Review

Current Researches on the Methods of Diagnosing Sasang Constitution: An Overview

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Sasang constitution diagnosis has traditionally been conducted by a Sasang constitutional medicine (SCM) doctor who examines the external appearance, temperament and various symptoms of an individual and then collectively analyzes this information to determine their own constitutions. However, because this process is subjective and not quantitative, many researchers have been attempting to develop objective and reasonable methods of determining constitutions. In Korea, even though a wide range of research regarding SCM has been conducted, most of the work has not been revealed internationally. So in this review, the authors have searched the Journal of Sasang Constitutional Medicine, as well as other Korean domestic journal databases and Pubmed for research regarding modernized constitution diagnosis methods so to provide the understanding of current research state and outlook for future research.

Keywords: body shape analysis – facial analysis – modernized constitution diagnosis methods – questionnaires – Sasang constitutional medicine

Introduction

According to Donguisusebowon (longevity and life preservation in oriental medicine), all people belong to one of the four constitutions based on the four emotional energies of sorrow, anger, gladness and enjoyment, which are derived from Confucianism. It is possible to classify an individual’s constitution based on their external appearance, temperament and various symptoms (1).

External appearance includes the body shape, as well as facial configuration and skin tactile. Temperament includes personality and abilities corresponding with the four emotional energies. Symptoms can be physiological or pathological. Spontaneously, an individual’s constitution is not a simple conception, but a systematic classification with its own unique psychological and physical traits (2).

The Sasang constitutional medicine (SCM), dividing human beings into four different constitution groups, is similar to Ayurveda, the traditional constitutional medicine of India, in which the individual’s constitution is divided into three groups, based on their external appearance, skin condition, walking and eating style and emotional traits (3). While Western medicine focuses on diseases, Ayurveda and SCM have put the priority on the human being itself (4). Comparing these two constitutional medicines within the framework of disease prevention and quality-of-life (QOL) evaluation, Tae-eumin (TE type) was found to be similar to Kapha type, Soyangin (SY type) to Pitta type, and Soeumin (SE type) to Vata type (5). Similar to Ayurveda, SCM is also fully dependent on the interpretation and the opinion of a doctor. So, to overcome this drawback, many SCM-related researchers have attempted to develop modernized diagnostic tools to support objective and quantitative constitution diagnosis.
The Korea Institute of Oriental Medicine (KIOM) and other domestic oriental medical colleges have been continuously evaluating SCM for the past 10 years, and their efforts to develop objective constitution diagnosis methods have received much attention (6). Recently, due to advances in information and communication technologies, it has become possible to process large volumes of genetic data. However, the results of these researches have not been introduced to the international CAM academic community. Therefore, the authors conducted this review of current researches regarding constitution diagnosis methods to provide an understanding of SCM as well as to provide an outlook for the future of SCM.

Methods

Articles related to constitution diagnosis were searched with the keyword ‘Sasang’ in Pubmed and in the databases containing literature regarding oriental medicine written in Korean. In addition, all articles in the Journal of Sasang Constitutional Medicine (JSCM) were reviewed from the first issue in 1989 up to the latest article in 2008. And, by examining the abstract, methods and results of all articles found in keyword-matching search, specific researches, which cover the modernization of traditional constitution diagnosis methods based on clinical experiment, were strategized to be selected and evaluated.

In Donguisusebowon, Lee Je-ma suggested the following methods to determine patients’ Sasang constitutions: physical appearance, temperament and talent, and pathological syndromes and pharmacology. So the selected ones were then reclassified into following four categories based on those methods: body shape analysis, facial analysis, voice analysis and questionnaire.

Search Results

(i) In JSCM, 86 articles were finally selected from 730 articles, based on the authors’ analyses of the abstracts, methods and contents. These articles covered the modernization of traditional constitution diagnosis methods that evaluate the body shape, face, voice and questionnaire.

(ii) In Pubmed, 22 articles were found using ‘Sasang’ as the keyword. Out of the 22, one article that dealt with the development of constitution diagnosis method was selected for this review.

(iii) By another search in databases containing journals related to oriental medicine written in Korean, such as DBPIA (http://www.dbpia.co.kr), KISS (http://kiss.kstudy.com) and KISTI (http://society.kisti.re.kr), 278 articles using ‘Sasang’ as a keyword were found. Then, 40 articles, which dealt with the development of constitution diagnosis methods, were extracted for this review.

Final search results are summarized in Table 1.

Table 1. Selected researches from various databases

<table>
<thead>
<tr>
<th>Name of DB or Journal searched</th>
<th>Number of searched SCM articles</th>
<th>Number of articles for review</th>
</tr>
</thead>
<tbody>
<tr>
<td>JSCM</td>
<td>86</td>
<td>730</td>
</tr>
<tr>
<td>Pubmed</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>DBPIA</td>
<td>6</td>
<td>69</td>
</tr>
<tr>
<td>KISS</td>
<td>5</td>
<td>72</td>
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<tr>
<td>KISTI</td>
<td>29</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>127</td>
<td>1030</td>
</tr>
</tbody>
</table>

Language

Korean

Results

Body Shape Analysis

Lee Je-ma (1837–1900) proclaimed that human beings could be classified into four constitutions, Taeyangin (TY type), Tae-eumin (TE type), Soyangin (SY type) and Soeumin (SE type), based on functional activity differences between the four viscera—lungs, liver, spleen and kidneys, which induce different shapes at four parts of the body. As a result, Taeyangins have a more developed ‘lung area’ and a less developed ‘liver area’, while Tae-eumins have a more developed ‘liver area’ and a less developed ‘lung area’. In addition, Soyangins have a more developed ‘spleen area’ and a less developed ‘kidney area’, while Soeumins have a more developed ‘kidney area’ and a less developed ‘spleen area’.

In body shape analysis for constitution diagnosis there are two primary methods used, body trunk measurement and body segment measurement (Table 2). These two methods deal with morphological differences in the trunk or body segments among constitutions.

As for body trunk measurement, Huh et al. (7) suggested that trunk shape differed among individuals with different Sasang constitutions; therefore, SCM doctors could classify Sasang constitutions based on the lengths of five horizontal lines in the trunk derived from Lee Je-ma’s Four Area Theory. They reported that the accuracy of constitution diagnosis using this method was ~90% when conducted by highly skilled practitioners (8). However, this method had a weak point that the measured lengths of anterior trunk are not sufficient for checking the degree of development in the trunk. Therefore, some researchers have insisted that the eight circumferences of the trunk embody the four viscera area better than the five lengths of the anterior trunk (9,10).

However, manual measuring methods cause inconvenience to the patients, and various human errors like intra-observer and inter-observer discrepancy could
influence the constitution diagnosis. Therefore, there has 
been a need to develop an automatic and reliable mea-
suring method (11). Recently, an automatic measuring 
device, IBS 2000 (Z-Scan Co. Ltd, Pusan, Korea), was 
developed and was clinically evaluated. The results of 
several researches have shown that the differences 
between automatic measurement using the IBS 2000 
and manual measurement by skilled operators are 
minimal (11,12).

Other researchers tried to find various specific body 
segments correlated to constitutions such as head, neck, 
thigh, lower leg, foot and upper arm as well as the angle 
between both costal margins over the abdomen, for con-
venient clinical use (13,14).

Facial Analysis

Since the Neijing era, oriental medical doctors have 
stressed diagnoses that involve observing the shape and 
color of the face. SCM doctors also have maintained 
this viewpoint and have elaborated facial analysis for 
determining the constitution or evaluating the patient’s 
health. Meanwhile, the most challenging part about 
the descriptions in SCM literatures regarding whole 
facial appearance or the features of partial compartments 
of the face, such as ears, eyes, mouth and nose, is that they 
are subjective and non-quantitative (15). To overcome this 
handicap, many SCM doctors have made great efforts to 
make facial analysis more objective (Table 3).

The first quantitative attempt of constitution diagnosis 
based on facial analysis was made by Koh et al. in 
1996. In their study, 200 indexes for classifying Sasang 
constitutions were suggested, which were generated with 
normalized lengths and their ratios of 69 feature points 
on the front and left lateral pictures of faces in the 
178 participants (16). These 69 points had been estab-
lished by SCM doctors through facial analysis based 
on Martin’s facial points (17). Furthermore, some 
researchers have attempted to set up typical Korean 
faces to each Sasang constitution through analysis of 
the facial features of 846 participants (18,19). However, 
facial-analysis methods using photographs are limited by 
lack of repeatability caused by the manual point assign-
ment and discrepancy between a 2D image and SCM 
doctors’ 3D recognition (15).

Therefore, to meet the needs for a realistic facial image, 
a stereo camera method was applied to facial analysis 
(15,20). However, the results of several researches 
revealed that improvement was needed both in software 
and in hardware because it had a larger margin of error 
than 3D laser scan method (19,21). So, instead of using 
the stereo camera method, 3D AFRA (3D automatic face 
recognition apparatus) that used a 3D shape restoration 
technique based on a space partition encoding optic 
formula was developed (22).

Recently, KIOM examined the correlation between 
constitutions and each possible distance, angle and 
distance ratio of the feature points in the frontal facial 
pictures. Of the 1225 distances, 40 000 angles and 600 000 
distance ratios, 9 distances, 10 angles and 10 distance 
ratios were found to be statistically significant among 
constitutions.

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Table 2. Body shape analysis researches

<table>
<thead>
<tr>
<th>First author</th>
<th>Part</th>
<th>Instrument</th>
<th>Year</th>
<th>N</th>
<th>Diagnosis method</th>
<th>Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huh MH</td>
<td>Trunk</td>
<td>Ruler</td>
<td>1992</td>
<td>311</td>
<td>Questionnaire, herbal prescription, experts</td>
<td>JSCM (in Korean)</td>
</tr>
<tr>
<td>Lee EJ</td>
<td>Trunk, segment</td>
<td>Ruler</td>
<td>1998</td>
<td>157</td>
<td>Questionnaire, expert, drug response</td>
<td>JSCM (in Korean)</td>
</tr>
<tr>
<td>Kim JW</td>
<td>Trunk</td>
<td>Ruler</td>
<td>2006</td>
<td>562</td>
<td>Questionnaire, expert, drug response</td>
<td>JSCM (in Korean)</td>
</tr>
<tr>
<td>Sul YK</td>
<td>Trunk</td>
<td>Ruler, IBS-2000, WBS</td>
<td>2007</td>
<td>1057</td>
<td>Expert</td>
<td>JSCM (in Korean)</td>
</tr>
<tr>
<td>Lee HS</td>
<td>Costal arch</td>
<td>Graduator</td>
<td>2008</td>
<td>173</td>
<td>Expert</td>
<td>JSCM (in Korean)</td>
</tr>
</tbody>
</table>

KJOP: Korean Journal of Oriental Physiology and Pathology; N: number of participants.

Table 3. Face analysis researches

<table>
<thead>
<tr>
<th>First author</th>
<th>Method</th>
<th>Instrument</th>
<th>Year</th>
<th>N</th>
<th>Diagnosis method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koh BH</td>
<td>2D</td>
<td>Camera (Nikon FM2)</td>
<td>1996</td>
<td>170</td>
<td>Questionnaire, herbal prescription, experts</td>
</tr>
<tr>
<td>Hong SC</td>
<td>3D</td>
<td>Camera (Nikon FM2) with moire slit</td>
<td>1998</td>
<td>113</td>
<td>Questionnaire, herbal prescription, experts</td>
</tr>
<tr>
<td>Hong SC</td>
<td>2D</td>
<td>Camera (Nikon FM2)</td>
<td>1998</td>
<td>209</td>
<td>Questionnaire, herbal prescription, experts</td>
</tr>
<tr>
<td>Hong SC</td>
<td>3D</td>
<td>Camera (Nikon FM2) with moire slit</td>
<td>1998</td>
<td>98</td>
<td>Questionnaire, herbal prescription, experts</td>
</tr>
<tr>
<td>Yoon JH</td>
<td>2D</td>
<td>Digital Camera (Kodak CD265)</td>
<td>2000</td>
<td>846</td>
<td>Questionnaire, herbal prescription, experts</td>
</tr>
<tr>
<td>Kwak CK</td>
<td>3D</td>
<td>3D-FARA</td>
<td>2006</td>
<td></td>
<td></td>
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<tr>
<td>Seok JH</td>
<td>2D</td>
<td>Digital Camera (Nikon D200)</td>
<td>2007</td>
<td>1732</td>
<td>Questionnaire, herbal prescription, experts</td>
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<tr>
<td>Kwak CK</td>
<td>3D</td>
<td>3D-AFRA</td>
<td>2007</td>
<td></td>
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</table>

N: number of participants.

5D-FARA: 3D Face Automatic Recognition Apparatus; 3D-AFRA: 3D Automatic Face Recognition Apparatus.
Voice Analysis

Oriental medical doctors generally have evaluated the patient’s voice from the viewpoint of the ‘five phases’ to understand the characteristics of diseases (23). Indeed, the vocal tract characteristics are related to body shape, and the voice can differ according to the variations in the vocal tract. Lee Je-ma stressed careful observation of the patient’s way of speaking as an important factor in constitutional classification. In addition, it is well-known that, due to state-of-the-art signal-processing techniques, it is possible to diagnose some diseases and identify an individual with a basic frequency and resonance components (24,25).

In early research, Kim et al. recorded and analyzed the voice focusing on the pitch, several elements of basic frequency and talking speed (26). After this, many researches have been conducted to evaluate pitch, shimmer, harmonics, formant and energy of voice for constitution diagnosis, using CSL (computerized speech laboratory) and these researches have revealed that several factors differed significantly among constitutions (25–27). On the basis of these results, KIOM and Sangji University research teams have developed a voice analysis system, the PSSC-2004 (Phonetic System for Sasang Constitution-2004, VoiceOne Inc., Wonju, Korea). The PSSC-2004 can bring out the estimated membership degrees to each constitution by analyzing recorded voices. The PSSC-2004 has been used to evaluate voice parameters such as pitch, APQ, octave, shimmer, energy, code and peak sum to determine constitutions (28,29). Although PSSC-2004 was used as a Sasang constitution diagnosis method (25), its diagnosis accuracy is not sufficient for widespread use in clinical practice (Table 4).

Questionnaires

When SCM doctors diagnose a patient’s constitution, it is very important to understand the patient’s temperament. In the psychological field, questionnaires such as MBTI (Myers–Briggs Type Indicator) and TCI (Temperament and Character Inventory) have been widely used to understand the patient’s temperament. In the SCM field, some researchers have reported that many of the questions regarding the contents of Donguisusebowon and Gyeokchigo (manuscript on science by Lee Je-ma), and then added questions to QSCC that had been proven to be statistically significant. The accuracy of QSCC II was initially reported to be 70.8% (31). However, subsequent researches revealed that QSCC II had a lower accuracy rate than claimed by the developers (34,35). Furthermore, it was later revealed that QSCC II could not diagnose Taeyangins (36).

Some researchers have reported that many of the questions in QSCC II pertaining to temperament had minor roles, and those pertaining to external features such as body shape had decisive roles (36,37). Therefore, there

Table 4. Voice analysis researches

<table>
<thead>
<tr>
<th>First author</th>
<th>Instrument</th>
<th>Year</th>
<th>N</th>
<th>Diagnosis method</th>
<th>Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yang SH</td>
<td>CSL</td>
<td>1996</td>
<td>66</td>
<td>Questionnaire</td>
<td>JSCM</td>
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<tr>
<td>Kim DL</td>
<td>CSL</td>
<td>1998</td>
<td>134</td>
<td>Questionnaire</td>
<td>JSCM</td>
</tr>
<tr>
<td>Shin MR</td>
<td>CSL</td>
<td>1999</td>
<td>140</td>
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<td>JSCM</td>
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<tr>
<td>Yang SM</td>
<td>CSL</td>
<td>2001</td>
<td>30</td>
<td>Questionnaire</td>
<td>JSCM</td>
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<tr>
<td>Park SJ</td>
<td>CSL</td>
<td>2004</td>
<td>71</td>
<td>Questionnaire, expert</td>
<td>JSCM</td>
</tr>
<tr>
<td>Kim SH</td>
<td>PSSC-2004</td>
<td>2005</td>
<td>217</td>
<td>Expert</td>
<td>JSCM</td>
</tr>
<tr>
<td>Kim DJ</td>
<td>PSSC-2004</td>
<td>2005</td>
<td>231</td>
<td>Expert</td>
<td>JSCM</td>
</tr>
<tr>
<td>Bae HS</td>
<td>PSSC-2004</td>
<td>2007</td>
<td>529</td>
<td>PSSC-2004</td>
<td>JSCM</td>
</tr>
</tbody>
</table>

Table 5. Questionnaire-related researches

<table>
<thead>
<tr>
<th>First author</th>
<th>Questionnaire</th>
<th>Year</th>
<th>N</th>
<th>Diagnosis method</th>
<th>Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koh BH</td>
<td>Basic questionnaire (I)</td>
<td>1987</td>
<td>670</td>
<td>–</td>
<td>JKM</td>
</tr>
<tr>
<td>Lee EJ</td>
<td>Questionnaire for identifying Sasangin (I)</td>
<td>1995</td>
<td>328</td>
<td>Expert</td>
<td>JSCM</td>
</tr>
<tr>
<td>Kim SH</td>
<td>QSCC</td>
<td>1993</td>
<td>241</td>
<td>Expert</td>
<td>JSCM</td>
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<tr>
<td>Kim SH</td>
<td>QSCC II</td>
<td>1996</td>
<td>1366</td>
<td>Expert</td>
<td>JSCM</td>
</tr>
<tr>
<td>Kim YW</td>
<td>QSCC III</td>
<td>1999</td>
<td>692</td>
<td>Questionnaire, expert</td>
<td>JSCM</td>
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<tr>
<td>Kim SB</td>
<td>QSCC II</td>
<td>2001</td>
<td>57</td>
<td>Questionnaire</td>
<td>JSCM</td>
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<tr>
<td>Sul YK</td>
<td>SSCQ or SDQ</td>
<td>2003</td>
<td>836</td>
<td>Expert, drug response</td>
<td>JSCM</td>
</tr>
<tr>
<td>Kim YW</td>
<td>TS-QSCD</td>
<td>2006</td>
<td>160</td>
<td>Questionnaire, expert</td>
<td>JSCM</td>
</tr>
</tbody>
</table>

JKOM: Journal of Korean Oriental Medicine; N: number of participants.
has been increasing needs for developing a new questionnaire in which more questions associated with external features are included.

Recently, KIOM and the Korean Society for SCM have released a web-based diagnosis program based on the new questionnaire, SDQ (Sasangin Diagnosis Questionnaire). This questionnaire was divided into separate sections for doctors and patients. Furthermore, the questionnaire contained few questions regarding temperament, but more quantitative items, such as the input of the actual measurements of the patient’s body. As a result, SDQ overcame many of the problems associated with QSCC II. The reliability of SDQ has been established using statistical methods based on clinical data (38).

Discussion

One of the largest problems associated with CAM is the lack of objectivity in the diagnosis. SCM, which is similar to the other areas of CAM, has a subjective diagnosis process. Therefore, it is difficult for SCM to be accepted by mainstream medicine. To overcome this limitation in SCM, researchers have attempted to develop objective constitution diagnosis tools in many ways.

In the early ‘body shape’ and ‘facial’ analyses, researchers adapted manual measurement to their research, which has been recently applied with automatic measurement to reduce the margin of error in manual measurement. It is expected that a new product will be released within the next 2–3 years.

Regarding voice analysis, even with the advances in voice analysis technology, the vocal factors for constitution diagnosis are not yet clear. If the vocal factors that increase the accuracy in the diagnosis can be identified, it could be possible to easily combine it with other constitution diagnosis methods.

In the questionnaire research, clinical factors such as external features, temperament and symptoms have been mainly reflected in the questions. And in recent research, more quantitative and objective factors such as body shape and facial features have been included in the questionnaire, so that it evolves to the integrative constitutional diagnosis method that traditional SCM doctors have tried to pursue for a long time.

Individual diagnosis tools have shown the possibilities in diagnosing constitution to some degree, but the accuracy of each tool cannot reach the level that is sufficient for SCM doctors to utilize it in clinical practice. It is known that the statistical accuracy of individual diagnosis tools, is a little low compared to SCM experts’ diagnosis, for example, 52% in body analysis (10), 58% in voice analysis (39) and unknown in facial analysis.

This is because Sasang constitution diagnosis should be done through a combination of information about the body shape, face, voice, character and symptoms by SCM doctors as Lee Je-ma described in his book (1) (Fig. 1). Furthermore, SCM doctors sometimes need

Figure 1. The future of Sasang constitution diagnosis combining of the body shape, face, voice and questionnaire.
more information about the patients’ response to constitutional herbal medication to confirm their diagnosis.

KIOM has collected the participants’ data that includes a questionnaire, facial pictures, body shape measurements and voice recording with the standard operation procedures through multiple collaborating centers (40,41). Using this information, KIOM constructed a database that is called Constitution Information Bank (CIB). KIOM will make a pilot integrated tool to diagnose Sasang constitutions in clinical practice by the end of 2009.

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References


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