

# Recognition of happiness from subjective, psychological and neuroimaging points of view

## Abstract

The goal of the medical practice and medical research may include the happiness and health of body and soul. The phrase “happy people live longer” has been known. Subjective Happiness Scale (SHS) can be used for the study for feeling of happiness. By functional magnetic resonance imaging (fMR), anterior right wedge region of the brain (precuneus) may be important for feeling happiness. Both of effective and functional connectivity of the right precuneus were positively associated with SHS scores. Consequently, happiness may be involved in SHS, structural neuroimaging, neurological study, positive psychological interventions, and so on.

Volume 11 Issue 2 - 2020

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**Received:** April 10, 2020 | **Published:** April 30, 2020

**Abbreviations:** SHS, subjective happiness scale; fMR, functional magnetic resonance imaging; fALFF, fractional amplitude of low-frequency fluctuation; SWB, subjective well-being

## Opinion

What would be the goal of the medical practice and medical research? It may be the happiness and health of body and soul for long period, associated with satisfactory situation in the light of bio-psycho-social aspects. Authors and colleagues have continued medical research for primary care medicine, integrative medicine, anti-aging medicine and Hinohara-ism until now.<sup>1</sup> Among them, an impressive phrase would be “happy people live longer” by Bruno S. Frey (Science 2011).<sup>2</sup> According to the meta-analysis investigation that summarized 24 studies concerning these general remarks, happy person seems to be live 14% longer than the person who is not happy.<sup>3</sup> Their results included that happiness has positive relationships with health outcomes (r0.14), short to long term health outcomes (r0.11-0.15), and disease or symptom control (r0.13).<sup>3</sup> In a survey of industrial countries, happier people can enjoy and have longer life with 7.5-10.0 years.<sup>4</sup> It is probably due to happiness protection for physical health. From individual point of view, some reasons include

1. Provided life situation for results of life-choices pursuing happiness.
2. Training and enjoying the art-of-living skill.
3. Opportunities of professional counselor for human life.
4. Satisfactory degree of standard of living.
5. Democracy and freedom of the life circumstances.<sup>4</sup>

Why do happy people live longer?<sup>5</sup> Two perspectives have been introduced so far. One is that happy people tend to have a positive habit of health. It usually brings stable and satisfactory regular life. The other is that the happy situation itself directly affects the body in positive way. When a person usually feels comfortable, one is less likely to show high blood pressure by dominant function of the parasympathetic nerve.<sup>5</sup>

There have been two theories that have accepted across the world in the science-based anti-aging medicine. One is the calorie

hypothesis.<sup>6</sup> Limiting calorie intake has been effective for health and longevity. As the restraint of calories can optimize nutrition, longevity gene sirtuins will be activated leading to extended lifespan. The other is the oxidative stress hypothesis. When the cells are oxidized and denatured by super oxide, it brings several tissues impaired or malfunctions. It has been believed that if oxidation is prevented, human can be kept youth. In practicing these theories, there has been a great deal of evidence on diet and exercise.<sup>6</sup>

There has been an inventory to measure subjective well-being, which is Subjective Happiness Scale (SHS).<sup>7</sup> SHS consists of four item scales indicating the degree of happiness and its reliability and validity. They are

1. The happiness level of individuals.
2. Happiness based on interaction with related people.
3. A sense of happiness due to positive self-evaluation.
4. A sense of happiness from interaction with society.

Consequently, happiness has been brought from not only personal satisfaction but also from surrounding people and society. It is said that SHS scores have not been affected by short-term pleasure or other opportunities but maintained stable for rather long.<sup>8</sup>

Everyone wants to obtain the happiness in the life. However, it is one of the difficult matters to get and hold. Even though a person looks happy, no one knows if the one is in the happy state or not. Happiness is a subjective feeling or sense. How does our brain create or feel happiness? From the study of brain activity for psychological constructs such as happiness feeling, resting status without tasks may be a suitable condition.<sup>9</sup> There have been some structural neuroimaging investigation concerning the neurocognitive mechanisms in relation to subjective happiness. Among them, SHS scores have been involved in the gray matter volume of the right precuneus.<sup>10</sup>

As for SHS scores, trainees of mindfulness meditation showed higher value,<sup>11</sup> and patients with depression showed lower scores with reduced volume of gray matter in the precuneus.<sup>12</sup> SHS scores have been generally lower in smokers, with reduced self-inhibition response in the medial parietal region.<sup>13</sup>

For the relationship between SHS and brain function, there was a study of functional magnetic resonance imaging (fMRI) and analyzed the fractional amplitude of low-frequency fluctuation (fALFF). As a result, higher SHS scores were associated with lower fALFF values in the right precuneus. Further analyses showed that both of effective and functional connectivity of the right precuneus were positively associated with SHS scores. There is other supportive evidence for the information-processing brain functions of the regions.<sup>14</sup> Consequently, these findings suggest that subjective happiness may be associated with a reduction in self-referential mental processes as integrated emotional processing.

According to some fMRI reports, depressive patients showed reduced resting-state functional connectivity for the amygdala and precuneus.<sup>15,16</sup> Consequently, higher SHS scores may be associated with positive strong functional connectivity between the amygdala and precuneus.<sup>15,16</sup> Some previous resting-state neuroimaging studies revealed that the precuneus has been functionally connected with other brain regions. From recent neuroimaging studies, precuneus activity has significant relationship with the level of mind-wandering.<sup>17</sup> It may be associated with stimulus-independent situations for the past and the future.<sup>17</sup> Furthermore, it may act like the functioning hub in a large-scale neural network, which was called the default mode network.<sup>18</sup> Its value lies in the utility in the translational applications, especially for neuromodulation devices.<sup>19</sup>

Recent reports of SHS study have evaluated subjective well-being and compared the data with brain imaging. As the anterior right wedge of the brain (precuneus) showed lower resting activity, the subjective well-being became higher value.<sup>14</sup>

The anterior wedge is situated in the gyri on the medial aspect of the cerebrum and it is behind the medial aspect of the parietal lobe of the brain. This region has a role of sensory information, and its excessive activity may bring negative self-consciousness and losing mind. In order to feel happiness, the activity of this region needs to be stable. When the person is in meditation state, the activity of the front wedge would be suppressed and the confusion would be reduced.<sup>14</sup>

The role of anterior right wedge includes the minute communication with the amygdala. As the connection becomes stronger, the subjective well-being becomes higher. The reason would be included that the processing of negative emotions in the amygdala would be adequately dealt with the circuits of the front wedge and amygdala. This process leads a person into the happiness feeling.

For various medical research, medical data have been described in not only measurable biomarkers, but also certain impact factors such as emotional state and subjective well-being (SWB).<sup>20</sup> Happiness is gradually clarified and grasped in the process of developing the research of the psychological study.<sup>21</sup> Among them, they include several matters such as positive or negative emotions and happiness, control of one's own emotions, time management and the appreciation of positive psychological interventions.<sup>21</sup>

In summary, the author has introduced various aspects of happiness from subjective, neurological and image points of view in this article. Hopefully, this description will contribute some people controlling their minds and bodies and continuing the better life leading to anti-aging medicine.

## Funding

None.

## Acknowledgments

None.

## Conflicts of interest

The authors have no conflicts of interest to declare.

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