

Original Article

## Analysis of Skin Humidity Variation Between Sasang Types

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The purpose of this study was to examine the relationship between variations in skin humidity (SH) induced by perspiration across Sasang types and to identify novel and effective Sasang classification factors. We also analyzed the responses of each Sasang type to sweating-related QSCC II items. The results revealed a significant difference in SH across gender and significant differences in SH before and after perspiration between Tae-Eum and So-Eum men. In addition, Tae-Eum women showed significant differences in SH compared with women classified as another Sasang type. Furthermore, evaluation of the items related to sweating in the QSCC II and their relationship to each constitution revealed a significant difference between Tae-Eum and other Sasang types. Overall, the results of this study indicate that there is a distinct SH difference following perspiration between Tae-Eum and other Sasang types. Such findings may aid in Sasang typology diagnostic testing with the support of further sophisticated clinical studies.

**Keywords:** QSCC II – Sasang typology – skin humidity

### Introduction

Sasang typology divides humans into Tae-Yang (TY), So-Yang (SY), Tae-Eum (TE) and So-Eum (SE) types. The differences in the physiology of the internal organs across different constitutions can be influenced by the characteristic temperaments of each Sasang type (1,2). Indeed, each Sasang type has a distinct temperament, physical characteristics and unique physiological and pathological symptoms (1,3,4). Such differences in physique are used for type classification, although much research has been conducted with the goal of establishing

a more objective method of classification for clinical use (5–7).

Specifically, many studies have been conducted to evaluate the use of various measures, biochemical markers and other methods (8) for obtaining clear characteristics that enable different Sasang types to be distinguished. Recent studies conducted under the premise that Sasang typology views the body and mind as one have led to the development of an objective diagnostic method for Sasang classification based on a self-evaluation method known as the Questionnaire of Sasang Constitution Classification II (QSCC II) (9). Although this survey has proven to be clinically useful, there is still a strong need for further development of an objective tool that can be used to classify Sasang types (9).

Physiological symptoms associated with perspiration, defecation, urination, sleep and digestion are especially important in Sasang classification, identification

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of type-specific diseases and management of disease symptoms. Perspiration or sweat is not only a physiological phenomenon, but can also be construed as a pathological symptom suggestive of a problem in the body's physiological mechanism for temperature control and waste excretion (10–13).

In traditional Korean medicine, sweat is formed by the addition of *yang qi* to *yin*. In other words, when there is sufficient *yin*, there is an interchange with *yang qi*, and after fumigation, sweat is formed. Perspiration is a form of waste fluid and humor excretion. Fluid belongs to *yang* and is distributed with defensive *qi*, while humor belongs to *yin* and flows through the body via nutrients and blood. Therefore, identification of deficiency of fluid and humor is pathologically important in differentiating excessive and deficient *yin* and *yang*, as well as in deciding upon a method of treatment through the diagnosis of internal organs (11). As a result, individuals with constitutional characteristics of excessive *yang* and heat and a deficiency in *yin* and fluid will perspire more to maintain temperature, while individuals with constitutional characteristics of deficiency in *yin* and cold, and *yin* and fluid, will perspire less (11).

In *Dong-eui-soo-se-bo-won (Longevity and Life Preservation in Oriental Medicine)*, perspiration in TY and TE types is described as a result of *qi* and humor energy that occurs due to the expansion and absorption forces of the lung and liver, while perspiration in individuals of the SY and SE constitution is described as a result of the ascension and descent of *yin* and *yang* due to the water and food energies of the spleen and kidneys (2).

For the SE types, perspiration is an important factor that represents the level of *yang qi*, which is very important for the SE type. The spleen is considered as a weakness in the SE types; therefore, the strength and weakness of the spleen play a major role in the pathology process of SE types. Perspiration can be used to evaluate the state of the spleen in SE types. In addition, the presence of perspiration is used to differentiate diseases. Because internal symptoms follow a similar pathological course as the external symptoms, perspiration is the most important factor for SE types. Although there is a lack of empirical data pertaining to perspiration in SY types, perspiration reportedly occurs as a result of the descent of *yin* when external symptoms are recovering, and when the *qi* of pure *yang* cannot fully ascend due to a weakness in *yang* as a result of internal symptoms (2).

TE types have deficient expansion energy due to their lungs being weak. In TE types, perspiration serves as an important indicator of health because it indicates that their weak point is functioning normally. Furthermore, perspiration is viewed as the core factor in treating disease; therefore, the characteristics of the disease are specifically differentiated. There is no empirical data concerning perspiration in TY types; however, because their strong point is lung functioning, it can be assumed that

they normally perspire more easily. In summary, perspiration may be a more important diagnostic factor for SE and TE types than for SY or TY types (11).

Current available literature (11–12,14) and pre-existing empirical data (10,13) have indicated that variations in skin humidity (SH) after perspiration can reflect the quantity of perspiration, and that this variation will likely differ across Sasang constitution types. Therefore, we analyzed differences in SH after perspiration among Sasang types. Sasang type classification was made using the QSCC II, and individual items on the QSCC II pertaining to sweating were then further analyzed for each Sasang type.

## Methods

### Subjects

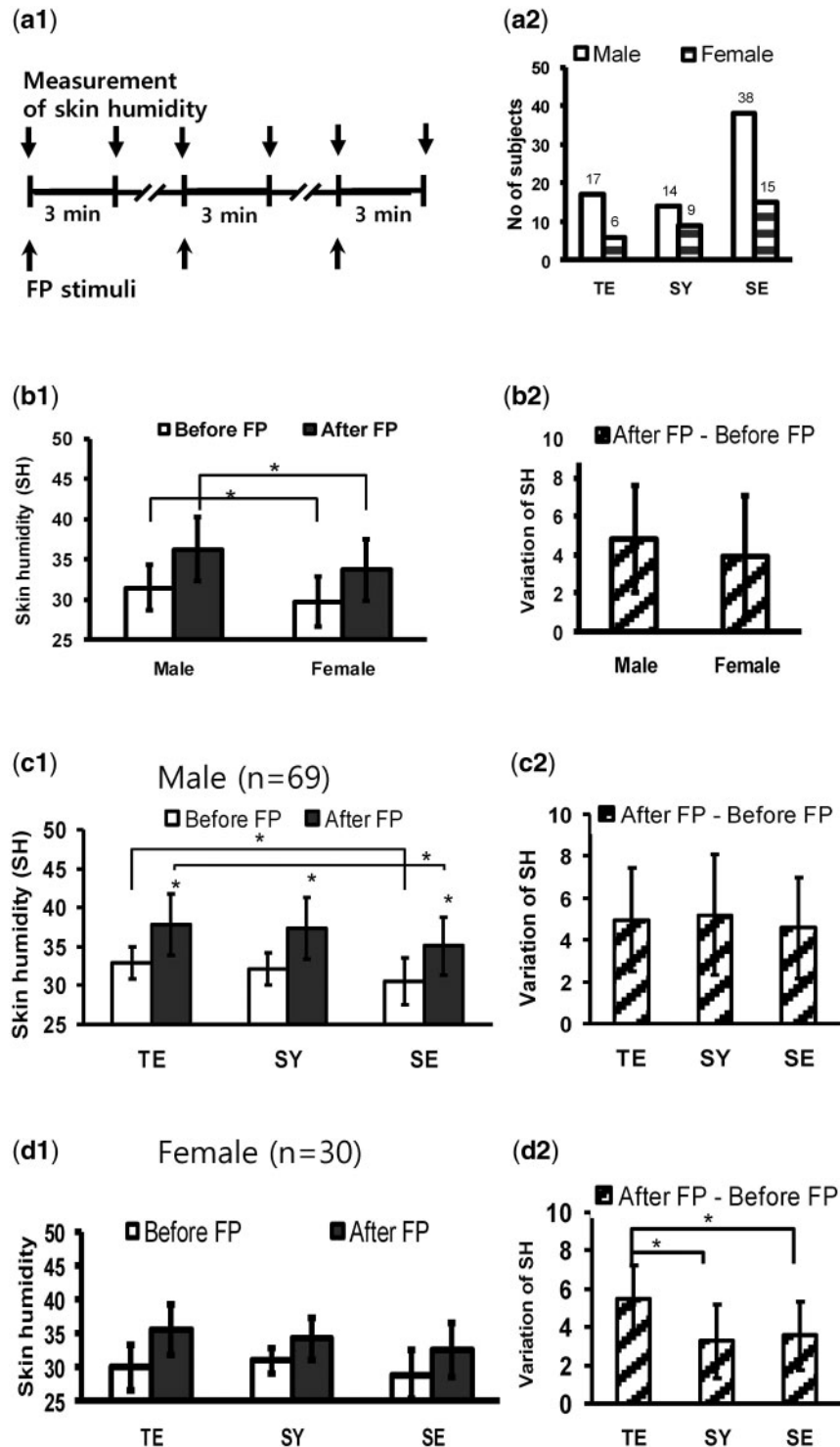
Participants in the present study included 99 students from the College of Oriental Medicine at Daegu Haany University. Because the formal institutional review board (IRB) was not yet established at the time of this study, we assessed the appropriateness of the protocol by consulting with the senior faculty of the college. This study was conducted in accordance with the Declaration of Helsinki and the faculty at the College of Oriental Medicine, Daegu Haany University, supervised the tests. All participants gave oral consent for the full assessment, which is described in detail below.

### Procedures

The results of the QSCC II were analyzed using the computerized scoring version of Win QSCC II (Sord Medicom & Sord OMS(Inc)/Association of SCM, Korean Oriental Medical Society). The internal consistency (Cronbach's alpha) of this inventory was 0.57, 0.59 and 0.63 for the SY, TE and SE types, respectively (1,9).

The following procedure was used to measure the Skin Humidity Variation (SHV) following Forced Perspiration (FP). Participants were asked not to move the body area that was being used for the measurement during the preparation phase. Each participant was then asked to physically mark the Neiguan (PC6) point (15) approximately 9 cm towards the elbow from the inner side of the wrist with a marker to ensure that an identical area was used for the actual measurements. Skin Humidity (SH) was then measured at the PC6 point using a portable humidity measurement instrument (MY707S-Moisture Checker for skin: scalar KOREA, Japan).

Prior to FP, participants were asked to measure the SH on their own. This value was regarded as the baseline SH. To induce the FP condition, the arm that included PC6 point was wrapped 3 times using sealing wrap while ensuring that air flow was not prevented. After 3 min



**Figure 1.** The effects of FP on SH. (a1) Procedure for the measurement of SH before and after FP. (a2) Classification of subjects ( $n=99$ ) into Sasang type according to QSCC II. (b1 and 2) Comparison of male ( $n=69$ ) and female ( $n=30$ ) SH (b1) before and after FP and variation in SH (b2). (c1 and 2) Comparison of SH among Sasang types (c1) before and after FP and variation in SH (c2) in males. (d1 and 2) Comparison of SH among Sasang types (d1) and variation in SH (d2) before and after FP in females. Data are expressed as the means  $\pm$  SEM. Data were analyzed by one-way ANOVA followed by Duncan multiple comparison tests.  $*P<0.05$  compared with values before FP or among groups.

of FP, participants were instructed to take off the wrapping by themselves, after which the SH of PC6 was immediately measured. After waiting for the SH to return to baseline, another measurement was taken

using the same method. In total, three SH measurements were taken (Fig. 1a1), and the average value was used for comparison of data before and after FP. SHV was calculated by subtracting the average pre-FP value from the

**Table 1.** Sweating-related questionnaire items in QSCC II

10-① <sup>a</sup>	I normally sweat a lot, and after sweating, I feel refreshed.
10-②	I normally don't sweat a lot, and I become tired even if I perspire a little.
10-③	I'm not really tired after perspiration.
106	I feel my body gets better after my hands and feet sweat.
107	I feel my body gets better after perspiration occurs below my nose.
110	When I don't feel good, perspiration makes me feel refreshed.
120	I normally don't perspire a lot, but when my sickness worsens, I experience more cold sweats.
121	I perspire a lot during winter, even after eating cold food.

<sup>a</sup>Numbers indicate item number in QSCC II.

average post-FP value. The SHV was then analyzed by gender and across Sasang constitution types.

Next, the relationship between the six QSCC II items related to sweating (items number 10, 106, 107, 110, 120 and 121) and constitution types were evaluated using a previously described method (5). Questions consisted of one multiple choice question (items number 10 and 5) and 'yes/no' questions (items number 106, 107, 110, 120 and 121; Table 1). Differences in the responses to these items were then evaluated across gender and Sasang constitution types. The responses to these items were also examined with regard to SHV, according to gender and Sasang type (9).

### Statistical Analysis

Statistical analysis was performed with one-way ANOVA followed by Duncan's multiple comparison test to identify potential differences in SH or SHV across Sasang types or using chi-squared tests to compare the response with QSCC II questions among Sasang constitution types. All analyses were conducted using SPSS 16.0.1 for Windows (SPSS Inc., Chicago, IL). A *P*-value <0.05 was considered to be statistically significant.

### Results

Figure 1a2 shows the prevalence of each Sasang type classified by QSCC II, and the gender of the participants.

#### SH of Each Gender Before and After FP

SH and SHV were measured before and after FP and then compared across gender. The SH before FP was  $31.44 \pm 2.82$  for male participants and  $29.69 \pm 3.19$  for female participants ( $F=7.34$ ,  $P<0.01$ ). Following FP, SH was  $36.23 \pm 3.96$  for male participants and  $33.56 \pm 3.85$  for female participants ( $F=9.63$ ,  $P<0.01$ ). However, there was no difference between male and female participants when SHV was evaluated ( $F=3.26$ ,

$P=0.07$ ;  $4.79 \pm 2.49$  for male participants and  $3.86 \pm 1.95$  for female participants; Fig. 1b1 and b2).

#### SH for Each Sasang Type Before and After FP

SH and SHV were measured before and after FP and then compared among Sasang types. SH prior to FP was  $32.85 \pm 2.05$  for the TE type,  $32.14 \pm 2.01$  for the SY type and  $30.54 \pm 3.08$  for the SE type when male participants were evaluated. The SH differed significantly between the TE and SE types ( $F=4.97$ ,  $P<0.05$ ). SH after FP increased significantly to  $37.81 \pm 3.92$  in the TE type,  $37.34 \pm 3.96$  in the SY type and  $35.11 \pm 3.71$  in the SE type ( $F=3.69$ ,  $P<0.05$ ). *Post hoc* analysis indicated that the SH differed significantly between TE and SE types. The SHV did not differ significantly among male participants across the different constitutions, as indicated by values of  $4.96 \pm 2.48$  for the TE types,  $5.19 \pm 2.87$  for the SY types and  $4.57 \pm 2.40$  for the SE types ( $F=0.37$ ,  $P=0.69$ ; Fig. 1c1 and c2).

The SH prior to FP was  $29.96 \pm 3.39$  for the TE type,  $30.91 \pm 1.88$  for the SY type and  $28.86 \pm 3.64$  for the SE type in female participants. These values did not differ significantly ( $F=1.20$ ,  $P=0.32$ ). The SH after FP was  $35.45 \pm 3.78$  for the TE type,  $34.18 \pm 3.21$  for the SY type and  $32.43 \pm 4.08$  for the SE type, which did not differ significantly ( $F=1.54$ ,  $P=0.23$ ). The SHV was  $5.49 \pm 1.72$  for the TE type,  $3.26 \pm 1.93$  for the SY type and  $3.57 \pm 1.79$  for the SE type. There was a significant difference in the values of SHV between the TE and SE types, and between the TE and SY types ( $F=3.08$ ,  $P=0.04$ ; Fig. 1d1 and d2).

#### Sweating-Related Items in QSCC II and Sasang Types

Participants' responses to the 6 QSCC II questions (items number 10, 106, 107, 110, 120 and 121) were analyzed for each constitution type and across gender. There were no significant differences in the sweating-related items across gender. For item number 10, which pertained to the relationship between the respondents' physical condition and sweating, 69.6% of TE types, 43.5% of SY types and 56.6% of SE types selected 10-①, 10-③ and 10-②, respectively. These responses differed significantly between the TE and SY types and the TE and SE types ( $P<0.01$ ). For item 110 ('When I don't feel good, perspiration makes me feel refreshed'), 60.9% of TE types, 34.8% of SY types and 17.0% of SE types replied 'Yes'. Duncan's *post hoc* analysis revealed that these responses differed significantly between the TE and SY types and the TE and SE types ( $P<0.01$ ). For item 120 ('I normally don't perspire a lot, but when my sickness worsens, I experience more cold sweats'), 8.7% of TE types, 30.4% of SY types and 45.3% of SE types replied 'Yes'. Statistical analysis of these responses revealed a significant difference between TE and SE types ( $P<0.01$ ). In summary,

**Table 2.** Sweating-related items and Sasang types

No.	Tae-Eum type (n=23), n (%)	So-Yang type (n=23), n (%)	So-Eum type (n=53), n (%)	Total, n (%)
10-①	16 (69.6) <sup>a</sup>	6 (26.1)	10 (18.9)	32 (32.3)
10-②	3 (13)	7 (30.4)	30 (56.6) <sup>b</sup>	40 (40.4)
10-③	4 (17.4)	10 (43.5) <sup>b</sup>	13 (24.5)	27 (27.3)
106	6 (26.1)	2 (8.7)	8 (15.1)	16 (16.2)
107	1 (4.3)	3 (13.0)	1 (1.9)	5 (5.1)
110	14 (60.9) <sup>a</sup>	8 (34.8) <sup>b</sup>	9 (17.0) <sup>b</sup>	31 (31.3) <sup>†</sup>
120	2 (8.7) <sup>a</sup>	7 (30.4) <sup>a,b</sup>	24 (45.3) <sup>b</sup>	33 (33.3) <sup>†</sup>
121	1 (4.3)	0	3 (5.7)	4 (4.0)

No. denotes item number in QSCC II; Superscripted letters denote Duncan's multiple comparison tests corresponding to the *F*-test.

<sup>†</sup>*P*<0.01, one-way ANOVA was used to identify differences in SH across Sasang types.

the responses to items 10, 110 and 120 differed significantly across Sasang types, while the responses to items 106, 107 and 121 did not (*P*=0.34, *P*=0.13 and *P*=0.99, respectively; Table 2).

## Discussion

We evaluated variations in SH after perspiration to determine if the amount of perspiration differed across different Sasang types (10,11). To this end, and to identify a novel method of diagnosing Sasang types, we induced perspiration in participants and then compared the differences in SHV before and after perspiration among Sasang types.

The results of this study revealed significant differences between male TE and SE types (Fig. 1c1). In addition, female TE types showed more perspiration compared with the SE and SY types (Fig. 1d2). It has been reported that the TE type has more total body water compared with SE and SY types when gender differences are not regarded (14). Therefore, the volume of body water and perspiration may be physiological characteristics of the TE type, and the SHV induced by FP may enable differentiation of the TE type from other Sasang types.

In regards to the relationship between sweating-related QSCC II items (9) and constitution type (Tables 1 and 2), the TE type tended to choose the answer, 'I normally sweat a lot, and after sweating, I feel refreshed' (item 10-①), while the SY type chose, 'I'm not really tired after perspiration' (item 10-③) and the SE type preferred the answer, 'I normally don't sweat a lot, and I become tired even if I perspire a little' (item 10-②). These findings indicate that there is a close correlation between sweating and Sasang typology.

When the responses to questions regarding pathological perspiration were evaluated, the TE type chose, 'When I don't feel good, perspiration makes me feel refreshed' (item 110) more often than SE and SY types. The SE type more frequently selected the response 'I normally

don't perspire a lot, but when my sickness worsens, I experience more cold sweats' (item 120) when compared with the TE type. The answers 'I feel my body gets better after perspiration in my hands and feet' (item 106), 'I feel my body gets better after perspiration below my nose' (item 107) and 'I perspire a lot in the winter even after eating cold food' (item 121) did not differ significantly across the Sasang types.

Regarding post-perspiration states, many of the SY and TE types replied that they felt refreshed after perspiration, while a majority of the SE type replied that they felt tired. When an identical comparison of Sasang types was conducted, there was a significant difference between SE and SY types and between SE and TE types. These findings confirm the results of a previous study in which the TE and SY types replied that they normally perspire a lot, while the SE type replied that they normally do not (10).

In the present study, there was a significant difference in SH between male TE and SE types under normal conditions and after FP, while the SHV induced by FP differed significantly between female TE and SE types and between TE and SY types. Further studies are needed to find differences between the TE and other Sasang types in regional sweat distribution, sweat rate, onset threshold for sweating and neural control in a larger clinical sample using a more stringent instrument (10,11,13,16-18).

This study was conducted to determine if there is a relationship between SH induced by FP and Sasang typology. Although this study cannot rule out the influence of other environmental factors such as temperature, humidity and the air flow, evaluation of forced sweating may be a methodological option for making comparisons across Sasang types.

The SH of male participants differed between the TE and SE types under normal conditions and after FP, while significant differences were observed between female TE and SE types and between female TE and SY types. Based on these results, we conclude that there is a need for further study regarding the use of differences in SH as a diagnostic index for the differentiation of the TE types from individuals with other Sasang constitutions.

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