Chapter 12
What Is Mental Health?

Contents

12.1 Normality and Health

What is normal? There are several ways of defining normality: (1) normality as what is common or prevalent without precisely defining what constitutes common, (2) statistical normality – if a value falls within two standard deviations, it is within normal limits, (3) normal as an ideal – a "normal" person may be someone without any conflicts, a state for which one might strive but never achieve, (4) normality as absence of pathology (abnormality) – according to this definition, the presence of even a single abnormality disqualifies the whole, as in a tissue pathology sample, (5) normality by legislation (or decree), e.g., homosexuality was an illness until 1973 when the Board of the American Psychiatric Association voted unanimously to remove it from the diagnostic and statistical manual. Each of the normality definition has uses within their specific context but can be misleading if used in another context.

What is health? Is being healthy normal?

The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity". According to this definition, mental health would be an ideal state of well-being difficult to achieve in real life.

The capacity to work and to love, a phrase attributed to Freud, is another definition of mental health that sets the bar to a lower achievable level.

Vaillant describes six models of mental health: (1) mental health as above normal, (2) mental health as positive psychology, (3) mental health as maturity,

H. Leigh, *Genes, Memes, Culture, and Mental Illness*,
DOI 10.1007/978-1-4419-5671-2_12,

(4) mental health as social-emotional intelligence, (5) mental health as subjective well-being, (6) mental health as resilience (Vaillant, 2003). We will briefly review these models and consider how the concept of gene × meme interaction may contribute to a unification of the models.

1. Mental health as above normal: In this model, the important task is defining what "normal" is. In general, persons who have no difficulty to work, love, and play are considered to be in good mental health. The Global Assessment of Function (GAF), part of the DSM multiaxial diagnostic scheme (see Chapter 14), is an attempt at quantification of mental functioning (thus mental health), and on a scale of 1–100, scoring somewhere over 90 is considered to be in superior mental health.
2. Mental health as positive psychology: Drawing in Maslow's concept of self-actualization of talents, capacities, and potentialities, positive psychology as represented by Seligman emphasizes optimism and endeavors to build qualities that help individuals and communities not just to endure and survive but also to flourish (Seligman, 1991, 2002). Positive mental health has been divided into four components – talents, enablers, strengths, and outcomes (Peterson and Seligman, 2004). Talents, e.g., disposition and intelligence, are genetically determined and not subject to much intervention. Enablers are social interventions and environmental variables that can be strengthened. Strengths are character traits such as openness and creativity that can be changed. Outcomes are the dependent variables such as strength of social relationships and GAF that can be a measure of therapeutic intervention.
3. Mental health as maturity: Since Erikson's groundbreaking description of adult developmental stages, there followed descriptions of adult ego development, adult moral development, and adult spiritual development. They all posit that there is continuing development in adulthood, i.e., maturity toward mental health. Vaillant added two stages to original Erikson's model of adult development as follows: identity (adolescence) – intimacy – career consolidation – generativity – keeper of the meaning – integrity.
4. Mental health as social-emotional intelligence: According to Vaillant, social-emotional intelligence can be defined by the following criteria (Vaillant, 2003):

    a. Accurate perception and monitoring of one's own emotions.
    b. Appropriate expression of emotions. This involves the capacity to self-modulate anxiety and to shake off hopelessness and gloom.
    c. Accurate recognition of and response to emotions in others.
    d. Skill in negotiating close relationships with others.
    e. Capacity for focusing emotions (motivation) on a desired goal. This involves delayed gratification and adaptively displacing and channeling impulse.

5. Mental health as subjective well-being: Subjective well-being or happiness (excluding potentially destructive excitement in risk taking behavior or drugs) is considered to be an antidote to learned helplessness. Happy people, after controlling for age, socioeconomic class, and disease, were shown to be half as likely

to die at an early age or become disabled as unhappy people (Ostir et al., 2000). Is happiness then a genetically determined temperament or a reflection of safe, non-stressful environment? It appears that happiness is more temperamental and tends to affect the environment more than the environment affects the temperament. The subjective well-being of monozygous twins raised apart was found to be more similar than that of heterozygous twins raised together (Bouchard et al., 1990; Newman et al., 1998; Tellegen et al., 1988). Some of the heritable factors that contribute to a high level of subjective well-being include a low level of trait neuroticism, high level of trait extraversion, absence of alcoholism, and absence of major depression (Vaillant, 2003). Relationships were shown to be more important to subjective well-being than money.

6. Mental health as resilience: This model is concerned with how the individual copes with stress. The trait of resilience or hardiness, and the type of psychological defense mechanisms used will determine whether the individual can bounce back from stressful situations without significant emotional distress.

12.2 Gene × Meme Interaction and Mental Health

The models of mental health discussed above by and large indicate that mental health is a desideratum involving aspects of personality such as resilience and openness that are achieved through interaction of temperament and experience in the course of continuing development of the person. Mental health is thus a state of well-being of the mind.

Pursuit of happiness is a fundamental motivation underlying all mental activity. What are the factors involved in the experience of happiness? Clearly, there are certain basic biological drives and needs that must be met, i.e., feeding, sex, exploration, attachment, physical comfort. Yet, the amount of fulfillment of the biological drives to produce a sense of happiness seems to vary depending on culture and individual. For example, obtaining a piece of bread for a person starving may produce extreme happiness while ten times the amount of bread will not elicit much happiness in a well-fed individual.

Modern humans are not happy with bread alone. We are happier with gourmet meals with complex flavors and tastes, perhaps with a glass of wine, served in pleasant and clean surroundings, often with good company and accompanied with music. The ingredients of this type of happiness are clearly both biological (genetic) and memetic (cultural). The arts of cooking, of decorating a room, of making wine, of conversation and of music are all products of memetic evolution based on genetic needs.

The Merriam-Webster Dictionary defines happiness as a state of well-being and contentment, or a pleasurable or satisfying experience (Merriam-Webster, 2008). The term happiness is usually used to denote a sustained state of well-being while the term pleasure often denotes more immediate positive experience.

Happiness as a goal in life, while accepted widely, has had many different meanings through history. Simply put, what constitutes happiness may be classified in two large categories – (1) pursuing and satisfying one's desires and needs through positive action, and (2) reducing the needs and desires so that one is in a state of satisfaction without the need for much positive action. Hedonism is often associated with the former, while stoicism or asceticism is associated with the latter. Another dichotomy has been between seeking pleasure of the body and senses versus of the spirit a la St. Augustine and Thomas Aquinas (http://science.jrank.org/pages/7739/Happiness-Pleasure-in-European-Thought.html, 2008). Clearly, seeking happiness for the spirit at the exclusion of the body is an example of memes driving the brain.

Pleasure is the experience that drives animals, including humans, to action and forms the biological/genetic basis of happiness.

12.3 Neurobiology of Pleasure, Punishment, and Inhibition

The main centers of the brain's *reward circuit* are located along the medial forebrain bundle (MFB). The ventral tegmental area (VTA) and the nucleus accumbens are the two major centers in this circuit, but it also includes several others, such as the septum, the amygdala, the prefrontal cortex, and certain parts of the thalamus. Each of these structures appears to participate in its own way in various aspects of behavioral response. All of these centers are interconnected and innervate the hypothalamus, informing it of the presence of rewards. The lateral and ventromedial nuclei of the hypothalamus are especially involved in this reward circuit. The hypothalamus then acts in return not only on the ventral tegmental area, but also on the autonomic and endocrine functions of the entire body, through the pituitary gland. See Figs. 12.1, 12.2, and 12.3.

The emotion of pleasure and reward seems associated with the dopaminergic activation of a circuitous pathway, first involving a descending medial forebrain bundle component and then involving the ascending mesolimbic ventral tegmental pathway (Bozarth, 1987; Wise and Bozarth, 1985), eventually activating the dopaminergic nucleus accumbens. The septum, the amygdala, the ventromedial prefrontal cortex, and certain parts of the thalamus also participate in the circuit. *The ventromedial prefrontal cortex*, *with its extensive connections with the limbic system, may link the conscious to the unconscious and ascribe meaning to perceptions by associating them with meaningful memes.*

The ventral tegmental pathway can also be activated by various substances including alcohol, amphetamines, exogenous and endogenous opiates, barbiturates, caffeine, marijuana, and nicotine.

All of these pleasure centers are interconnected and innervate the hypothalamus, particularly the lateral and ventromedial nuclei. The hypothalamus then activates the ventral tegmental area, as well as the autonomic and endocrine functions through the pituitary gland.

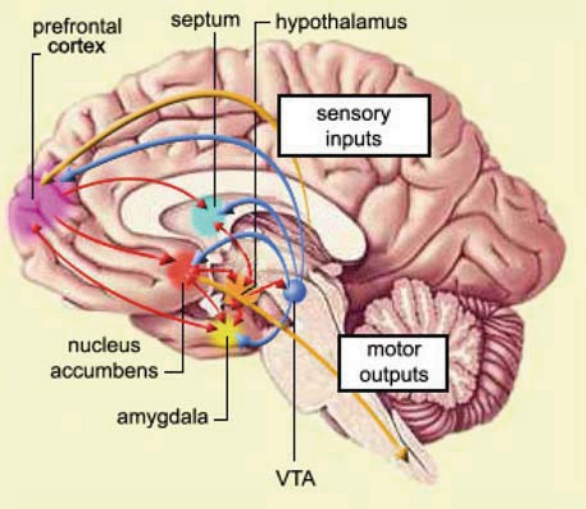
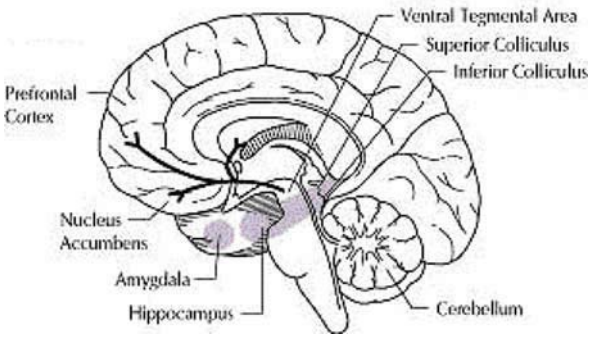


Fig. 12.1 Brain structures associated with pleasure, punishment, and inhibition 1.

Fig. 12.2 Brain structures associated with pleasure, punishment, and inhibition 2.



Aversive stimuli that provoke fight or flight responses activate the brain's punishment circuit (the periventricular system, or PVS), which is activated to cope with unpleasant situations by activating the fight/flight response. It includes the hypothalamus, the thalamus, and the central gray substance surrounding the aqueduct of Sylvius. Some secondary centers of this circuit are found in the amygdala and the hippocampus. The cholinergic punishment circuit stimulates the secretion of adrenal corticotropic hormone (ACTH) as well as stimulation of the adrenal medulla and sympathetic outflow. ACTH in turn stimulates the adrenal cortex to release adrenocortical hormones. Stimulation of the punishment circuit can inhibit the pleasure circuit, thus fear and punishment can drive out many pleasures.

The behavioral inhibition system (BIS), associated with the septo-hippocampal system, the amygdala, and the basal nuclei, receives inputs from the prefrontal

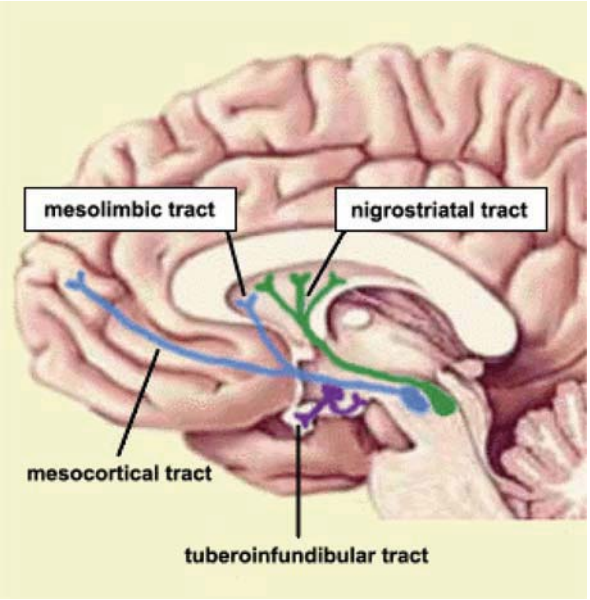


Fig. 12.3 Dopaminergic pathways in the brain. (http://www.ask.com/bar?q=brain+reward+diagram&page=1&qsrc=2417&ab=5&u=http%3A%2F%2Fthebrain.mcgill.ca%2Fflash%2Fi%2Fi_03%2Fi_03_cl%2Fi_03_cl_par%2Fi_03_cl_par.html, copyleft). The three diagrams and explanatory text are from The Brain Top To Bottom, website by Canadian Institute of Neuroscience, Mental Health, and Addiction, Canadian Institutes of Health Research, http://thebrain.mcgill.ca/flash/index_a.html. Copyleft. The linear drawing is in public domain)

cortex and transmits its outputs via the noradrenergic neurons of the locus coeruleus and the serotonergic fibers of the medial Raphe nuclei. Serotonin may also play a major role in this system. The BIS is activated when both fight and flight seem impossible and the only remaining behavioral option is to submit passively.

When a sensory stimulus is perceived by the cortex to indicate a danger, it is routed first to the thalamus. From there, the information is sent out over two parallel pathways: the thalamo-amygdala pathway (the "short route") and the thalamo-cortico-amygdala pathway (the "long route"). The short route quickly activates the central nucleus of the amygdala. Then the information that has been processed by the cortex through the long route reaches the amygdala and modifies its response dependent on the cortical evaluation of the threat. This cortical evaluation involves the following steps: (1) The various modalities of the perceived object are processed by the primary sensory cortex. Then the unimodal associative cortex provides the amygdala with a representation of the object. (2) The polymodal associative cortex conceptualizes the object and transmits the information to the amygdala. (3) *This elaborated representation of the object is then compared with the contents of explicit memory (memes) available through the hippocampus, which also communicates closely with the amygdala*. The hippocampus is also involved in the encoding of the context associated with a fearful experience. The amygdala conveys the gratifying

or aversive nature of the experience through connections to the nucleus accumbens, the ventral striatum, the septum, the hypothalamus, the nuclei of the brainstem, and orbitofrontal, cingulate, piriform, and other parts of the cortex. *The combination of stimuli from the amygdala with working memory (memes) in the dorsolateral prefrontal cortex may constitute the experience of emotion.* The basal ganglia have close connections with the amygdala and are involved with the voluntary expression of emotions. The amygdala has outputs to the nuclei of the sympathetic nervous system in the brainstem and the hypothalamus, controlling the pituitary gland and the endocrine system.

The anterior cingulate gyrus of the frontal lobe seems to be important in emotions and cognition. The subgenual anterior cingulate, together with the rostral cingulate, is considered to be the emotional sector of anterior cingulate gyrus and subserves autonomic arousal, reward mechanisms, and emotions, particularly anxiety and sadness in close coupling with the amygdala (Grady and Keightley, 2002; Pezawas et al., 2005). The dorsal portion of the anterior cingulate, called "cognitive cingulate," is involved with error monitoring and selecting among competing responses.

Orbitofrontal cortex plays an important role in decision making in the context of emotional situations. Ventrolateral prefrontal cortex, together with subgenual cingulate, plays a role in responding to reward contingencies.

In the course of evolution, the brain has developed intricate mechanisms for adapting to the environment that include the emotions of pleasure and fear. Emotions facilitate cognitive evaluation of a situation by providing flavor and urgency – the "gut reaction" often is a shortcut of much elaborative cognition. The mirror neurons that appeared in primates that directly elicit an imitation of emotions of another animal probably enhanced the development of memes as imitation of others' emotions and behavior. Thus, in addition to perceptions based on sensations, empathy occurring as mirror neuron activity may be then perceived as an internal sensation, which might be a precursor to an internal representation of the self, i.e., by empathizing with others, one might also learn to empathize with oneself.

12.4 Mental Health: A Democracy of Memes

In the beginning, memes developed simply as patterns of neural connection (memory) that were transmitted from one individual to another through observation and activation of the mirror neurons and/or the perceptual apparatus. In the beginning, memes were obviously in the service of the genes as memes that elicited the pleasure experience were readily incorporated, and those that elicited the fear/punishment response were discarded. Memes that arose from individuals who were successful were welcomed as they promised pleasure. As memes became more numerous, and became free-floating in books and electronic media, largely independent of the brain from which they rose, the link between memes and immediate pleasure or fear became largely uncoupled.

Now in the form of information and knowledge, memes are to a large extent emotionally neutral, neither pleasure nor fear. Except, of course, the process of acquiring memes has been linked to pleasure as an evolutionary adaptation of *Homo sapiens*, though such pleasure may also be seen in some animals that acquire new skills through learning.

As I discussed in the previous chapter, memes also acquired the ability to encapsulate themselves in disguise by forming memeplexes such as a toxic meme (e.g., murder) being sugarcoated in a fashionable –ism (e.g., patriotism, fascism).

Modern human brain is immersed in an ocean of memes of all shapes, colors, and sizes, mutually compatible, incompatible, or indifferent. The sole purpose, of a meme is replication. Thus, once inside the brain, each meme is intent on replication. Replication of a meme in the brain is by converting another set of neurons to be like them, which involves connecting with another set of neurons and converting it. The brain is a Hobbsean universe of memes where each meme is out for itself against all other memes. It is natural, then, that some memes should form alliances with each other, and recruit other allies to form small cooperating societies, or memeplexes and complexes of memeplexes. Thus, small societies of memeplexes develop, and there may be tension, cooperation, or frank conflict among these societies of memes.

Before the advent of memes, the animal had a unity of purpose dictated by genes. With memes, however, the unity of purpose has been lost, replaced by competing purposes of genes and memes.

From early childhood, memes enter the brain that stand for social norms, codes of conduct, and ways of relating with people. Some social memes are created by the brain through trial and error, e.g., the child learns that it is more effective to ask with a smile rather than with a frown. Such autochthonous memes may be augmented by imitation of others, or may spread by others imitating them. The learning of morals and ethics may be through a combination of memes introduced from outside as well as trial and error. Some social memes, such as a tendency toward altruism, may arise from genes that have been evolutionarily selected sociobiologically (Wilson, 1980).

Empathy, both automatic through motor neurons and conscious through identification, would play an important role in the development of memes concerned with the sense of morals and justice, in parallel with those introduced from the society in the form of codes and rules.

During adolescence, there is an influx of new memes as the developing brain has now gained the ability to abstract and absorb abstract memes. There is confusion, conflict, and turmoil among the competing memes, some already resident but called to question by new incoming memes, and newly introduced abstract memes. Eventually, one or more memes are identified as comprising the essence of the self, the selfplex, which are the memeplexes that have been successful in competing with others and established dominance. There are often more than one dominant selfplexes depending on the environment in which the brain finds itself. For example, the dominant selfplex at work may be that of a "scientist," while at home, it may be "wife" and "mother." At church, she might be a "Christian." The selfplex(es) then rule over other societies of memeplexes within the same domain.

When the dominant selfplexes in different domains are in reasonable harmony with each other, they are called roles that can change smoothly depending on the setting. When a selfplex for a particular role asserts dominance over others, for example, a religion, then there is potential conflict. Such dominant selfplexes often recruit self-serving memeplexes such as prejudice against other and chauvinism. Counterbalancing such memes are tolerance memes and freedom memes.

How the selfplex and other societies of memes should relate with each other is a meme itself, and has a number of variations. One model is that of an authoritarian and tyrannical regime in which one selfplex ruthlessly suppresses others. The self is, therefore, seen to be unitary and coherent with a strong identity, with strong support of prejudice and chauvinism memes. Authoritarian selfplex is subject to violent overthrow by the repressed memes and memeplexes if they are energized by an infusion of new memes or if the selfplex is weakened either by a decrease in brain function, or by infusion of conflicting memes. An example of the fear an authoritarian selfplex exhibits toward new meme infusion is censorship. Individuals with authoritarian selfplexes tend to advocate censorship, for example of "bad words." Of course, the "bad words" are resident in the brains of those individuals as memes; otherwise they would not recognize a "bad word." And they are often preoccupied with the "bad words" that they look for them in everything they see or read. This is an example of the replication of the resident memes represented by the "bad words," and how the authoritarian selfplexes are threatened by it.

Another model of interaction of memes and selfplexes in the brain is that of an enlightened sovereign or of an oligarchy, where the selfplex maintains hegemony but is open to coexistence with other selfplexes and conflicting memes, and recognizes them as legitimate, some of them more so (the aristocrats, so to speak) than others.

Yet another model is a democracy of selfplexes where there is recognition that different senses and objectives of the self can coexist, and depending on the needs of the genes and the environment, the different selfplexes may be elected to be dominant, with the consent of the ruled (Benjamin et al., 1996; Cohen et al., 2005; Ebstein et al., 1996; Okuyama et al., 2000; Shiraishi et al., 2006; Van Gestel et al., 2002).

The memes within the selfplexes are not mutually exclusive, i.e. – some memes may participate in more than one selfplex. Just as an incoming administration in a democracy may retain some of the cabinet members of the outgoing administration of another party, newly dominant selfplexes often retain memes of now nondominant selfplex. Furthermore, the memes that form the day to day working of the memetic government, like bureaucrats in a government, continue to function regardless of the changes in dominance of selfplexes. This model of memetic relationship in the brain may offer the most flexibility and least oppression. Unlike in multiple personality in which a repressed selfplex overturns the dominant one temporarily, in a democracy the change of regime is based on rational needs and is effectuated without suppression of the now nondominant selfplex.

In a memetic democracy, the selfplexes that may be likened to be major parties recognize the right to exist of the minor, even subversive parties. Thus, revolutionary memes and subversive memes, and even toxic memes, can exist in a state of check and balance, and may express themselves in accepted forms such as

creativity and art. Freedom, tolerance, and openness memes are universally accepted by the competing major selfplexes. Depending on the form of government, i.e., parliamentary democracy or a presidential system, the ease with each the selfplex changes may differ.

What is mental health considering the gene–meme interactions? The brain as a well-functioning memetic democracy may well fit the bill. As to Vaillant's first model, mental health as above normal, Winston Churchill's description of democracy may suffice: "democracy is the worst form of Government except all those other forms that have been tried from time to time"(Churchill, 1947).

As to the second model, mental health as positive psychology, pursuit of pleasure, both genetic and memetic, would be best facilitated in a memetic democracy, in which there are memes that seek primarily one or the other or both ends. The memes that constitute character strength such as open-mindedness and curiosity (See Table 12.1 below) may find certain brains particularly habitable because of

Table 12.1 The values in action institute classification of character strengths

Love
Love, valuing close relations with others
Kindness, generosity, compassion, altruistic love
Social intelligence, emotional intelligence – being aware of others' feelings and motives
Temperance
Forgiveness and mercy, not being vengeful
Modesty and humility, not regarding oneself more special
Prudence, not taking undue risks, refraining from things that one might regret later
Self-regulation, self-control
Wisdom and Knowledge
Creativity originality, ingenuity.
Curiosity, interest, novelty seeking, openness.
Judgment, open-mindedness, critical thinking
Love of learning – mastering new skills, knowledge, etc.
Perspective, wisdom, providing wise counsel to others
Appreciation of beauty and excellence
Courage
Bravery
Integrity, authenticity, honesty – taking responsibility for one's feelings and actions
Persistence, perseverance, industriousness, taking pleasure in completing tasks.
Zest, vitality, enthusiasm, vigor – approaching life with excitement
Justice
Citizenship – social responsibility, loyalty, teamwork.
Fairness:
Leadership.
Transcendence
Gratitude – for the good things that happen, taking time to express thanks
Hope, optimism, future orientation.
Humor, playfulness, seeing the light side
Spirituality, purpose – coherent beliefs of higher purpose and meaning of life that guide conduct and provide comfort.

Based on strengths of character and well-being (Park et al., 2004) and mental health (Vaillant, 2003).

their genetic predisposition. For example, those brains with the serotonin transporter promoter gene (5-HTTLPR) *l/l* may be more likely to welcome kindness/love memes and those with type 4 dopamine receptor gene (D4DR) *l/l* may be associated with curiosity/novelty-seeking memes (Benjamin et al., 1996; Cohen et al., 2005; Ebstein et al., 1996; Okuyama et al., 2000; Shiraishi et al., 2006; Van Gestel et al., 2002). On the other hand, strong exposure to character strength memes in early childhood may turn off certain genes that may be incompatible with them, such as the 5-HTTLPR *s/s* that predisposes the individual for fear and anxiety memes.

The third model, mental health as maturity, is compatible with a mature brain that is tolerant of competing needs and inclinations. Erikson's developmental stages can be seen to be stages of development of the ability to manipulate memes. In the earliest stage, memes concerning trust and mistrust have to be properly processed, followed by those of autonomy and shame, then taking initiative and guilt memes. During early school years, the child is infused with memes concerning rules and concrete operations (industry), as well as memes associated with inferiority. Adolescence ushers in a consolidation of selfplexes that have been formed in various stages of maturity in earlier stages. Processing of memes concerning sex and sexual identify is also important in adolescence. In early adulthood, the task is the processing of memes associated with intimacy and sharing as well as loneliness. Memes concerning success and competence in career are also important in what Vaillant calls the stage of career consolidation. In middle age, generativity or productivity memes, as well as memes associated with stagnation and boredom must be processed. There may be a proliferation of memes associated with meaning of life and place of the person in culture, what Vaillant calls "keeper of the meaning." Then, in Erikson's integrity vs. despair stage, memes concerning continuity of life and meaning as well as memes concerning mortality are processed with intensity.

This memetic view of stages of life does not posit achievement vs. nonachievement, but rather considers the memes that are more numerous depending on the stage. There may be only partial processing, and there may coexist processed (integrated) and nonintegrated memes, e.g., one might feel productive academically (abundance of academic memes and success memes associated with them) but not personally (abundance of dissatisfaction memes associated with relationships).

The fourth model, mental health as social-emotional intelligence, likewise, is achieved in a memetic democracy where empathy and socialization memes are given free expression.

The fifth model, mental health as subjective well-being, is best achieved in a memetic democracy where there is an orderly process of memetic expression and change of dominance, and where both genetic and memetic pursuit of happiness is recognized. There is, as in any democracy, healthy tension among competing memes and ongoing debate, which can be consciously carried out with the use of reason, the tool invented for effective memetic manipulation. Such a brain is then naturally resilient, Vaillant's sixth model, as it is best equipped to deal with stress by mobilizing all available genetic and memetic resources.

In a memetic democracy, most of the memes in the surrounding culture would be represented, but the unique interaction resulting in the epigenesis of the genes and memes through development would result in unique combinations of memes constituting the selfplexes. Each democracy of such selfplexes would have unique needs and desires just as each individual in a society has unique needs and desires. Furthermore, the needs and desires are likely to change over time with adaptation and possible change of regimes.

Pleasure is the activation of the dopaminergic reward system elicited by fulfillment of the needs of the genes or memes or both. Sustained pleasure would be possible when a majority of the memes and genes are satisfied, and the minorities are not dissatisfied enough to open revolt.

The self is not a coherent and unitary entity, but equilibrium of constantly changing selfplexes in a sea of memes. The self is fragile, an uneasy coalition of memes, that is subject to changes of regime and revolutions.

Mental health is a state of well-being of the gene–meme interaction in the brain. Such well-being is most likely achieved in a memetic democracy within the brain that recognizes both genetic and memetic needs, provides an orderly mechanism for their expression and mechanisms for adaptation to changing demands, and strives to maintain both cohesiveness and diversity within the societies of memes contained within.

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