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Association between Purpose in Life/(*Ikigai*), Prefrontal Cortex Function, and the Prevention of Halitosis Caused by Mental Stress, Pseudo-Halitosis, and Halitophobia

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Abstract

Halitosis is a condition characterized by unpleasant oral odor or oral malodor problems that can lead to social and psychological impediments; it can be either genuine halitosis or pseudo-halitosis. One of the extra-oral conditions of genuine halitosis is mental stress, which causes a reduction in both saliva secretion and the presence of salivary lysing agents known as lysozymes, leading to oral malodor. Even in the absence of objective oral malodor, persons with pseudo-halitosis complain of halitosis symptoms, while those with halitophobia have a fear of halitosis. Genuine halitosis caused by stress, pseudo-halitosis, and halitophobia may all be due to anxiety resulting from an excessive need of approval from others. Purpose in life (PIL)/(*ikigai*), which is related to prefrontal cortex function, has been shown to be an effective way to manage stressful events, and is negatively correlated with an excessive need of approval from others. PIL/*ikigai*, similar to prefrontal cortex function, develops through positive experiences from infancy to adolescence, such as spending time in beautiful natural surroundings, having success at meeting valued goals, and gaining empathetic acceptance and affection from others. Understanding the traits and developmental conditions associated with PIL/*ikigai* and prefrontal cortex function could improve the ability of individuals to manage stressful events, thereby promoting the prevention of halitosis, pseudo-halitosis, and halitophobia. The present proposal could contribute to future empirical research.

Keywords

Purpose in Life/*Ikigai*, Prefrontal Cortex Function, Stressful Events, Halitosis

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1. Introduction

1.1. Halitosis

Halitosis, which is defined as "bad breath or oral malodor problems", often leads to social and psychological impediments (Curd & Thomas, 2012; Madhushankari, Yamunadevi, Selvamani, Kumar, & Basandi, 2015; Yaegaki & Coil, 2000). Clinically, halitosis can be classified as genuine halitosis, pseudo-halitosis, or halitophobia. Genuine halitosis has both oral and extra-oral etiologies; oral causes include periodontitis and tongue coating, while extra-oral causes include gastrointestinal problems and mental stress (Curd & Thomas, 2012; Madhushankari et al., 2015; Yaegaki & Coil, 2000). Mental stress causes fear and anxiety as well as imbalances in autonomic nervous activity such as overactivity of the sympathetic nervous system (Cannon, 1939; Ishida, 2014; Selye, 1976). Saliva, which is regulated by the autonomic nervous system, contains lysozyme, an enzyme that lyses many oral malodor-causing bacteria (Aylikci & Colak, 2013; Tiwari, 2011). Therefore, mental stress leads to a reduction in saliva secretion, and in turn, genuine halitosis. On the other hand, even though oral malodor is objectively absent, individuals with pseudo-halitosis complain of halitosis symptoms (Curd & Thomas, 2012; Madhushankari et al., 2015; Yaegaki & Coil, 2000), while those with halitophobia, the fear of halitosis, present with halitosis symptoms (Curd & Thomas, 2012; Madhushankari et al., 2015; Yaegaki & Coil, 2000). However, regardless of their differences, genuine halitosis caused by stress, pseudo-halitosis, and halitophobia may all be due to anxiety resulting from an excessive need of approval from others. Therefore, all three conditions should be managed psychologically or psychiatrically, not through dental practice (Curd & Thomas, 2012; Madhushankari et al., 2015; Yaegaki & Coil, 2000). The focus of this proposal is on the role of serotonin, an inhibitory neurotransmitter manufactured in the brain, in decreasing fear and anxiety and cultivating well-balanced emotions (Curd & Thomas, 2012; Adams et al., 2005).

1.2. Management of Stressful Events

Every person has an intrinsic need to establish the meaning of life or pursue a life worth living (Frankl, 1954; Ishida, 2014). This need is associated with prefrontal cortex function (Ishida, 2014; Solomon, Berg, & Martin, 2011). Excessive need of approval from others has also been proposed as a risk factor for increased mental stress (Ishida, 2014). Managing stress involves neurotransmitters, primarily serotonin (Adams et al., 2005; Curd & Thomas, 2012; Ishida, 2014). Recently, a focus has been placed on "meaning of life" or "life worth living", expressed by "purpose in life (PIL)/(*ikigai*)", as an effective way to manage stressful events (Ishida, 2014; Schaefer et al., 2013). An example of PIL/*ikigai* is "My PIL/*ikigai* is teaching children with the use of music". Variations of PIL/*ikigai*, including examples such as "cleaning the road near my house every morning" and "informing others about traditional entertainment in our town", depend on inner needs and experiences. However, despite the importance of these concepts and processes, a search of terms related to a combination of halitosis, meaning of life or life worth living, and prefrontal cortex function in the PubMed database (US National Library of Medicine, 2015) reveals only a limited number of previous studies.

In the present proposal, prospects for the prevention and improvement of halitosis caused by stress, pseudo-halitosis, and halitophobia are discussed with a focus on prefrontal cortex function and PIL/*ikigai*.

2. Prefrontal Cortex Function

Prefrontal cortex function in humans evolved over a period of more than 10,000 years from hunting and gathering and by cooperating with others in natural surroundings (Solomon et al., 2011). The genetics that govern physiological function have not significantly changed throughout human history (Genc, Zadeogulari, Fuss, & Genc, 2012; Inoue, 2012). The function of the prefrontal cortex, which is connected with many other cerebral structures, includes the mental integration of stimuli, the orchestration of goal-oriented thoughts and actions, decision making, ambition, and cooperation with others (Kolb et al., 2012; Solomon et al., 2011). Cognition and emotions such as pleasure, comfort, fear, and anxiety are associated with the release of neurotransmitters and hormones, as well as with the activities of the autonomic nervous and endocrine systems, and variations in cognition and emotion indicate success or failure in adapting to changing environments (Carter, 2010; Ikuta, 2000). The associated neurotransmitters are as follows: serotonin, which modulates emotions by regulating the secretion of other neurotransmitters; dopamine, which contributes to experiencing pleasure and reinforcing behavior; oxytocin, which provides feelings of familiarity and trust in other people; β-endorphin, which provides pleasur-

able feelings and decreases stress; and noradrenaline, which focuses attention to a stimulus (Carter, 2010; Ikuta, 2000). In addition, endogenous testosterone modulates prefrontal-amygdala connectivity during social emotional behavior (Carter, 2010; Ikuta, 2000). Therefore, prefrontal cortex function works in combination with the autonomic nervous and endocrine systems to contribute to human prosperity (Kolb et al., 2012).

3. Mechanism of PIL/*Ikigai*

The term "PIL" is drawn from European existentialism (Ishida, 2011), while the term "*ikigai*" first appeared in fourteenth-century Japan (Ishida, 2011). Both terms convey the concept that "Everything changes. Life is a one-time-only event. Thus, every person has an intrinsic need to achieve a meaningful life" (Ishida, 2011). Currently, PIL/*ikigai* can be measured by various psychological instruments (Crumbaugh & Maholick, 1964; Sato & Tanaka, 1974). Our previous studies found that PIL/*ikigai* negatively correlated with anxiety and the need for approval from others (Ishida, 2011; Ishida, 2012). PIL/*ikigai* is a mechanism for alleviating, even during stressful situations, the anxiety and conflict associated with psychologically stressful events from the past, present, and future (Ishida, 2011; Ishida, 2012). In addition, PIL/*ikigai* provides individuals with the ability to delay gratification, appreciate the points of view of others, have faith in a higher power, accept personal limitations, and count personal blessings (Ishida, 2011; Ishida, 2012). Persons with PIL/*ikigai* seem to demonstrate attitudes related to equality and independence more frequently than those who have an excessive need for approval from others (Schaefer et al., 2013). PIL/*ikigai*, similar to prefrontal cortex function, develops through positive experiences from infancy to adolescence, such as spending time in beautiful natural surroundings, being successful at achieving valued goals, and gaining empathetic acceptance and affection from others (Ishida, 2011; Ishida, 2012). On the other hand, excessive need for approval from others causes anxiety and conflict during stressful situations (Ishida, 2011; Ishida, 2012). Excessive need for approval from others develops when children are subject to unrealistically high expectations from parents and teachers (Ishida, 2011; Ishida, 2012). PIL/*ikigai* and sense of coherence (Iida & Oguma, 2013), which are accompanied by positive cognition and emotions, may cause a chemical response referred to as epigenetic change involving serotonin, influencing the genetic epidemiology of anxiety without any actual genetic change (Ishida, 2014; Ohta, 2013). In summary, PIL/*ikigai* may be an effective strategy for managing stressful events caused by the excessive need of approval from others.

4. Proposal

Sharing one's PIL/*ikigai* with others may impress them, and in turn, reinforce their own personal motivation for PIL/*ikigai*. Individuals should be aware that everyone is capable of finding their own PIL/*ikigai* at any time and in any situation, regardless of the conditions.

5. Limitations and Future Research

The effect of PIL/*ikigai* on halitosis caused by stress, pseudo-halitosis, and halitophobiais not empirical. Not only PIL/*ikigai*, but also moderate aerobic exercise and a well-balanced diet are recognized as effective strategies for managing stressful events. Therefore, their effects on halitosis caused by stress, pseudo-halitosis, and halitophobia need to be clarified. The effects of working memory (Alloway & Alloway, 2013) and mindfulness (Parkash, Whitmoyer, Aldao, & Schirda, 2015), concepts that appear to be similar to PIL/*ikigai*, on these halitosis conditions should also be clarified.

6. Conclusion

Mental stress causes anxiety. Regardless of their differences, genuine halitosis caused by stress, pseudo-halitosis, and halitophobia may all be due to anxiety resulting from an excessive need of approval from others. PIL/*ikigai*, in relation to prefrontal cortex function, is an effective way to manage stressful events, and is negatively correlated with an excessive need of approval from others. PIL/*ikigai*, similar to prefrontal cortex function, develops through spending time in beautiful natural surroundings, being successful in achieving valued goals, and gaining empathetic acceptance and affection from others. Cannon (1939) posited that the mastery of disease and pain that can relieve the burdens of humankind could only be attained through understanding the wisdom of the body. In conclusion, understanding the traits and developmental conditions of PIL/*ikigai* and prefrontal cortex function could improve the ability of individuals to manage stressful events, thereby promoting the prevention of halito-

sis, pseudo-halitosis, and halitophobia. The present proposal could contribute to future empirical research.

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