

Review Article

Digestive system-related pathophysiological symptoms of Sasang typology: Systematic review

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ABSTRACT

The purpose of this study was to review clinical studies on digestive system-related pathophysiological symptoms of each Sasang type to obtain the generalizable typespecific clinical features, which are important for the diagnosis of the Sasang type and subsequent disease treatment. Sasang typology and digestive system symptom-related keywords were used to search through eight domestic and foreign databases up to March 2012. The results were organized and analyzed based on four categories [digestive function, appetite, eating pattern, and body mass index (BMI)] to elucidate type-specific symptoms. Sasang type-specific digestive system-related symptoms were identified by reviewing 30 related articles that were gathered by searching through the databases. The Tae-Eum (TE) type had the highest digestive functions and the So-Eum (SE) type had the lowest. The TE type appeared to have larger volume with fast eating speed compared with the SE type and individuals in the TE category preferred fatty or salty food, which is responsible for the high occurrence rates of organic digestive diseases such as gastritis. Moreover, BMI was higher in the TE type and lower in the SE type. We systematically reviewed previously published clinical reports on digestive functions, which can be used to meet the objective of Sasang-type differentiation and pathophysiological pattern identification.

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1. Introduction

Sasang typology is a traditional Korean personalized medicine developed philosophically through Confucianism and medically through clinical experiences in Korea.^{1,2} It divides individuals into four different types, namely, Tae-Yang (SY), Tae-Eum (TE), and So-Eum (SE), which allows for distinctive disease diagnosis and treatment depending on the Sasang type. Recently, studies on type-specific psychological,^{3–5} physical,^{3,6,7} and genetic^{8,9} characteristics have been actively pursued with various cutting-edge techniques.

Moreover, interest on the type-specific original symptoms, which means commonly observed Sasang type-specific pathophysiological symptoms, is steadily increasing as it is considered to be pivotal for the diagnosis and treatment of the disease in the clinical situation. This is because the original symptom becomes the most important clinical index^{10,11} in finalizing the Sasang-type differentiation, pathological pattern identification, and evaluation of treatment results. Previous clinical studies on the original symptoms^{12,13} have been subject to five categories, namely, digestion¹⁴, sleep,^{15–18} defecation,^{17,19} urination,¹⁷ and sweating,^{20,21} through which questionnaire items that heavily reflect type-specific characteristics have been sporadically presented.

Among these original symptoms, it is known that the most distinctive difference among type-specific characteristics is shown in digestive function.^{12,14,22,23} However, the existing studies^{14,22,24} on type-specific digestive system-related symptoms have not been able to thoroughly compare digestive function, appetite, and eating habits, which are considered as the three major factors of digestive system with that of body mass index (BMI)/obesity, which is a numerical and physical index used to indicate digestive power. Because these digestive function-related factors have mutually intricate relationship, they may show complicated and multifaceted results in the clinical situation. Therefore, the clinical diagnostic process should consider these factors multilaterally especially for the Sasang typology.

Moreover, it is important to diagnose the disease in the gastrointestinal system in health care.²⁵ Approximately 35% of Korean population has visited a medical facility more than once due to digestive disease, with diseases of the upper gastrointestinal tract being the leading reasons for the visits (54%). Functional gastrointestinal diseases show a chronic progress, thereby degrading the quality of life and increasing medical expenditure. Therefore, if type-specific personalized medicine can be offered, more effective treatment will be provided along with an improvement in the quality of life.

This research put together previous clinical studies performed on the digestive systems in Sasang typology and analyzed type-specific digestive function, appetite and eating patterns with characteristics of BMI to elucidate the distinctive features of each Sasang type. This research will contribute more to the objective of Sasang-type differentiation and characterization of the pathophysiological gastrointestinal symptoms in the pattern identification.

2. Methods

2.1. Search strategy and data sources

The following eight electronic databases, in either Korean or English, were searched: PubMed (www.pubmed.org), National Discovery for Science Leaders (www.ndsl.kr), Korea Institute of Science and Technology Information (society.kisti.re.kr), Korean Studies Information Service System (kiss.kstudy.com), DBpia (www.dbpia.co.kr), Oriental Medicine Advanced Searching Integrated System (oasis.kiom.re.kr), Korean Traditional Knowledge Portal (www.koreantk.com), and Research Information Service System (www.riss4u.net).

The keywords entered were Sasang typology-related words such as Sasang, Sasang typology, constitution, and Sasang medicine, as well as digestive system-related words such as digestion, appetite, eating habit, or attitude and were searched in English and Korean. All articles in peer-reviewed journals published by March 2012 were included for the screening. We also manually searched our departmental files and relevant journals. Furthermore, the references in all the located articles were manually searched for additional relevant articles.

2.2. Article selection and data extraction

Hard copies of all articles were obtained and read in full. Two reviewers (M.S.L. and H.C.) independently assessed the eligibility of the articles, and disagreements between the reviewers were resolved by discussion and consensus.

2.2.1. Inclusion and exclusion criteria

Peer-reviewed research articles that used any type of questionnaire or examination to investigate digestion/digestive function, appetite, and eating patterns of each Sasang type were included. The articles that only provided description of clinical experience or hypothesis without specifying the Sasang types were excluded. Review papers with only translated texts, commentary articles, and clinical case studies were also excluded. A total of 30 articles identified in the search process out of the initially gathered 120 articles were used in this review.

2.2.2. Data extraction

All the 30 articles were reviewed by two independent reviewers (M.S.L. and H.C.) and data from the articles were extracted according to the predefined criteria. Data pertaining to demographic features such as the number of participants, type of participants, gender distribution, the mean age, and BMI were collected. Moreover, the method by which the Sasang-type classification was obtained and the prevalence of each Sasang type were both extracted to take potential differences that may arise as a result of different classification methodology used in the different studies into consideration. Furthermore, data pertaining to digestion, appetite, eating patterns, and BMI of each Sasang type were extracted to examine the significant differences in digestive system-related functions and diseases.

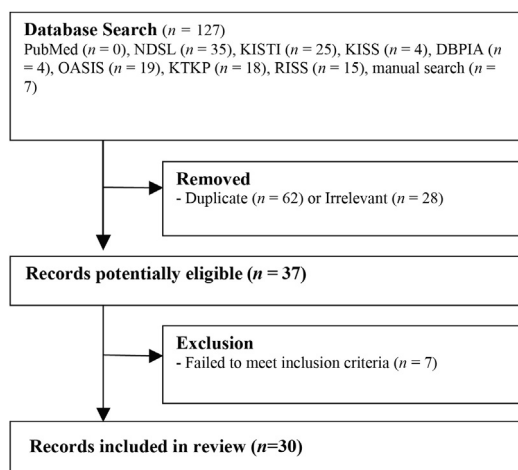


Fig. 1 – Flowchart of the article-selection process. KISS, Korean Studies Information Service System; KISTI, Korea Institute of Science and Technology Information; KTKP, Korean Traditional Knowledge Portal; KTKP, Korean Traditional Knowledge Portal; NDSL, National Discovery for Science Leaders; OASIS, Oriental Medicine Advanced Searching Integrated System; RISS, Research Information Service System.

2.2.3. Data analysis

The data analysis to find type-specific digestion-related pathophysiological symptoms was conducted by the following process: First, data pertaining to questionnaire or examination in Sasang typology were classified into three categories, namely, digestion, appetite, and eating pattern. The digestion category was further classified into two subcategories, namely, digestive function and disease. In addition, the eating patterns were analyzed with respect to eating rate, meal size, eating regularity, and food preference. Finally, the significant differences between different Sasang types in terms of digestion, appetite, and eating pattern were summarized and their meaning in clinical situation is reviewed.

3. Results

3.1. Article selection

A total of 120 potentially relevant articles were identified, of which 28 were excluded as irrelevant after reviewing their full text. Ninety-two articles remained, but 62 were duplicates. Subsequently, seven articles were included in manual research, and seven articles were excluded based on the exclusion criteria described in Figure 1. Finally, 30 articles were reviewed in this study. The key data extracted from the articles are summarized in Tables 2–5. The detailed analyses are presented in the following sections.

3.2. Characteristics of participants

Sixteen studies were conducted with clinical participants, 12 with healthy or nonclinical participants, and one used a mixed sample. One study did not specify the participant characteristics (Table 1).

As for the gender of participants, 26 studies dealt with both male and female, three with females only, one with males only. Seven studies provided information on participants' age with mean and standard deviation, seven studies had only the mean age, and 11 studies did not include any information on age. Only five articles specified the age distribution (Table 1).

3.3. Sasang-type classification

As for the Sasang-type classification, various methods were used in the studies, such as the Questionnaire for the Sasang Constitution Classification versions I, II, and II+, Sasang typology clinical specialist or general practitioner's clinical diagnosis, Sasang type-specific medication response, measure of face and body type, and phonetic system for Sasang constitution. Fourteen studies used just one classification method, whereas others used a combination of two or more methods (Table 1).

3.4. Methods for statistical analysis

With respect to the statistical methods for data analysis, χ^2 test was used in 19 studies, followed by one-way analysis of variance in seven studies and binary logistic regression analysis in one study. Three studies did not use any statistical analysis.

3.5. Digestive system-related features of each Sasang type

3.5.1. Digestion or digestive function

There were eleven^{13,14,23,26–33} studies showing the Sasang typology-related digestive functions. Ten studies used questionnaires evaluating the digestion of Sasang types qualitatively, and one³¹ study used blood samples to test for the activity of digestive enzymes (Table 2).

There were six^{13,23,26,27,32,33} studies asking whether the qualitative status of the digestive function is generally good or poor. Three^{13,26,32} studies showed that the TE type has relatively good digestive functional status, although one study²⁷ identified the SY type. As for the poor digestive function, all three^{13,26,32} studies picked the SE type. There were four^{14,26,29,30} studies, which reported that the SE type suffered indigestion, stomach upset, and indigestion due to nervousness most frequently.

Six^{32,34–38} studies used endoscopic examination to test the Sasang type-specific incidence of digestive disease or abnormalities (Table 3). Based on the result of endoscopic examination, one³⁸ study showed that the proportion of gastritis was significantly higher in the TE type than in the others, and two^{32,35} studies showed that the TE type accounted for a higher proportion of gastritis than others, whereas one³⁴ study showed that the SE type has a higher frequency of digestive disease than other types.

Although there were no significant differences in the degree of gastrointestinal symptoms between Sasang types, the SE type has a higher percentage of dyspepsia based on three^{35,39,40} studies (Table 2).

Table 1 – Demographic features of the articles reviewed.

References	Demographic features			Sasang-type classification	
	Participants (male, female)	Characteristics of participants	Mean age (y)	Method	Prevalence (Tae-Yang, So-Yang, Tae-Eum, So-Eum)
Baek et al. (2004) ¹⁴	588 (248, 340)	Outpatient	39.1	Specialist with chart review *	10, 136, 175, 267
Baek and Park (2004) ²²	588 (248, 340)	Outpatient	39.1	Specialist with chart review	10, 136, 175, 267
Park et al. (2006) ²³	1229 (529, 700)	Outpatient	n.a.	Specialist with chart review	14, 365, 361, 489
Jang et al. (2007) ¹²	418 (168, 250)	Outpatient	n.a.	Specialist with chart review	0, 126, 191, 101
Baek et al. (2009) ¹³	1241 (476, 765)	Outpatient	n.a.	Specialist with chart review	0, 389, 541, 311
Ham et al. (2004) ²⁶	101 (54, 47)	Stroke inpatient	SY (64.15 ± 11.05), TE (60.28 ± 12.47), SE (66.00 ± 10.25)	QSCCII + and specialist with chart review	0, 52, 39, 10
Kim et al. (2010) ²⁷	602 (307, 295)	Healthy personnel	n.a. (age: 20s and 60s)	Specialist	0, 131, 257, 214
Koh et al. (2007) ⁴⁴	146 (80, 66)	Outpatient	n.a. (age: 2-18)	Specialist with chart review	1, 36, 66, 43
Kim (1996) ²⁸	73 (31, 42)	Outpatient	40.2	QSCC	0, 8, 24, 41
Kim and Kim (1999) ²⁹	196 (100, 96)	Outpatient	n.a.	QSCCII, Questionnaire for the Sasang Constitution Classification and Specialist	0, 32, 97, 67
Lee and Kim (2002) ³⁰	584 (300, 284)	Outpatient	n.a.	QSCCII and Questionnaire for the Sasang Constitution Classification	0, 100, 268, 216
Baek (2004) ³⁹	100 (35, 65)	Functional dyspepsia patient	Male (43), female (47)	QSCCI and specialist	0, 35, 27, 48 Male (0, 7, 14, 14) Female (0, 18, 13, 34)
Lee and Sul (2000) ³⁴	280 (109, 171)	Health-screening population	n.a.	General practitioner	0, 35, 58, 187
Choi et al. (2010) ³¹	1084 (399, 685)	Outpatient	44.41 ± 15.93	Specialist or general practitioner with chart review	0, 389, 371, 324
Lee et al. (2004) ³⁵	100 (42, 58)	Dyspepsia outpatient	41.69	QSCCII	0, 31, 32, 37
Lee et al. (2007) ⁴¹	974 (292, 682)	Health-screening population	53.8 ± 7.5 Male (55.8 ± 7.6) Female (52.9 ± 7.3)	PSCC, face measures, and specialist	0, 240, 488, 246

Table 1 (Continued)

References	Demographic features			Sasang-type classification	
	Participants (male, female)	Characteristics of participants	Mean age (y)	Method	Prevalence (Tae-Yang, So-Yang, Tae-Eum, So-Eum)
Lee et al. (1996) ³²	193 (107, 86) n.a. (3)	Health-screening population	42.84 Male (43.45) Female (42.06)	QSCCI, Questionnaire for the Sasang Constitution Classification, and specialist	0, 28, 110, 58
Lee et al. (2004) ³³	100 (0, 100)	Healthy personnel	n.a. (age: 30s–50s)	QSCCII, body measures, face measures, and specialist	0, 30, 30, 40
Lee et al. (2004) ³⁶	68 (30, 38)	Health-screening population	Male (49.7) Female (46.4)	QSCCII + and specialist	0, 24, 23, 21
Kim and Kim (2004) ⁴⁵	129 (0, 129)	Obesity patient	n.a.	QSCCII and general practitioner	0, 12, 102, 15
Kim et al. 2002) ³⁷	84 (35, 49)	Health-screening population	Age over 65 years Male (69.8 ± 3.6) Female (68.6 ± 3.5)	QSCCII and specialist	0, 23, 41, 19
Kwon et al. (1994) ⁵⁶	641 (258, 383)	Health-screening population	n.a.	Questionnaire, body measures, and specialist	0, 197, 286, 158
Hong et al. (2002) ⁴⁶	74 (45, 29)	Healthy personnel	n.a. (age: 10–11 years)	QSCCII and specialist	0, 26, 33, 15
Shin et al. (2010) ⁴³	31 (31, 0)	Healthy personnel (BMI: 18.5–23)	n.a. (age: 20–35 years)	Specialist	0, 10, 11, 10
Jin et al. (2009) ⁴²	249 (30, 219)	Outpatient	n.a.	QSCCII and specialist	21, 48, 66, 114
Park and Kim (2003) ⁴⁷	305(0, 305)	Female college students	n.a.	QSCCII	0, 101, 157, 47
Hong et al. (2011) ⁵⁷	108 (60, 48)	Dyspepsia patient	40.25 ± 10.20 Male (40.25 ± 9.96) Female (40.5 ± 10.60)	QSCCII + and specialist with chart review	0, 57, 27, 24
Lee et al. (1999) ⁴⁰	FGID [27 (8, 19)], other somatoform disorder [28 (9, 19)], healthy control [26 (13,13)]	Inpatient, outpatient, and healthy control	FGID (44.2 ± 11.2), other somatoform disorders (41.9 ± 10.3), healthy control (36.2 ± 10.2)	Questionnaire	n.a.
Lee et al. (1998) ⁴⁸	34 (8, 26)	n.a.	n.a.	QSCCII and specialist	0, 9, 12, 13
Lee et al. (2006) ³⁸	1453 (719, 734)	Health-screening population	46.6 ± 11.9	QSCCII + and specialist	0, 421, 683, 349

* No specific adverse events to the Sasang type-specific medication.

BMI, body mass index; FGID, functional gastrointestinal disorder; n.a., not available; PSSC, Phonetic System for Sasang Constitution; QSCC, Questionnaire for the Sasang Constitution Classification; SE, So-Eum; SY, So-Yang; TE, Tae-Eum; TY, Tae-Yang.

Table 2 – Digestive function and disease of Sasang typology.

References	Status of the digestive function
Baek et al. (2004) ¹⁴	Indigestion due to cold or fatty foods (SE > TE *), indigestion since childhood (SE > TE, TY > TE †), digestive upset (SE > TE †), nervousness-induced indigestion (SE > TE, SE > SY †)
Park et al. (2006) ²³	Eupepsia [TY + TE > SY + SE (p < 0.1)]
Baek et al. (2009) ¹³	Dyspepsia (SE > TE *), eupepsia (TE > SY, TE > SE *)
Ham et al. (2004) ²⁶	Dyspepsia (SE > SY, SE > TE *), eupepsia (TE > SY, TE > SE *)
Kim et al. (2010) ²⁷	Eupepsia (SY > TE > SE †)
Kim (1996) ²⁸	Vomiting (TE > SY, TE > SE *)
Kim and Kim (1999) ²⁹	Stomach ache (SE > SY, SE > TE *)
Lee and Kim (2002) ³⁰	Indigestion and nervousness (SE > SY, SE > TE *)
Choi et al. (2010) ³¹	Digestive enzymes: lipase (n.s.), amylase (SE > TE †)
Lee et al. (1996) ³²	Dyspepsia (SE > SY, SE > TE *), eupepsia (TE > SY, TE > SE *)
Lee et al. (2004) ³³	Digestive upset or stomach ache [SE, SY, TE (20%, 6.7%, 3.3%)], eupepsia [SY, TE, SE (36.7%, 26.8%, 10%)]
References	Prevalence of the digestive disease
Baek (2004) ³⁹	FD total [SE, TE, SY (48%, 27%, 25%)], male [SE, TE, SY (40%, 40%, 20%)], female [SE, TE, SY (52.3%, 20%, 27.7%)]. The SE type has more digestive problem than the normal group
Lee and Sul (2000) ³⁴	Gastritis [SE, TE, SY (19, 6, 2)], peptic ulcer [SE, TE, SY (7, 3, 0)], gastroptosis [SE, TE, SY (17, 0, 3)], gastric malformation [SE, TE, SY (2, 1, 0)], <i>Helicobacter pylori</i> [SE, TE, SY (21, 12, 6)], the SE type has more gastric disease (SE > TE, SE > SY *)
Lee et al. (2004) ³⁵	Dyspepsia [SE, TE, SY (37, 32, 31)], GI symptom score (n.s.), gastritis [TE, SE, SY (29, 26, 24)], gastric ulcer [SE, TE, SY (7, 3, 3)]
Lee et al. (1996) ³²	Gastric disorder [TE, SE, SY (33, 14, 6)], superficial gastritis [TE, SE, SY (21, 8, 4)]
Lee et al. (2004) ³⁶	Degree of gastritis (n.s.), degree of gastritis (male > female †), type of gastritis (n.s.), GI symptom (n.s.), GI symptom (female > male †)
Kim and Kim (2004) ⁴⁵	Dyspepsia [TE, SY, SE (53, 10, 4)], dyspepsia prevalence [SY, TE, SE (83.3%, 52.0%, 26.8%)]
Kim et al. (2002) ³⁷	Gastritis prevalence [TE, SY, SE (43.9%, 52.2%, 57.9%)]
Kwon et al. (1994) ⁵⁶	Gastric disease prevalence (SE > SY, SE > TE †)
Shin et al. (2010) ⁴³	GSRS (n.s.)
Hong et al. (2011) ⁵⁷	Dyspepsia (SY > TE, SY > SE †)
Lee et al. (1999) ⁴⁰	FGID [SE, non-SE (15, 12)], other somatoform disorder [SE, non-SE (16, 12)]
Lee et al. (2006) ³⁸	Gastric polyp (TE > SY, TE > SE †), gastritis (TE > SY, TE > SE †), peptic ulcer (n.s.), <i>Helicobacter pylori</i> (n.s.)
* p < 0.05.	
† p < 0.01.	
‡ p < 0.001.	
FD, functional dyspepsia; FGID, functional gastrointestinal disorder; GI, gastrointestinal; GSRS, gastrointestinal symptom rating scale; n.s., nonspecific differences with Sasang types; SE, So-Eum; SY, So-Yang; TE, Tae-Eum; TY, Tae-Yang.	

3.5.2. Appetite

There were 10 studies^{12,13,22,23,26,27,29,30,33,41} asking whether the qualitative status of the appetite is generally good or poor. Six articles^{12,13,22,26,27,41} showed that the TE type had relatively

good appetite although one article³³ showed the SY type. As for the poor digestive function, six studies^{12,13,26,27,29,30} showed that the SE type has poor appetite compared with other types (Table 3).

Table 3 – Appetite of Sasang typology.

References	Appetite
Baek and Park (2004) ²²	Poor (SE > TE, SY > TE, TY > TE *), good (TE > SE, SY > SE *), good and overeating (TE > SE, TE > TY, SY > SE, SY > TY *), irregular (SY > TE, SE > TE *), changing with mood (SE > SY, SE > TE *)
Park et al. (2006) ²³	Good [TY + TE > SY + SE (p < 0.1)]
Jang et al. (2007) ¹²	Poor (SE > SY, SE > TE), good (TE > SE †)
Baek et al. (2009) ¹³	Poor (SE > SY, SE > TE), good (TE > SE †)
Ham et al. (2004) ²⁶	Poor (SE > SY, SE > TE), good (TE > SY, TE > SE †)
Kim et al. (2010) ²⁷	Poor (SE > SY, SE > TE †), good (TE > SY > SE *)
Kim and Kim (1999) ²⁹	Poor (SE > SY, SE > TE †)
Lee and Kim (2002) ³⁰	Poor (SE > SY, SE > TE †)
Lee et al. (2007) ⁴¹	Good (TE > SY > SE *)
Lee et al. (2004) ³³	Good and eupepsia [SY > TE > SE (p = 0.064)]
Shin et al. (2010) ⁴³	DEBQ [restraint eating (n.s.), emotional eating (SY > SE †), external eating (n.s.)]
Jin et al. (2009) ⁴²	The reason for eating [hunger (SE > TE †), pleasure of eating (TE > TY, TE > SE †)]
* p < 0.01.	
† p < 0.05.	
‡ p < 0.001.	
DEBQ, Dutch Eating Behavior Questionnaire; n.s., nonspecific differences with Sasang types; SE, So-Eum; SY, So-Yang; TE, Tae-Eum; TY, Tae-Yang.	

One article²² reported that the SY type has irregularity with appetite, although the SE type tends to have mood-related appetite changes. There was one study⁴² dealing with the reason for appetite, in which the authors reported that hunger was the reason for eating in the SE type, whereas pleasure was the reason in the TE type.

There was an article⁴³ that examined the appetite-related psychological factors using the Korean version of Dutch Eating Behavior Questionnaire. The SY type showed significantly higher score than the SE type in Emotional Eating scale, but there were no significant differences between Sasang types in Restraint Eating and External Eating subscales (Table 3).

3.5.3. Eating pattern

There were 17 studies^{12–14,22,23,26,29,30,32,37,41,42,44–48} that used arbitrary questionnaire items to evaluate the eating pattern of each Sasang type (Table 4). The SE type finished the meals significantly faster than the Sasang types in four articles,^{12,13,41,44} while the SE type finished the meals significantly slower than others in eight articles.^{12,13,22,26,41,42,44,47}

Twelve articles have examined the volume of meals between different Sasang types. The TE type had significantly larger volume than the other Sasang types in four articles,^{13,26,42,44} and tend to have stress-induced volume increase in one article.⁴⁷ In addition, the female TE type had significantly larger caloric intake according to one of the articles.⁴⁶ According to five articles,^{12,13,22,26,41} the SE type had significantly smaller volume. The TE type tend to show overeating habits in three articles,^{12,26,41} while the SE type does not show such habits in three articles.^{14,41,42}

As for the regularity of the meals there were no significant differences between Sasang types as shown in two articles.^{22,41} There were five articles questioning the preference for specific foods. The TE type preferred fatty food in three articles,^{29,30,44} and salty food in two articles.^{29,30}

3.5.4. BMI

The BMI data of study participants were provided in 14 articles, which showed that BMI of the TE type was significantly ($p < 0.05$) higher than that of the SE type (Table 5).

4. Discussion and Conclusion

This study reviewed digestive system-related Sasang typology studies and provided Sasang type-specific pathophysiological symptoms in four categories of digestion, appetite, eating habit, and BMI to obtain generalizable clinical features of each Sasang type.

We showed that the TE type has the tendency to prefer fatty or salty food and to eat faster because such individuals have high digestive power and strong appetite. Therefore, the TE type has frequent prevalence to organic digestive malfunction and the SE type was identified to have the opposite characteristics.

This study covered broader digestive system-related symptoms than previous studies meticulously.^{14,22,24} While analyzing the digestive system, digestion function or disease, appetite, and eating habit should be studied closely at the same time. This is not only based on the result of previous

reports on diagnosis and treatment with type-specific clinical perspectives,^{12–14,22,23,26} but it is also because the three factors have a complex mutual relationship in digestive system's function and malfunction.

Digestive function has an intricate clinical relationship with appetite and eating habit. Indigestion⁴⁹ is accompanied by loss of appetite, but with strong appetite the volumes of meals tend to increase as well as the speed of eating. Irregular eating habits cause future gastrointestinal diseases,^{50,51} and therefore intervention on eating habits is used for the treatment of indigestion.^{52,53}

In digestion (Table 2), the SE type was identified to have weak digestive power and thereby symptoms such as dyspepsia, upset stomach, or neurotic dyspepsia are reported more often. The TE type, by contrast, has strong digestive power and showed that abnormal digestive system findings such as gastritis are more common on a gastrointestinal endoscopy examination.

The second factor, appetite (Table 3), showed that the TE and SE types indicate opposite features as well. The TE type has a strong appetite and has enjoyment in eating, whereas the SE type has weak appetite and eats just to fill the hunger and shows irregularity in eating depending on the mood. In eating pattern (Table 4), as the third factor, the TE type tends to have a fast eating speed with bigger meal size with a tendency to overeat and preference for fatty or salty food, whereas the SE type shows a rather slow eating speed.

Results of previous research^{50–53} suggested that eating irregularly and rapidly would cause future gastrointestinal diseases showing that there is an elaborate relationship between eating pattern and digestive malfunction. This shows that the TE type is likely to seek medical aid due to its type-specific pathophysiological features.

Physical characteristics of BMI showed that the TE type has the highest number (Table 5), which seems to be due to strong appetite and bigger meal sizes reported in the previous studies. It is said that the TE type has high accumulation and anabolism and low consumption and catabolism,^{1–3} which are secondary characteristics, and has a physical index due to digestive characteristic in agreement with the results of previous studies.^{2,3,6,24} As for the relation with BMI and digestive malfunction, the frequency of functional dyspepsia is attentively low when the BMI is greater than 25 (overweight),⁵⁴ and the cross ratio of nonulcer dyspepsia decreases as the BMI increases.⁵¹ Taking into account that underweight and slim body shapes have considerably more gastroptosis,⁵⁵ they support the current study results that the TE type, which has greater BMI, has better digestive function.^{56,57}

This research has several limitations to be generalized. First, this review could not create a meta-analysis and present quantified data because the data from previous studies had different forms of questionnaires and used self-reporting methods lacking reliability and validity. Second, some of the studies were performed with participants lacking representation enough to be generalized, which may be the result of sampling bias. Finally, the majority of the studies were descriptive rather than testing the differences between Sasang types, and therefore results or definitive summary measures were not available.

Table 4 – Eating patterns of Sasang typology.

References	Eating patterns			
	Eating rate	Meal size	Eating regularity	Food preference
Baek et al. (2004) ¹⁴	–	–	Overeating (TE > SE, SY > SE *)	–
Baek and Park (2004) ²²	Fast (TE > SE, SY > SE *)	Big (TE > SE, SY > SE *)	Regularity (n.s.)	–
Park et al. (2006) ²³	Fast [TY + TE > SY + SE (p < 0.1)]	Big [TY + TE > SY + SE (p < 0.1)]	–	–
Jang et al. (2007) ¹²	Fast (TE > SE †), slow (SE > SY, SE > TE †)	Small (SE > TE †)	Overeating (TE > SE †)	–
Baek et al. (2009) ¹³	Fast (TE > SY, TE > SE †), slow (SE > SY, SE > TE †)	Big (TE > SY, TE > SE †), small (SE > SY, SE > TE †)	–	–
Ham et al. (2004) ²⁶	Slow (SE > SY, SE > TE †)	Big (TE > SY, TE > SE †), small (SE > SY, SE > TE †)	Overeating (TE > SY, TE > SE †)	–
Koh et al. (2007) ⁴⁴	Fast (TE > SE †), slow (SE > TE †)	Big (TE > SE, TE > SE †), small (SE > TE, SY > TE †)	–	Unbalanced diet (SE > SY, SE > TE †), dislike vegetable (SE > SY †), fatty (TE > SY, TE > SE †)
Kim and Kim (1999) ²⁹	–	–	–	Fatty (TE > SY, TE > SE), salty (TE > SY, TE > SE), not fatty (SE > SY, SE > TE), not salty (SE > SY, SE > TE)
Lee and Kim (2002) ³⁰	–	–	–	Fatty (TE > SY, TE > SE), salty (TE > SY, TE > SE)
Lee et al. (2007) ⁴¹	Fast (TE > SY > SE *)	Small (SE > SY > TE *)	Overeating (TE > SY > SE *) Regularity (n.s.)	–
Lee et al. (1996) ³²	–	–	–	Cold (TE > SY, TE > SE), warm (SE > SY, SE > TE)
Kim and Kim (2004) ⁴⁵	–	–	Overeating by stress [SY, TE, SE (10, 49, 6)]	–
Kim et al. (2002) ³⁷	Fast [TE > SE, SY > SE (p < 0.1)]	Caloric intake [male (n.s.), female (TE > SY, TE > SE) (p < 0.1)]	Irregularity [SE > SY, SE > TE (p < 0.1)]	–
Hong et al. (2002) ⁴⁶	–	Caloric intake [male (n.s.), female (TE > SY, TE > SE †)]	–	–
Jin et al. (2009) ⁴²	Fast (TE > SE, SY > SE †)	Big (TE > SE †)	Overeating (TE > SE, SY > SE †), irregularity (TE > SY, TE > SE †)	–
Park and Kim (2003) ⁴⁷	Slow (SE > SY, SE > TE *)	Medium (SE > SY, SE > TE †), stress-induced increase (TE > SE †)	–	–
Lee et al. (1998) ⁴⁸	Slow [TE, SY, SE (41.7%, 33.3%, 15.4%)]	Big [TE, SY, SE (58.3%, 55.6%, 15.4%)]	–	Cold [TE, SE, SY (0%, 0%, 22.2%)], warm [TE, SE, SY (58.3%, 76.9%, 44.4%)], hot and spicy [TE, SY, SE (41.7%, 55.6%, 61.5%)]

* p < 0.01.
† p < 0.05.
‡ p < 0.001.
n.s., nonspecific differences with Sasang types; SE, So-Eum; SY, So-Yang; TE, Tae-Eum; TY, Tae-Yang.

However, due to the fact that they are the results of the last 20 years of type-specific digestive system-related studies in various methods, it provides a rather broad spectrum of information and confirmation from different clinical situations that the TE and SE types are consistently at the opposite ends of the axis in terms of digestion, appetite, eating pattern, and BMI.

This review thoroughly examined the pivotal digestive system-related pathophysiological symptoms that are considered to be important in clinical diagnosis and treatment. We are suggesting that Sasang type-specific pathophysiological

clinical features are useful for designing questionnaire structure and items that can be used as a standardized clinical index for Sasang-type differentiation. This study would contribute to the improvement of quality of life through personalized treatment in digestive diseases based on traditional Korean medicine.

Conflict of interest

No competing financial interests exist.

Table 5 – Body mass index of Sasang typology.

References	BMI				
	Tae-Yang	So-Yang	Tae-Eum	So-Eum	Comparison
Baek et al. (2004) ¹⁴	19.54 ± 2.18	23.01 ± 2.63	25.78 ± 2.64	20.63 ± 2.32	TE > SE, TE > TY, SY > SE, SY > TY *
Baek and Park (2004) ²²	19.54 ± 2.18	23.01 ± 2.63	25.78 ± 2.64	20.63 ± 2.32	TE > SE, TE > TY, SY > SE, SY > TY *
Park et al. (2006) ²³	–	SY + SE (21.66 ± 2.54)	TY + TE (25.61 ± 2.87)	–	TY + TE > SY + SE *
Kim et al. (2010) ²⁷	n.a.	22.38 ± 2.73	25.21 ± 3.01	21.20 ± 2.44	n.a.
Lee et al. (2007) ⁴¹	n.a.	23.4 ± 2.1	25.8 ± 2.5	22.0 ± 2.0	TE > SY > SE †
Lee et al. (1996) ³²	n.a.	21.5	25.1	20.61	TE > SY, TE > SE †
Lee et al. (2004) ³³	n.a.	22.54 ± 2.98	27.78 ± 3.24	21.74 ± 2.38	TE > SY, TE > SE *
Kim et al. (2002) ³⁷	n.a.	Male (22.3 ± 2.7) Female (22.8 ± 2.1)	Male (24.7 ± 2.1) Female (25.7 ± 3.2)	Male (20.4 ± 2.9) Female (22.6 ± 3.5)	Male (TE > SE †) Female (TE > SY, TE > SE †)
Hong et al. (2002) ⁴⁶	n.a.	16.82 ± 0.34 Male (17.07 ± 0.45), Female (16.53 ± 0.54)	19.62 ± 0.53 Male (19.81 ± 0.68) Female (19.28 ± 0.89)	14.95 ± 0.28 Male (14.96 ± 0.41), Female (14.95 ± 0.31)	TE > SE * Male (TE > SE *) Female (TE > SE *)
Shin et al. (2010) ⁴³	n.a.	21.38 ± 0.91	22.34 ± 0.73	20.02 ± 1.07	TE > SE, SY > SE *
Park and Kim (2003) ⁴⁷	n.a.	19.2 ± 1.32	21.0 ± 2.17	18.2 ± 1.22	TE > SY > SE *
Lee et al. (1998) ⁴⁸	n.a.	Female (21.8 ± 0.9)	Male (24.7 ± 1.3) Female (23.6 ± 3.7)	Male (18.9) Female (18.6 ± 1.4)	Female (TE > SE, SY > SE †)

* p < 0.001.
† p < 0.01.
BMI, body mass index; n.a., not available; SE, So-Eum; SY, So-Yang; TE, Tae-Eum; TY, Tae-Yang.

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