent groups, respectively[28].

4) Comparison of psychosomatic characteristics between Sasang types and latent groups

The distribution of Sasang types was compared with those of the SPQ-based and NEO-PI-based latent groups using x^2. The estimated psychological and physical characteristics considering sex and age were also illustrated in the figure for comparison.

Data are presented as means and standard deviations or as frequencies with percentages. All analyses were performed using IBM SPSS Statistics 25.0 (IBM, Armonk, NY), except the LPA, which was done using Mplus 8.4 (Muthén & Muthén, Los Angeles, CA).

III. RESULTS

1. Demographic features of the participants

The demographic, psychological, and physical features of male and female participants are presented in Table 1. There were significant differences between male and female groups in age (t=-4.503, p<0.001), education level (χ^2=55.32, p<0.001), and

Table 1. Demographic Features of the Study Participants

	Male (n=632)	Female (n=1,417)	
Age***	39.76±12.8	42.42±11.34	t=-4.503, p<0.001
Education***			χ^2=55.32, p<0.001
None	0	3	
Elementary school	10	41	
Middle school	21	97	
High school	247	693	
Bachelor	277	503	
Ph.D.	77	80	
Marriage***			χ^2=57.539, p<0.001
Single	208	280	
Married	421	1076	
Divorced	2	30	
Deceased	1	31	
Psychological characteristics			
NEO-PI			
Neuroticism***	42.67±10.99	45.87±10.85	t=-6.152, p<0.001
Extraversion***	53.74±10.28	51.98±10.48	t=3.526, p<0.001
Openness	54.67±8.21	54.27±7.99	t=1.017, p=0.309
Agreeableness***	57.05±8.94	59.17±8.46	t=-5.134, p<0.001
Conscientiousness	56.76±8.8	56.46±8.61	t=0.719, p=0.472
SPQ-Total	28.45±5.43	28.32±5.53	t=0.49, p=0.624
SPQ-Behavior	10.69±2.64	10.77±2.61	t=-0.637, p=0.524
SPQ-Cognition**	9.92±2.27	9.6±2.38	t=2.869, p=0.004
SPQ-Emotion	7.84±2.05	7.94±2.08	t=-1.091, p=0.276
Physical features			
Height***	172.01±5.86	158.79±5.3	t=48.558, p<0.001
Weight***	72.39±10.04	57.64±8.08	t=32.543, p<0.001
Anthropometrics			
Body mass index***	24.46±3.1	22.87±3.08	t=10.781, p<0.001
Ponderal index*	14.24±1.91	14.43±2.09	t=-1.974, p=0.049
Waist hip ratio***	0.9±0.05	0.88±0.06	t=8.602, p<0.001
Basal metabolic rate***	1746.58±113.82	1326.76±69.92	t=85.787, p<0.001
Circumference			
Forehead***	58.17±1.84	56.03±1.78	t=24.795, p<0.001
Neck***	38.57±2.32	33.55±2.11	t=46.577, p<0.001
Axillary***	97.67±6.31	87.51±6.03	t=34.716, p<0.001
Chest***	94.86±7.06	88.78±7.44	t=17.338, p<0.001
Rib***	87.89±7.52	78.03±7.67	t=27.042, p<0.001
Waist***	87.22±8.14	82.37±8.39	t=12.186, p<0.001
Pelvic***	91.84±6.97	89.4±7.04	t=7.28, p<0.001
Hip***	96.86±6.06	93.71±6.08	t=10.823, p<0.001
Sasang type***			χ^2=48.823, p<0.001
So-Yang	164	496	
Tae-Eum	361	574	
So-Eum	107	347	

NEO-PI: NEO-Personality Inventory, SPQ: Sasang Personality Questionnaire.
*p<0.05, **p<0.01, ***p<0.001.

marital status (χ^2=57.539, p<0.001).

The male participants exhibited higher extraversion (t=3.526, p<0.001), lower neuroticism (t=-6.152, p<0.001), and lower agreeableness (t=-5.134, p<0.001) scores than female participants in NEO-PI subscales. Furthermore, male participants displayed higher SPQ-C scores (t=2.869, p=0.004) than females in the SPQ subscales. The male participants had higher scores in physical features of height (t=48.558, p<0.001), weight (t=32.543, p<0.001), BMI (t=10.781, p<0.001), WHR (t=8.602, p<0.001), BMR (t=85.787, p<0.001), and circumference measures (p<0.001); however, female participants were marginally higher in PI (t=-1.974, p=0.049).

The distribution of Sasang types was significantly different (χ^2=48.823, p<0.001) in the male and female groups. The present study only included So-Yang, Tae-Eum, and So-Eum types, as the Tae-Yang type is rare.

2. Correlation coefficients among psychological and physical features

The correlation coefficients between the NEO-PI and SPQ subscales was examined (Table 2). The NEO-PI extraversion demonstrated a positive correlation with the SPQ-T (r=0.474, p<0.001), SPQ-B (r=0.598, p<0.001), and SPQ-C (r=0.322, p<0.001). Interestingly, NEO-PI neuroticism was negatively correlated with the SPQ-B (r=-0.232, p<0.001) but positively correlated with the SPQ-E (r=0.261, p<0.001).

The correlation between the psychological and physical features are shown in Table 3. Those correlation coefficients between psychological and physical features with correlation coefficient smaller than 0.2 might imply that psychological traits do not have meaningful correlations with physical features when considering a large sample size.

3. Psychological and physical characteristics of each Sasang type

The distinctive psychological and physical characteristics of the Sasang type groups are demonstrated in Table 4. Regarding the psychological characteristics, the So-Yang (n=660) type showed significantly high extraversion, SPQ-B, SPQ-C, and SPQ-E scores and significantly low neuroticism score, while the So-Eum (n=454) type displayed significantly low extraversion, SPQ-B, SPQ-C, and SPQ-E scores and significantly high neuroticism score. The Tae-Eum (n=935) type scored between the So-Yang and So-Eum types across psychological measures.

There were significant differences between Sasang type groups in the physical characteristics of weight, BMI, PI, WHR, BRM, and the eight circumferences, and those of So-Eum, So-Yang, and Tae-Eum types were in increasing order.

The estimated values of the psychological and physical characteristics of the Sasang type groups are illustrated in Fig. 1A. These data indicate that the introverted, passive, distressing, and detached group

Table 2. Correlation Coefficients between the Subscales of the SPQ and NEO-PI

	NEO-PI				
	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
SPQ-Total	-.085***	**.474***	.080***	-.147***	.017
SPQ-Behavior	-.232***	**.598***	.131***	.015	.188***
SPQ-Cognition	-.171***	**.322***	.026	-.144***	-.051*
SPQ-Emotion	.261***	.137***	.016	-.246***	-.135***

Bold represent correlation coefficient bigger than 0.3.
*p<0.05, **p<0.01, ***p<0.001.

Table 3. Correlation Coefficient between Psychological and Physical Features of the Participants

| | Anthropometrics | | | | | | Circumferences | | | | | | | |
	Height	Weight	BMI	PI	WHR	BMR	Forehead	Neck	Axillary	Chest	Rib	Waist	Pelvic	Hip
NEO-PI														
Neuroticism	-.055*	-.105***	-.091***	-.067**	-.052*	-.137***	-.042	-.139***	-.129***	-.086***	-.123***	-.066**	-.054*	-.055*
Extraversion	.108***	.101***	.050*	.011	-.038	.100***	.060**	.075**	.086***	.052*	.053**	.019	.034	.065**
Openness	.063**	-.010	-.060**	-.081***	-.056*	.010	.070**	-.024	-.028	-.056*	-.047*	-.039	-.029	-.007
Agreeableness	-.118**	-.072**	-.003	.039	-.037	-.104***	-.098***	-.077***	-.067**	-.052*	-.042	-.034	-.016	-.016
Conscientiousness	-.005	-.014	-.014	-.011	-.002	.002	-.065**	-.001	.011	-.014	.013	-.025	-.025	-.033
SPQ-Total	.064**	.124***	.117***	.091***	.075**	.069**	.066**	.077***	.111***	.138***	.121***	.122***	.113***	.117***
SPQ-Behavior	.034	.064**	.062**	.050*	.021	.023	.032	.029	.069**	.084***	.064**	.054*	.057**	.064**
SPQ-Cognition	.086***	.185***	.178***	.141***	.112***	.130***	.100***	.138***	.172***	.199***	.190***	.183***	.175***	.176***
SPQ-Emotion	.028	.039	.030	.019	.045*	.006	.021	.011	.012	.035	.024	.048*	.030	.030

BMI: body mass index, PI: ponderal index, WHR: waist-hip ratio, BMR: basal metabolic rate.
*p<0.05, **p<0.01, ***p<0.001.

(So-Eum type, n=454, 22.2.6%) had a lean and small body and low basal metabolism, while the extroverted, pro-active, flexible, and affective group (So-Yang type, n=660, 32.2%) had a developed muscular body and activated metabolism. And, the ordinary people with conventional personality (Tae-Eum type, n=935, 45.6%) had a well-developed, big, and obese body and highly activated metabolism.

4. Extraction of latent profile groups using SPQ and NEO-PI subscales

The LPA was performed using SPQ and NEO-PI subscales, and latent profile models of four profiles and three profiles, respectively, were determined as acceptable because the model fit criteria were satisfactory.

A three-profile model for SPQ subscales displayed smaller AIC (45335.729), BIC (45493.232), and adjusted BIC (45404.274) compared to other models, with significant p-values of VLMR (p<0.0001), LMR (p<0.0001), and BLRT (p<0.0001), and a greater than 0.7 Entropy index (0.713) as acceptable (Table 5). Three SPQ-based latent groups were labeled as SPQ-High (n=663), SPQ-Middle (n=903), and SPQ-Low (n=483) with reference to their SPQ-T score.

A four-profile model for NEO-PI subscales demonstrated smaller AIC (91858.321), BIC (92128.326), and adjusted BIC (91975.826) compared to other models with significant p-values of VLMR (p=0.0002), LMR (p=0.0003), and BLRT (p<0.0001), and a greater than 0.7 Entropy index (0.727) as acceptable (Table 6). Four NEO-PI-based latent groups were labeled as NEOPI-LH (low neuroticism & high extraversion; n=388), NEOPI-MH (middle neuroticism & high extraversion; n=461), NEOPI-ML (middle neuroticism & low extraversion; n=1,029), and NEOPI-HL (high neuroticism and low extraversion; n=171) considered after their NEO-PI neuroticism and extraversion scores.

Table 4. Psychological and Physical Features of the Three Sasang Type Groups

	So-Yang (n=660)	Tae-Eum (n=935)	So-Eum (n=454)	Total (n=2,049)	F-test	Post-hoc
Psychological characteristics						
NEO-PI						
Neuroticism***	43.9±11.01	44.66±10.99	46.78±10.76	44.88±10.99	F=11.812, p<0.001	SY<TE<SE
Extraversion***	56.32±9.78	52.19±10.56	47.69±8.92	52.52±10.45	F=98.485, p<0.001	SY>TE>SE
Openness**	55.31±8.31	53.72±7.92	54.46±7.87	54.39±8.06	F=6.502, p=0.0015	SY>TE
Agreeableness	58.63±8.62	58.36±8.95	58.69±8.13	58.52±8.66	F=0.089, p=0.915	
Conscientiousness***	57.67±8.47	55.89±8.89	56.31±8.33	56.55±8.67	F=11.784, p<0.001	SY>SE&TE
SPQ-Total***	31.47±4.28	28.04±5.43	24.51±4.48	28.36±5.50	F=273.498, p<0.001	SY>TE>SE
SPQ-Behavior***	12.47±1.98	10.36±2.53	9.06±2.13	10.75±2.62	F=321.984, p<0.001	SY>TE>SE
SPQ-Cognition***	10.52±2.08	9.89±2.34	8.13±1.98	9.70±2.35	F=166.017, p<0.001	SY>TE>SE
SPQ-Emotion***	8.48±1.99	7.80±2.06	7.32±2.03	7.91±2.07	F=43.779, p<0.001	SY>TE>SE
Physical features						
Height*	162.63±7.83	163.39±8.57	162.14±7.89	162.87±8.20	F=3.827, p=0.022	TE>SY
Weight***	58.36±7.66	69.11±10.42	53.51±7.05	62.19±11.08	F=717.536, p<0.001	TE>SY>SE
Anthropometrics						
Body mass index***	22±1.68	25.8±2.62	20.3±1.67	23.36±3.17	F=1209.619, p<0.001	TE>SY>SE
Ponderal index***	13.55±1.17	15.83±1.79	12.55±1.18	14.37±2.03	F=1108.99, p<0.001	TE>SY>SE
Waist hip ratio***	0.87±0.05	0.91±0.05	0.86±0.05	0.88±0.06	F=172.429, p<0.001	TE>SY>SE
Basal metabolic rate***	1402.82±178.94	1543.88±219.78	1353.46±163.11	1456.25±212.09	F=646.27, p<0.001	TE>SY>SE
Circumference						
Forehead***	56.43±1.95	57.26±2.06	55.9±1.83	56.69±2.05	F=63.06, p<0.001	TE>SY>SE
Neck***	34.16±2.62	36.67±3.08	33.22±2.51	35.1±3.18	F=393.409, p<0.001	TE>SY>SE
Axillary***	88.33±6.24	94.93±7.07	85.21±5.79	90.65±7.71	F=464.551, p<0.001	TE>SY>SE
Chest***	88.1±5.82	95.52±7.07	84.35±5.28	90.66±7.85	F=550.711, p<0.001	TE>SY>SE
Rib***	77.88±6.65	86.59±8	74.36±6.09	81.08±8.88	F=638.994, p<0.001	TE>SY>SE
Waist***	80.91±6.32	89.26±7.51	77.06±6.41	83.87±8.61	F=549.325, p<0.001	TE>SY>SE
Pelvic***	87.85±5.39	94.24±6.51	85.05±5.52	90.15±7.11	F=417.532, p<0.001	TE>SY>SE
Hip***	92.78±4.69	98.31±5.71	89.99±4.75	94.68±6.24	F=419.829, p<0.001	TE>SY>SE

NEO-PI: NEO-Personality Inventory, SPQ: Sasang Personality Questionnaire, SY: So-Yang, TE: Tae-Eum, SE: So-Eum.
*p<0.05, **p<0.01, ***p<0.001.

5. Psychosomatic characteristics of latent groups based on SPQ subscales

The differences in psychological and physical characteristics between the SPQ-T-based latent groups were examined (Table 7), and the estimated values of psychological and physical characteristics in the SPQ-based latent groups are illustrated in Fig. 1B.

Regarding the psychological aspects, the SPQ-based latent groups showed distinctive differences in extraversion, neuroticism, SPQ-B, SPQ-C, and SPQ-E scores. The SPQ-High (n=663) group showed significantly higher extraversion, SPQ-B, SPQ-C, and SPQ-E scores and significantly lower neuroticism score; however, the SPQ-Low (n=483) group dis-

played significantly lower extraversion, SPQ-B, SPQ-C, and SPQ-E scores and significantly higher neuroticism score. The SPQ-Middle (n=903) group was in the middle of the SPQ-High and SPQ-Low groups in extraversion, neuroticism, SPQ-B, SPQ-C, and SPQ-E scores.

The physical characteristics of the SPQ-based latent groups were apparent. The SPQ-Low group showed significantly lower weight, BMI, PI, WHR, BMR, and circumference measures than the SPQ-Middle and SPQ-High groups. However, there were no significant differences in physical characteristics between the SPQ-Middle and SPQ-High groups.

These data suggest that the introverted, passive, distressing, and unemotional group (SPQ-Low, n=463,
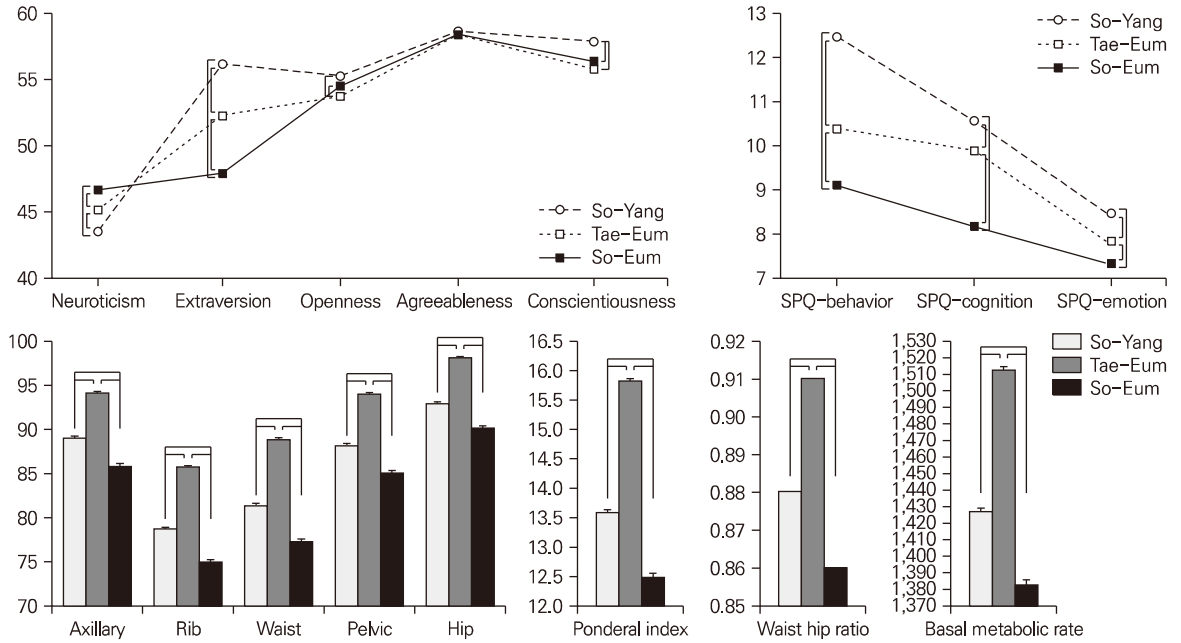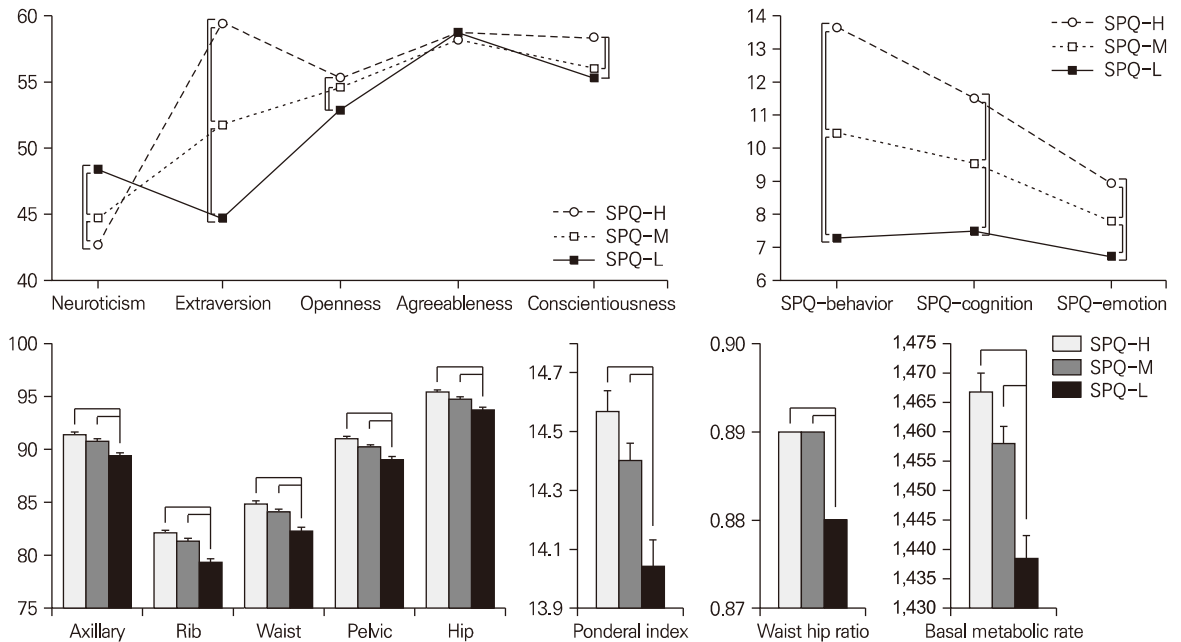
Fig. 1. Psychological and physical features of extracted latent groups and Sasang type groups. (A) Psychosomatic features of the three Sasang type groups. (B) Psychosomatic features of the three latent psychological groups based on the SPQ subscales. (C) Psychosomatic features of the four latent psychological groups based on the NEO-PI subscales.

23.6%) has lean and small body shape and low basal metabolism, while the extroverted, pro-active, stable, and affective group (SPQ-High, n=663, 32.4%) has

obese and developed body shape with activated metabolism.

C Psychosomatic features of the four latent psychological groups based on the NEO-PI subscales
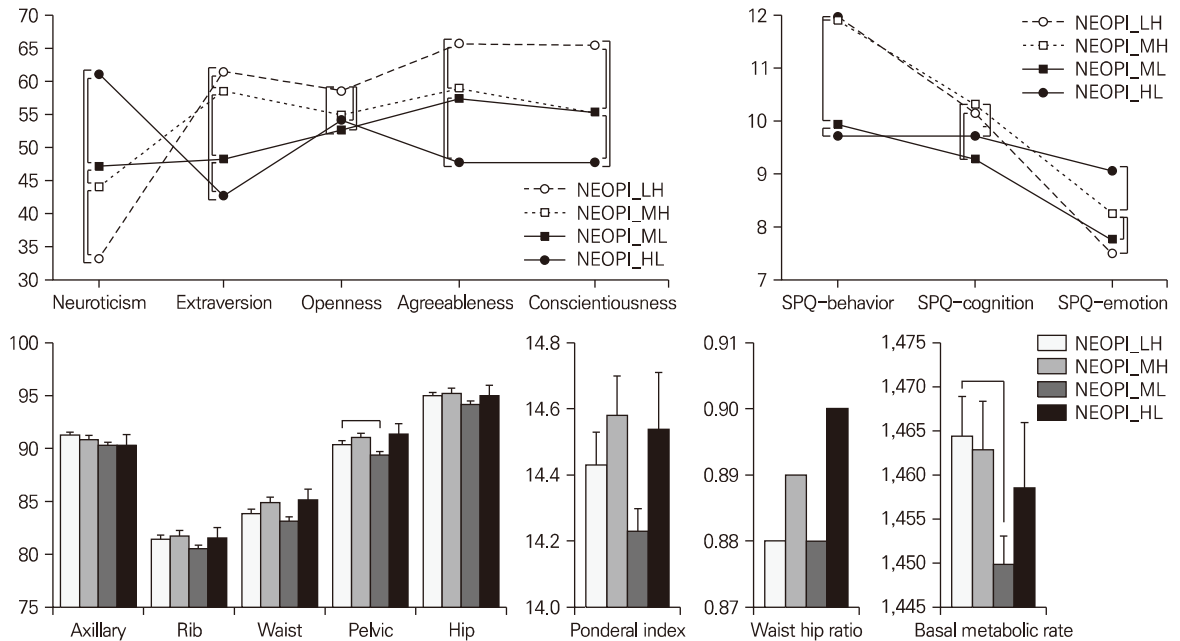

Fig. 1. Continued.

Table 5. Information Criterion for 1~5 Latent Profiles of the Three Subscales of the SPQ

Model	AIC	BIC	adj. BIC	Entropy	VLMR *p*	LMR *p*	BLRT *p*
1 group	46471.716	46561.718	46510.885				
2 group	45498.523	45622.276	45552.38	0.683	0	0	0
3 group	**45335.729**	**45493.232**	**45404.274**	**0.713**	**0**	**0**	**0**
4 group	45311.588	45502.841	45394.821	0.682	0.7652	0.7678	0
5 group	45162.162	45387.166	45260.083	0.682	0	0	0

AIC: Akaike Information Criterion, adj.: adjusted, BIC: Bayesian Information Criterion, BLRT: Bootstrapped Likelihood Ratio Test, LMR: Lo-Mendell-Rubin Likelihood Ratio Test, VLMR: Vuong-Lo-Mendell-Rubin Likelihood Ratio Test.

Table 6. Information Criterion for 1~6 Latent Profiles of the Five Subscales of the NEO-PI

Model	AIC	BIC	adj. BIC	Entropy	VLMR *p*	LMR *p*	BLRT *p*
1 group	93042.125	93177.128	93100.878				
2 group	92238.022	92418.026	92316.359	0.599	0	0	0
3 group	92019.452	92244.457	92117.373	0.725	0	0	0
4 group	**91858.321**	**92128.326**	**91975.826**	**0.727**	**0.0002**	**0.0003**	**0**
5 group	91783.037	92098.043	91920.127	0.735	0.0824	0.0855	0
6 group	91890.321	92250.328	92046.995	0.789	0.5712	0.5655	1

AIC: Akaike Information Criterion, adj.: adjusted, BIC: Bayesian Information Criterion, BLRT: Bootstrapped Likelihood Ratio Test, LMR: Lo-Mendell-Rubin Likelihood Ratio Test, VLMR: Vuong-Lo-Mendell-Rubin Likelihood Ratio Test.

6. Psychosomatic characteristics of latent groups based on the NEO-PI subscales

The differences in psychological and physical characteristics between NEO-PI-based latent groups were examined (Table 8), and the estimated values of psychological and physical characteristics in NEO-PI-based latent groups are illustrated in Fig. 1C.

Table 7. Psychological and Physical Features of the Three Latent Psychological Groups Based on the SPQ Subscales

	SPQ-High (n=663)	SPQ-Middle (n=903)	SPQ-Low (n=483)	Total (n=2,049)	F-test	Post-hoc
Psychological characteristics						
SPQ-Total***	34.13±3.07	27.81±2.8	21.48±2.69	28.36±5.5	F=2746.248, p<0.001	H>M>L
SPQ-Behavior***	13.67±1.04	10.47±1.11	7.26±1.12	10.75±2.62	F=4906.055, p<0.001	H>M>L
SPQ-Cognition***	11.52±1.92	9.53±1.84	7.52±1.68	9.70±2.35	F=674.473, p<0.001	H>M>L
SPQ-Emotion***	8.94±1.91	7.80±1.92	6.70±1.83	7.91±2.07	F=195.823, p<0.001	H>M>L
NEO-PI						
Neuroticism***	42.67±11.22	44.76±10.6	48.14±10.64	44.88±10.99	F=40.978, p<0.001	H<M<L
Extraversion***	59.51±9.66	51.7±8.64	44.48±7.91	52.52±10.45	F=410.445, p<0.001	H>M>L
Openness***	55.31±8.43	54.61±7.8	52.73±7.79	54.39±8.06	F=13.345, p<0.001	H&M>L
Agreeableness	58.06±8.96	58.67±8.46	58.86±8.62	58.52±8.66	F=0.929, p=0.395	
Conscientiousness***	58.28±9.01	55.92±8.52	55.37±8.1	56.55±8.67	F=22.472, p<0.001	H>M&L
Physical features						
Height	163.52±8.26	162.78±8.12	162.14±8.23	162.87±8.20	F=2.562, p=0.077	
Weight***	63.56±11.01	62.21±11.37	60.27±10.33	62.19±11.08	F=16.65, p<0.001	H&M>L
Anthropometrics						
Body mass index***	23.7±3.19	23.38±3.28	22.85±2.88	23.36±3.17	F=14.275, p<0.001	H&M>L
Ponderal index***	14.53±2.08	14.39±2.07	14.12±1.88	14.37±2.03	F=10.866, p<0.001	H&M>L
Waist hip ratio***	0.89±0.06	0.89±0.05	0.88±0.06	0.88±0.06	F=7.89, p<0.001	H&M>L
Basal metabolic rate***	1474.47±215.49	1454.01±213.28	1435.44±203.31	1456.25±212.09	F=15.647, p<0.001	H&M>L
Circumference						
Forehead	56.81±2.03	56.71±2.07	56.51±2.04	56.69±2.05	F=2.082, p=0.125	
Neck***	35.39±3.17	35.06±3.24	34.77±3.05	35.1±3.18	F=10.224, p<0.001	H&M>L
Axillary***	91.54±7.69	90.63±7.87	89.45±7.26	90.65±7.71	F=15.875, p<0.001	H&M>L
Chest***	91.69±7.78	90.67±8.09	89.20±7.24	90.66±7.85	F=19.661, p<0.001	H>M>L
Rib***	82.12±8.92	81.14±9.10	79.52±8.17	81.08±8.88	F=22.031, p<0.001	H&M>L
Waist***	84.78±8.67	83.94±8.66	82.46±8.25	83.87±8.61	F=14.642, p<0.001	H&M>L
Pelvic***	90.92±7.07	90.11±7.29	89.17±6.69	90.15±7.11	F=11.695, p<0.001	H&M>L
Hip***	95.39±6.11	94.66±6.48	93.74±5.85	94.68±6.24	F=10.504, p<0.001	H&M>L

NEO-PI: NEO-Personality Inventory, SPQ: Sasang Personality Questionnaire, H: SPQ-High, M: SPQ-Middle, L: SPQ-Low.
*p<0.05, **p<0.01, ***p<0.001.

Regarding the psychological aspects, the NEOPI-LH (n=388) group had significantly lower neuroticism, high extraversion, high agreeableness, and high conscientious scores; however, the NEOPI-HL (n=171) group was on the contrary. The NEOPI-MH (n=461) and NEOPI-ML (n=1,029) groups showed significant differences in extraversion and neuroticism scores. The NEOPI-LH and NEOPI-MH groups showed higher SPQ-T, SPQ-B, SPQ-C scores, and lower SPQ-E scores than the NEOPI-ML and NEOPI-HL groups; in contrast, NEOPI-ML and NEOPI-HL demonstrated lower SPQ-T, SPQ-B, SPQ-C scores, and higher SPQ-E scores than the NEOPI-LH and NEOPI-MH groups.

The physical characteristics of the NEO-PI-based latent groups were similar. The NEOPI-LH group showed larger BMR and pelvic circumference measures than the NEOPI-ML group.

These data suggest that the highly extroverted and stable group (NEOPI-LH, n=338, 18.9%) had activated metabolism and a wider pelvic circumference than the majority (NEOPI-ML, n=1,029, 50.2%).

7. Association between Sasang types and SPQ- and NEOPI-based latent groups

The distribution of Sasang types was explored in the SPQ-based and NEO-PI-based latent groups (Table 9). There were significant differences in the

Table 8. Psychological and Physical Features of the Four Latent Psychological Groups Based on the NEO-PI Subscales

	NEOPI-LH (n=388)	NEOPI-MH (n=461)	NEOPI-ML (n=1,029)	NEOPI-HL (n=171)	Total (n=2,049)	F-test	Post-hoc
Psychological							
NEO-PI							
Neuroticism***	33.16±7.9	43.63±9.3	47.18±8.03	61.01±8.83	44.88±10.99	F=481.116, p<0.001	LH<MH<ML<HL
Extraversion***	60.94±8.67	59.44±8.14	47.74±7.83	43.6±9.13	52.52±10.45	F=395.372, p<0.001	LH>MH>ML>HL
Openness***	58.07±7.59	55.75±8.46	52.3±7.22	55±8.94	54.39±8.06	F=51.232, p<0.001	LH>MH>ML, LH>HL
Agreeableness***	65.6±6.91	59.04±7.27	57.38±7.64	47.85±7.91	58.52±8.66	F=233.799, p<0.001	LH>MH&ML>HL
Conscientiousness***	65.21±6.01	56±7.89	54.95±7.24	48.11±8.88	56.55±8.67	F=259.949, p<0.001	LH>MH&ML>HL
SPQ-Total***	29.87±5.19	29.81±5.08	27.22±5.51	27.89±5.57	28.36±5.5	F=36.834, p<0.001	LH>ML, MH>HL>ML
SPQ-Behavior***	12.1±2.27	11.66±2.35	10.04±2.49	9.49±2.7	10.75±2.62	F=106.069, p<0.001	LH&MH>ML&HL
SPQ-Cognition***	10.23±2.31	10.07±2.26	9.38±2.36	9.47±2.36	9.7±2.35	F=19.039, p<0.001	LH&MH>ML, MH>HL
SPQ-Emotion***	7.53±2.06	8.08±2.04	7.81±2.03	8.93±2.1	7.91±2.07	F=16.732, p<0.001	LH&ML<MH<HL
Physical							
Height	161.75±7.58	167.33±8.56	160.79±7.25	165.89±8.46	162.87±8.20	F=1.136, p=0.333	
Weight*	62.73±10.63	64.14±13.11	61.07±9.81	62.43±12.44	62.19±11.08	F=2.828, p=0.037	MH>ML
Anthropometrics							
Body mass index	23.9±3.15	22.76±3.45	23.55±2.9	22.59±3.6	23.36±3.17	F=2.347, p=0.071	
Ponderal index	14.8±2.05	13.61±2.01	14.67±1.88	13.64±2.21	14.37±2.03	F=2.056, p=0.104	
Waist hip ratio	0.89±0.05	0.87±0.06	0.89±0.05	0.87±0.06	0.88±0.06	F=2.524, p=0.056	
Basal metabolic rate*	1450.29±205.85	1518.08±245.14	1428.2±189.24	1471.87±225.52	1456.25±212.09	F=3.12, p=0.025	LH>ML
Circumference							
Forehead	56.54±1.97	57.31±2.20	56.38±1.89	57.30±2.27	56.69±2.05	F=2.355, p=0.070	
Neck	35.36±3.11	35.20±3.55	35.04±2.99	34.58±3.35	35.10±3.18	F=2.081, p=0.101	
Axillary	91.41±7.36	90.98±8.74	90.41±7.12	89.45±8.73	90.65±7.71	F=2.53, p=0.056	
Chest	91.62±7.51	89.67±8.42	90.96±7.42	89.30±9.01	90.66±7.85	F=2.888, p=0.034	
Rib	82.43±8.83	79.65±9.68	81.60±8.20	78.65±9.73	81.08±8.88	F=2.251, p=0.081	
Waist	84.95±8.15	82.25±9.30	84.45±8.13	82.24±9.64	83.87±8.61	F=2.674, p=0.046	
Pelvic**	91.32±6.80	88.74±7.12	90.53±6.99	89.01±7.75	90.15±7.11	F=3.931, p=0.008	LH>ML
Hip	95.25±6.17	94.77±6.33	94.50±6.00	94.68±6.24	94.68±6.24	F=2.315, p=0.074	

NEO-PI: NEO-Personality Inventory, SPQ: Sasang Personality Questionnaire, NEOPI-LH: NEOPI-Low Neuroticism and High Extraversion, NEOPI-MH: NEOPI-Middle Neuroticism and High Extraversion, NEOPI-ML: NEOPI-Middle Neuroticism and Low Extraversion, NEOPI-HL: NEOPI-High Neuroticism and Low Extraversion, LH: NEOPI-LH, MH: NEOPI-MH, ML: NEOPI-ML, HL: NEOPI-HL.
*p<0.05, **p<0.01, ***p<0.001.

Table 9. Comparison of Sasang Types with Latent Psychological Groups Based on the Subscales of the NEO-PI and SPQ

Latent groups	Sasang type			Total	
	So-Yang	Tae-Eum	So-Eum		
SPQ-based***					χ^2=490.368, p<0.001
SPQ-High	380 (57.6)	257 (27.5)	26 (5.7)	663 (32.4)	
SPQ-Middle	261 (39.5)	438 (46.8)	204 (44.9)	903 (44.1)	
SPQ-Low	19 (2.9)	240 (25.7)	224 (49.3)	483 (23.6)	
NEO-PI-based***					χ^2=61.625, p<0.001
NEOPI-LH	158 (23.9)	170 (18.2)	60 (13.2)	388 (18.9)	
NEOPI-MH	185 (28.0)	206 (22.0)	70 (15.4)	461 (22.5)	
NEOPI-ML	272 (41.2)	481 (51.4)	276 (60.8)	1,029 (50.2)	
NEOPI-HL	45 (6.8)	78 (8.3)	48 (10.6)	171 (8.4)	
Total	660 (32.2%)	935 (45.6%)	454 (22.2%)	2,049 (100%)	

NEO-PI: NEO-Personality Inventory, SPQ: Sasang Personality Questionnaire, NEOPI-LH: NEOPI-Low Neuroticism and High Extraversion, NEOPI-MH: NEOPI-Middle Neuroticism and High Extraversion, NEOPI-ML: NEOPI-Middle Neuroticism and Low Extraversion, NEOPI-HL: NEOPI-High Neuroticism and Low Extraversion.

SPQ- (χ^2=490.368, p<0.001) and NEO-PI-based (χ^2=61.625, p<0.001) latent groups.

The psychological profiles of Sasang types and SPQ-based latent groups illustrated in Fig. 1A and 1B showed remarkable similarity, however those of Sasang types and NEO-PI based latent groups didn't. The So-Yang Sasang type and SPQ-High latent group with significantly higher SPQ subscale scores, lower neuroticism, and higher extraversion showed significantly larger circumference measures, PI, WHR, and BMI; in contrast the So-Eum Sasang type and SPQ-Low latent group were on the contrary. Furthermore, the Tae-Eum type with similar psychological features of the SPQ-Middle latent group showed larger circumference measures, PI, WHR, and BMI than the So-Eum type.

These data might demonstrate that the SPQ-based latent groups have stronger associations with Sasang typology than the NEO-PI-based latent groups, given the similarity in psychosomatic characteristics.

IV. DISCUSSION

The scientific validity of Sasang type classification was attested using data-driven analysis with objective measures of 2,049 participants in the current study.

The SPQ of the East and NEO-PI of the West were used to extract reliable latent groups with LPA, and the psychosomatic characteristics of SPQ-based and NEOPI-based latent groups were compared with those of Sasang types. That is, the psychological features of the NEO-PI and SPQ subscales along with the multifaceted physical features of BMI, WHR, PI, circumferences, and BMR were used to analyze psychosomatic characteristics.

The current study revealed several expected and motivating results.

First, the three Sasang types showed distinctive psychological (e.g., SPQ and NEO-PI) and physical (e.g., BMI, PI, WHR, BMR, and circumferences) characteristics (Table 4), as corroborated in previous reports[1,9,12,13,26]. The psychological features of NEO-PI extraversion and SPQ subscale scores were in increasing order of So-Eum, Tae-Eum, and So-Yang types, and the NEO-PI Neuroticism score was in decreasing order of So-Eum, Tae-Eum, and So-Yang types. And, the physical scores of BMI, PI, WHR, BMR, and circumference measures were in increasing order of So-Eum, So-Yang, and Tae-Eum types.

Second, the data-driven statistical analysis of LPA sharing conceptual resemblance with the traditional East-Asian medical syndrome complex and pattern

identification[48,49] revealed latent profiles of SPQ or NEO-PI subscales, and categorized individuals retaining similar psychological features into three SPQ-based and four NEOPI-based latent groups, respectively[29,30].

The three SPQ-based latent groups are extroverted and stable group (SPQ-High), majority group (SPQ-Middle), and introverted and unstable group (SPQ-Low). The SPQ-High and SPQ-Middle groups had a large body shape with wider circumferences and elevated metabolism; however, the SPQ-Low group has a small body shape with narrow circumferences, lean body, and lowered metabolism (Table 7). The four NEOPI-based latent groups are introverted and unstable group (NEOPI-HL), introverted majority group (NEOPI-ML), extroverted group (NEOPI-MH), and extroverted and stable group (NEOPI-LH). As for the physical perspective, only the NEOPI-LH group showed higher metabolism and wider pelvic circumference than the NEOPI-ML group (Table 8).

Furthermore, the distribution of Sasang types was examined with that of the NEOPI- and SPQ-based latent groups (Table 9). The So-Yang, Tae-Eum, and So-Eum types were included in the SPQ-High (57.6%), SPQ-Middle (46.8%), and SPQ-Low (49.3%) latent groups, respectively, which might be regarded as sharing significant structural resemblance (χ^2=490.368, p<0.001). However, the individuals of the So-Yang, Tae-Eum, and So-Eum types were categorized in the NEOPI-ML latent group as 41.2%, 51.4%, and 60.8%, respectively, which indicates that the Sasang types and NEOPI-based latent groups might not share meaningful similarity.

Thus, the SPQ-based latent group (SPQ-High, SPQ-Middle, and SPQ-Low) rather than the NEOPI-based latent group shows significant association with psycho-physiological characteristics of the Sasang type (So-Yang, Tae-Eum, and So-Eum). This result indicates that the data-driven analysis using objective measures might be useful for confirming the traditional clinical typology as reasonable.

Our results might provide intriguing insights into the medical typologies of the world from the following perspectives.

First, the current study presented the usefulness of data-driven analysis using objective psychological measures to scrutinize the integrity of theory-based psychological typologies and their mind-body characteristics. This research method may invite future studies to verify the clinical typologies of the East and the West, including humoral types (e.g., sanguine, choleric, phlegmatic, and melancholic) of Galen[2-4], physique types (e.g., Asthenic, Athletic, and Pyknic) of Kretschmer[5], somatotypes (e.g., Ectomorph, Mesomorph, and Endomorph) of Sheldon[6], Yin-Yang and five phase types of traditional East-Asian medicine, and Ayurvedic dosha types (e.g., Vata, Pitta, and Kapha) of India[8], with reference to the Sasang types (e.g., Tae-Yang, So-Yang, Tae-Eum, and So-Eum) of Korea[1,4,9].

Second, the current study might disclose the mind-body monistic perspective of the East since the Eastern SPQ-based latent groups were shown to have both psychological and physical characteristics, while the Western NEOPI-based latent groups had only psychological features.

The mind-body dualism of the West often considers the psychological and physical features separated or independent, which was exhibited as an insignificant or low correlation between psychological and physical measures in the NEOPI-based latent groups of the current study. In contrast, the entanglement of psychological and physical characteristics is clearly revealed in the SPQ-based latent groups of the current study when the recognition of homogeneity and interaction in real life is considered[50].

Third, the psychological profile of Eastern SPQ-based groups (SPQ-High, SPQ-Middle, and SPQ-Low)

from the LPA showed remarkable resemblance to that of Eastern Sasang types (So-Yang, Tae-Eum, and So-Eum), while that of the Western NEOPI-based groups did not, as mentioned above (Fig. 1).

This result may indicate that the traditional typology based on Eastern philosophy and medicine can be attested only with an Eastern psychological measure, and Western psychology might have innate limitations. Furthermore, this quantitative study may be regarded as a pertinent example for personality studies in which the *etic* approach focusing on the cross-cultural and universal measure could not explain psychological issues of observation, interpretation, and its application without the help of an *emic* approach emphasizing traditional and cultural influences[51].

Finally, the Sasang typology suggests certain medical herbs are adequate for types with specific psychosomatic characteristics[15-17,52], and the current study might make the East-Asian pharmacognostic wisdom[10] useful for personalized medicine in the future.

The So-Eum type was introverted and distressed with a small body shape and low basal metabolism in the current study. They are also known to be susceptible to functional dyspepsia[17] and psychological problems[15,22], therefore, type-specific medical herbs with stomachic, sedative, spasmolytic, and anti-inflammatory properties[10] are recommended for the So-Eum type. The So-Yang type was found to be extroverted, pro-active, and affective with muscular body shape, and activated metabolism; type-specific medical herbs with antipyretic, diuretic, anti-inflammatory, and anti-rheumatic properties[10] have been advised for this type of patient. The Tae-Eum type was reported to have a conventional personality with well-developed, big, and obese body shape along with highly activated metabolism[9,24]. They are also known to be susceptible to hypertension, diabetes, obesity, and metabolic disease[23] consequently, type-

specific medical herbs with anti-inflammatory, anti-asthmatic, antitussive, expectorant, and metabolism-regulating against obesity and hypertension properties[10] have been recommended.

There are several limitations for generalizing the findings of the current study. First, the results with a relatively large sample size of 2,049 participants might have acceptable validity; however, further studies using participants of various ages, cultural backgrounds, and ethnic diversity might be warranted as the results of LPA are sensitive to the characteristics of the data[29,47]. It should be examined whether the extraction of latent groups using SPQ and NEO-PI would reveal similar psychosomatic profiles by using participants with diverse ethnocultural backgrounds.

Second, as the latent psychological group or construct might differ depending on the nature of psychological measures, future studies using other personality and physical measures are needed to verify the current results. For example, psychological measures of the Temperament and Character Inventory, Eysenck Personality Questionnaire, and alternative versions of the five factor model[15] as well as the physical features of muscle strength and volume, bone mineral density and mass, blood test results, comprehensive metabolic panel, and others might be required for the generalization of the current results.

V. CONCLUSION

This study illustrated the psychosomatic characteristics of data-driven latent groups using psychological measures of the East and West, and they were compared with those of Sasang types to examine the scientific validity of the Sasang type classification. The results showed that the Sasang typology has robust foundation on the SPQ-based latent groups, and the SPQ-based latent groups have distinctive psychosomatic characteristics resemble those of Sasang

typology.

The entanglement of psychological and physical characteristics in Sasang typology was confirmed by using objective clinical measures and LPA disclosing novel insights into the traditional clinical wisdom of mind-body monism of the East. And, the SPQ of the Eastern psychology was found to be a pertinent example integrating *etic* and *emic* approaches for investigating traditional medical typology using quantitative method[26]. The research scheme and findings in the current study would provide a foundation for examining the scientific validity of traditional medical typologies in the world.

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