Research paper

A longitudinal study of iris parameters and their relationships with temperament characteristics

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ABSTRACT

Introduction: A previous study suggested that iris parameters may be related to temperament and because they are innate and are unchangeable over time. This longitudinal study examined the robustness of iris parameters, temperament characteristics (TC), and their relationship over a 1 year period.
Methods: A total of 70 healthy subjects who participated in the 2013 study were interviewed 1 year later. They were asked to complete the Korean version of the Temperament and Character Inventory (TCI), and 6 iris parameters (iris density, pigment, nerve ring, toxic radii, pupil area ratio [PAR], and autonomic nerve wreath area ratio [ANWAR]) were calculated. Subsequently, intra- and inter-rater reliabilities and robustness of the iris parameters were examined using an intra-class coefficient (ICC), and the relationships between the iris parameters and TC scores in 2014 were compared with those recorded in 2013. Finally, decision tree modeling was conducted to examine which iris parameters were related to TC.
Results: The 6 iris parameters possessed excellent levels of reliability and robustness, ranging from 0.797 to 1.000 of ICCs. Among the 5 significant relationships between iris parameters wereTC scores, iris density and harm avoidance, pigment and reward dependence, ANWAR and persistence had the same significant relationships to those in 2013. Decision tree modeling showed that PAR, iris density, ANWAR, and toxic radii were related to individual TCs (classification accuracy: 77.5–88.9%).
Conclusions: Iris parameters and the relationships between iris parameters and TC are robust. Iris parameters may serve as a contributing factor to one's TC.

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1. Introduction

The iris is a circular structure approximately 12 mm in diameter and comprises connective tissue and muscle, with a central opening called the pupil. The main function of the iris is to control the amount of light entering the eye by contracting to make the pupil smaller in bright light, and dilating the pupils in low light [1]. Together with individual or racial differences in the iris color and pigmentation, many studies have reported medical meanings of iris characteristics [2,3]. Iridology is a technique used to assess inherited characteristics and functional conditions of individuals through iris markers such as color, pigment distribution, pathological lesions, or development of lacunas on the iris [4].

There are two points of view about the iris: changeable and unchangeable. Researchers who support the changeable iris view contend that pathological changes in the tissue and the organs of the human body are associated with changes in the fibrous tissue on the iris layer, which may be mediated by the neural connections of the iris and whole body [5–7]. Popescu [8] and Salles [9] contend that the dysfunction of all bodily organs (such as diabetes mellitus and mitral stenosis), are reflected on the surface of the iris. Other researchers have been skeptical about the changeable iris, because some blind test results showed that iris parameters failed to determine the presence or absence of diseases according to "iris mapping," and they could not serve as a functional biomarker [10,11]. Rather, researchers in support of the unchangeable iris suggest that the iris should be utilized to assess inherited or genetic characteristics [12,13].

To address these diverging viewpoints, we hypothesized in our previous study that if iris parameters were related to temperament, they would be unchangeable, since temperament traits are widely accepted as being innate and change little over one's life

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[14–16]. If iris parameters were related to heart rate variability (HRV) however, they would be changeable because HRV, a cardiovascular autonomic marker, is well known to be changeable according to physical or mental conditions such as exercise, breathing, baroreflex, and depression [17]. Our previous study results showed that there was a significant relationship between iris parameters and temperament scores, as estimated using the Temperament and Character Inventory (TCI), whereas there was a weak relationship between the iris and HRV parameters [14]. This indicated that iris characteristics seemed to reflect inherited temperament, not functional changes.

However, since our previous study did not have a longitudinal study design, we could not guarantee that the iris parameters were robust over time [14]. In terms of longitudinal stability of the human eyes, Brückner et al. reported that the superficial appearance of the iris was unchangeable for 15–20 years [18]. Similarly, other studies using pattern recognition reported that visual changes of the iris were the results of blur, noise, or the diversity of pupil diameter due to lighting variability, and thus, the iris was actually unchangeable over time [19,20]. However, these studies had limitations in that generally accepted iris parameters were not used, and reliability test results were not conducted. Therefore, the first purpose of the present study was to examine whether generally accepted iris parameters possessed robustness and satisfactory intra-rater and inter-rater reliabilities over the span of 1 year.

Another purpose of our study was to examine whether the relationships between iris parameters and temperament characteristics were maintained after 1 year. If the relationships between them are stable, iris parameters may partially serve as determining factors of temperament characteristics.

Summarizing we examined intra-rater and inter-rater reliabilities and the robustness of iris parameters measured both in 2013 and in 2014. Subsequently we examined whether the relationships between iris parameters and temperament characteristics recorded in 2013 were consistent with those measured in 2014. Finally, we conducted decision tree modeling to utilize the iris parameters as determinants for high- or low-level temperament characteristics.

2. Subjects and methods

2.1. Subjects and data collection

This follow-up study which took place between August and December 2014 was conducted in the same Korean medical clinic in Seoul where the previous study was conducted in 2013. Fig. 1 depicts the entire process of this study. First, we re-contacted 117 volunteers who previously participated in our study via e-mail or telephone, explained the purpose of the present study, and asked them to participate. Among them, 70 subjects (male:female, 30:40; mean age, 38.14 ± 5.73) agreed to participate in the study. They were asked to visit the medical clinic and to undergo the iris test and TCI measurement, as in the first study. Subjects with conjunctivitis, ophthalmorrhagia, glaucoma that could affect iris parameters, and any psychiatric disorder that could affect the results of the TCI measurements were excluded from the study, based on self-reports. To avoid time intervals between the
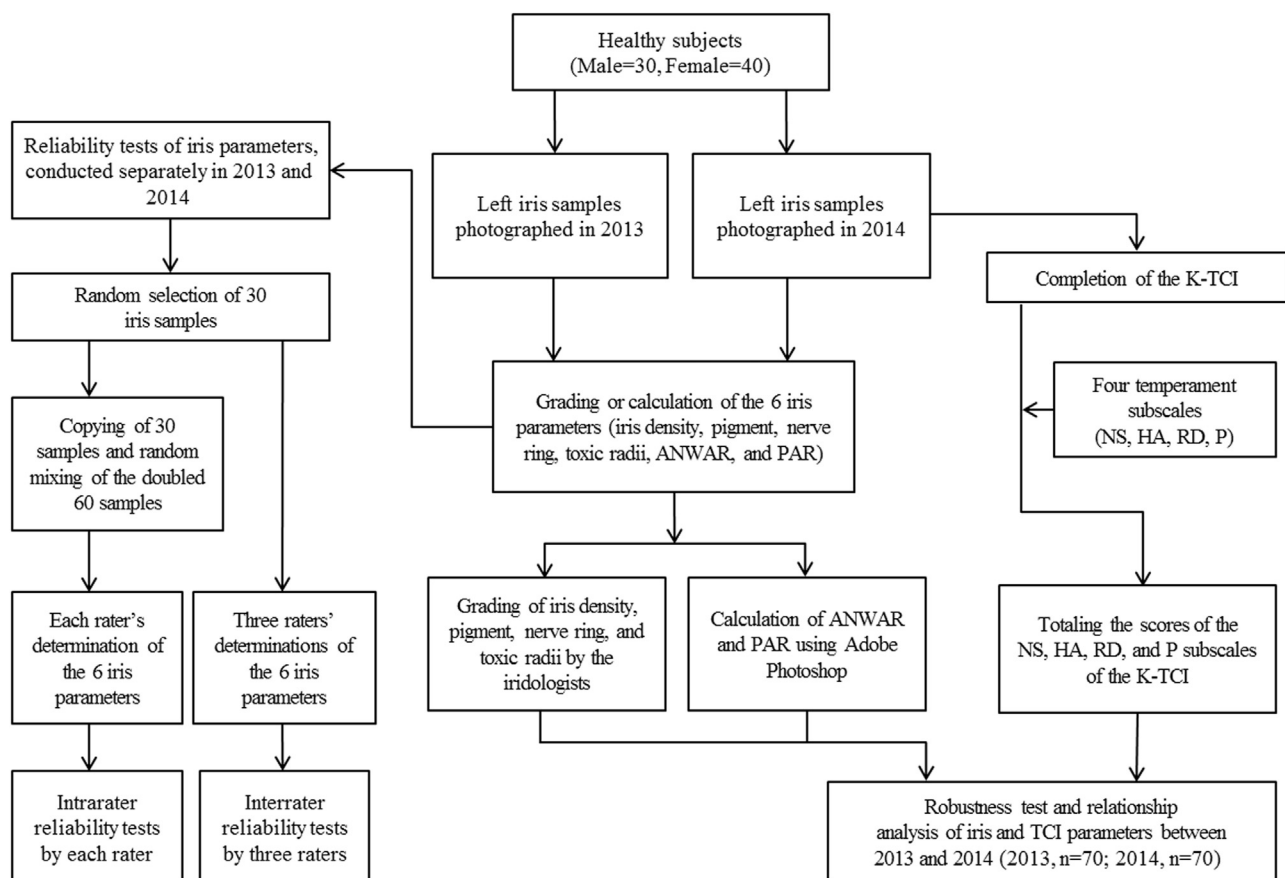

Fig. 1. Study flow diagram of reliability tests for the iris parameters and the relationships between iris parameters and TCI subscale scores. ANWAR: Autonomic Nerve Wreath Area Ratio, PAR: Pupil Area Ratio, K-TCI: Korean version of the Temperament and Character Inventory, NS: novelty seeking, HA: harm avoidance, RD: reward dependence, P: persistence.