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Review Article

Psychiatry/Mental Health Section

Biological Connection to the Feeling of Happiness

JOSMITHA MARIA DSOUZA[1], ANIRBAN CHAKRABORTY[2], JACINTHA VEIGAS[3]

ABSTRACT

Happiness is a psychological state, resulting from the secretion of certain chemicals by specialist cells in the brain. It is a very tricky multifaceted theory that is challenging to comprehend. Humans desire to be happy and strive for the same throughout their lives. There is nothing else that can give more pleasure than being happy. Without knowing how happiness is achieved, humans tend to slog for worldly things that are perceived to bring joy. But the fact is that the human brain is a master programmer that controls when and how one feels happy. The determinants that offer happiness are numerous like biological, cognitive, behavioural, sociocultural, etc. Amongst these the biological factors are the endogenic constituents that top the table in defining human happiness. Today, happiness is a typical problem that is being examined by several researchers. It is thus, obligatory to comprehend the biological outlook of joy and understand the quality of life. Therefore, this paper intends to reflect on the biological factors that hold happiness. The data acquired from the database search is categorised under the subheadings hormones/ neurotransmitters, genetics, and the anthropometric typology. The neurotransmitters identified to offer happiness are dopamine, oxytocin, serotonin, endocannabinoids, endorphins, epinephrine, norepinephrine, cortisol, and melatonin. These are secreted in humans and have a designated purpose in ascertaining happiness. Although there is no extensive proof available on the genetics of happiness, studies suggest that 35-50% of the joy is hereditary. Genes like Serotonin Transporter Polymorphism (5-HTTLPR) and Monoamine Oxidase (MAOA) and their role in happiness are explored through various research studies. Also, the physical features of an individual have a link to human happiness. Therefore, the existing knowledge points out that the biological factors' role is vital in determining happiness which is undebatable.

Keywords: Biological factors, Genetic factors, Hormones, Neurotransmitters

INTRODUCTION

Happiness is an emotion with several definitions and dimensions [1]. It can lead to a favourable outlook towards living, a positive self-concept, increased vitality and mental health, and higher social and physical functioning [2]. The quest for happiness and well-being is a unifying human intent and is the basis for creating human harmony at the world level [3]. Happy people endure gains in their social relations, profession, and overall wellness [4].

For decades, efforts are made to investigate and learn the predictors of happiness. Being happy is genetically determined in a few, while in others, it may be determined by environmental factors like income, education etc. The parts of our brain (amygdala, limbic system, and hippocampus) and hormones/neurotransmitters like dopamine, serotonin, endorphins, epinephrine, oxytocin etc., help control happiness. Also, physical health plays a vital role in happiness. Human biology and health are confirmed to have a particular purpose in joy. Thus, it is clear that satisfaction is not the byproduct of one or two factors, but a combination of diverse elements.

Factors that promote happiness could either be endogenic (biological, character, cognitive) or exogenic (behavioural, geographic, sociocultural, and life experiences). Amongst all, the biological factors are the notable predictors of joy. The major players are hormones/ neurotransmitters, genetic factors, and the anthropometric typology [5]. This article will give an overview of the biological connections to the feeling of happiness.

HORMONES/NEUROTRANSMITTERS

a. Dopamine

Dopamine, a hormone linked with happiness, is responsible for reward-driven behaviour and exploring pleasure [3]. "Reward molecule" and "feel-good hormone" [6] are additional terms for dopamine. Dopamine is a catecholamine (a benzene ring, including two hydroxyl side groups) with one amine group connected through an ethyl chain [7]. Adequate dopamine levels enhance pleasure and reward pursuits which are indispensable for happiness [6].

Dopamine functions by anticipating happiness rather than creating it [3]. It assists in reinforcement and motivation to do something over and over again. For instance, increased dopamine would make a lab creature frequently press a lever to obtain delicious food pellets [7]. When dopamine levels are raised, the exertion becomes greater to accomplish even more. When any human deed is praised purely, the body secretes a large amount of dopamine that results in sensations of well-being [6]. The urge to attain fixed goals arises from dopamine. Hence, the secretion of dopamine can be increased by establishing reasonable goals (e.g., tidying your room) and performing to achieve them [8]. Conversely, depletion in dopamine secretion is linked with self-doubt, low energy and low self-esteem, which tend to make a person flee from obligation and look for easy alternatives to get tasks done [6].

Typically, dopamine levels are well-controlled within the nervous system, but there are ways to naturally raise their levels. The key to increasing dopamine levels in the body is to fragment the big goals into smaller units so that the attainment of each becomes easy. The fulfillment of each becomes simple thus, resulting in a frequent discharge of dopamine post-goal attainment. Studies have shown that simple activities such as going out for meals, watching a TV program, climbing mountains, or taking spouses out, all trigger the dopamine flow [6].

Amino acids tyrosine and phenylalanine execute vital roles in the production of dopamine, and these amino acids are commonly obtained from protein abundant foods (eggs, dairy, soy, legumes, etc.,). A few animal studies have confirmed that saturated lipids (butter, palm oil, coconut oil) can decrease dopamine signaling in the brain when eaten in substantial quantities. However in humans, this is not yet proved [9]. The probiotics have been shown to be linked to a better mood in humans and animals. However, additional study

is required to determine how essential probiotics are in dopamine production [10]. Velvet beans *(Mucuna pruriens)* are the natural sources of L-Dopa, a precursor molecule to dopamine [9]. Research on people with Parkinson's Disease has shown that consumption of 250 grams of cooked velvet beans elevates dopamine levels and lessens Parkinsonian features for the next four hours following the meal [11].

Frequent exercise can lift the mood and hence, heighten dopamine levels. Research in rats have revealed that treadmill running enhances dopamine discharge and stimulates the receptors in the reward regions of the brains. However, these observations could not be replicated consistently in humans [9]. Nevertheless, another study has shown that a three-month yoga intervention six days a week with one hour per day, results in a significant increase in dopamine levels [12].

It is well known that sleep deprivation can diminish dopamine sensitivity in the brain as regular sleep aids in managing our natural dopamine levels and helps us look more alert throughout the day [13]. Studies have also proposed that hearing music could be a fun way of stimulating dopamine release [9]. Several types of research that utilised brain imaging have revealed that music boosts activity in the reward and pleasure areas of the brain, rich in dopamine receptors [14]. Meditation improves dopamine levels in experienced meditators, but the results are unclear on those who are new to meditation. A study on physically fit adults has unveiled that those exposed to the highest sunlight in the past 30 days had a massive surge of dopamine receptors in the brains. Studies in animal models have shown that optimum levels of iron, niacin, folate and vitamin B6 are critical for dopamine creation [9].

b. Serotonin

Serotonin tagged as the "confidence molecule" [6], plays a vital role in a positive mood i.e., mediating satisfaction, happiness, and optimism [15]. Chemically, serotonin is called the 5-hydroxytryptamine and is synthesised from the amino acid L-tryptophan by a short metabolic pathway [7]. Generally, serotonin is secreted when one feels significant. During isolation or a state of sadness, serotonin levels are lower. Earlier studies have linked depleted serotonin levels with counterproductive activities such as gangs and illegal activities [6]. Thus, serotonin is also known as a natural mood stabiliser [16]. Indeed, antidepressants, prescribed for patients with depression, work by generating serotonin levels [6]. Besides antidepressant pills, there are natural ways to increase serotonin levels. Activities such as challenging oneself and attempting something that bolsters a feeling of hope, significance, and fulfillment are known as serotonin boosters. Being able to say, "I did it," strengthens self-confidence, subdues uncertainty, and increases serotonin levels [17]. Speculating on our former deeds enables the brain to re-live the happening, which causes an increase in serotonin [6].

Most foods (bananas, beans, eggs, etc.,) have serotonin. However, without nutrients like tryptophan, vitamin B6, vitamin D, and omega-3 fatty acids, our body cannot produce serotonin [18]. Fibre-rich diets such as fruits and vegetables increase a load of favourable bacteria in the intestines, which is linked to adequate serotonin levels [19]. Each day, exposure to sunshine for roughly 10-15 minutes can increase the vitamin D levels, which is necessary for serotonin generation [20]. Regular aerobic workouts (swimming, brisk walking, jogging, etc.,) are also known to raise serotonin levels [21]. Massage therapy is another typical way to discharge serotonin within us. As per the study by Field T et al., in depressed pregnant ladies, a 20-minute massage session by their spouse increased their serotonin levels by 28% [22].

c. Oxytocin

Oxytocin is dubbed as the "cuddle hormone" [6] or "bonding molecule" or "trust hormone" or "love hormone" [7] because it is released when we hug, cuddle or make love [6]. It is a peptide hormone that originates in the hypothalamus and is discharged into the bloodstream by the posterior pituitary gland. Oxytocin has a connection with human bonding, developing faith, and integrity [7]. It is primarily released both in men and women during orgasm and by mothers while in labor and breastfeeding. Oxytocin is the glue that secures together healthy relationships [6]. Harmful social confrontations like an insult and negative thinking reduce oxytocin levels [7].

Oxytocin is accountable for traits such as love, loyalty, honesty, courage, and empathy [3,7]. There are several straightforward techniques to keep oxytocin flowing. People who have surplus oxytocin are happier, and they hold extra-pleasing relations. An affectionate hug and interpersonal touch lead to the discharge of oxytocin and further strengthen human bonds [23]. It has been stated that consumption of foods rich in proteins, lipids, minerals, vitamins, e.g., figs, avocados, watermelon, spinach, green tea, increases the synthesis of this love hormone [24].

As per the study of Zak PJ, wherever the role of oxytocin in human behaviour was analysed, the following suggestions were made to increase the levels of oxytocin: proffering someone your complete concentration, sharing your meals with others, exercising mindfulness meditation, soaking in a warm tub with cherished ones, staying in touch with others atleast through social media, employing ventures like rafting, bungee jumping, skydiving, revealing your love to others, giving and getting hugs or petting a dog [25].

d. Endorphins

Endorphins are termed as the "Pain-killing molecules" because they alleviate pain and propel happiness. Hypothalamus and the pituitary gland manufacture endorphins, which resemble opiates in their biochemical makeup. They are involved in analgesia, which implies they lessen the perception of pain and trigger a positive response in the body, similar to morphine. Thus, endorphins are also referred to as self-produced morphine [7].

Endorphins are released during high-stress levels, where it acts by tranquilising the brain and induces a feeling of happiness [26]. When we are wounded, the resulting pain alerts the release of endorphins. For instance, the pain caused by the introduction of the needles during acupuncture spurs pain and excites the pituitary gland to deliver endorphins [27].

Multiple agents, including constant exercise, anxiety, love, music, chocolate-eating, sex, orgasm, etc., incite endorphins [5]. Research on 22 samples unveiled that an hour of moderate-intensity workout sustained a euphoric feeling in the members, which was linked with endorphin secretion [28]. In another study involving 12 members, an endorphin boost was seen while exercising in a group rather than in isolation [29]. Meditation is another technique to trigger endorphin discharge [30]. It has been shown that the essence of essential oils like lavender can further lead to endorphin deliverance [31].

Laughter can aid in the discharge of endorphins. Watching a comedy program for at least 30 minutes with companions can raise endorphin levels [32]. Even enjoying a play and other narratives that excite a person emotionally can also trigger endorphin release [33]. An act of benevolence, kindness towards others can also lead to the release of endorphins [34]. Hearing music can foster genuine feelings and elevate mood, but research suggests a musical act is more apt in increasing endorphin levels than just listening to music [35].

Sunshine is a universal specialist that is associated with several health gains. Besides serotonin, UV rays of the sun can also increase endorphin levels. Like dopamine and serotonin, endorphin levels are increased by massage therapy [36]. Foods that are spicy such as pepper and green chilies trigger a pain sensation in the mouth which induces the rise in endorphins [37]. Research recommends that having dark chocolate may increase endorphins as the cocoa

powder and chocolate holds compounds named flavonoids that seem favourable to the brain [38]. Regular sex grants us happiness or the feeling of bliss and the production of endorphins [39].

e. Endocannabinoids

Endocannabinoids, also known as the "bliss molecule" [6], is self-produced cannabis [3] that act on the Cannabinoid receptor (CB1) and CB2 receptors of the cannabinoid system. Anandamide ("Ananda" means bliss in Sanskrit) is the well-known endocannabinoid [17]. The endocannabinoids help improve mood, emotion, motivation, memory, pleasure perception, appetite, metabolism, and much more. There is a bond between cannabinoids and emotional situations. The prime active component identified from the cannabis plant (*Cannabis sativa*), delta9-tetrahydrocannabinol, has been perceived to generate delight and intensification of sensory perceptions [40].

Multiple stress stimuli like trauma, temperature fluctuation, pathogens, contagions, emotional strain are responsible for the secretion of endocannabinoids. They execute a guarding function and defend the body from the physiological outcomes of stress. When a person is stressed, some sections of the brain are activated, which are the areas that possess the maximum cannabinoid receptors. These areas are the hedonic brain hotspots and prove a linear anatomical association within happiness and cannabinoids [40].

There are diverse approaches to stimulate the endocannabinoid system. Exposure to cold has confirmed to advance endocannabinoid levels [41]. Researchers have identified that exposure to cold boosts CB1 neurons' mass and arouse the vagus nerve [42]. Another approach to spur the endocannabinoid system is by sipping coffee. Investigations have revealed that the cannabinoid system is involved in caffeine's psychoactive attributes and stimulates the activation of CB1 receptors [43]. Likewise, extravirgin olive oil can upregulate CB1 receptors [44].

Studies have confirmed that some probiotics can stimulate and strengthen the endocannabinoid system. A distinct probiotic species, like *Lactobacillus acidophilus*, is known to improve CB2 receptors [45]. Dark chocolate holds anandamide and has other compounds that delay the breakdown of anandamide. This rise in the anandamide levels excites the endocannabinoid system [46]. Another means to promote the stimulation of the endocannabinoid system is the practice of exercise, which upregulates CB1 receptors and intensifies CB1 receptor sensitivity and therefore, defends from the consequences of stress [47].

f. Melatonin

Melatonin or n-acetyl-5-methoxytryptamine is a hormone produced by the brain's pineal gland. It has a connection with our body's readiness to sleep [5]. Determinants like age, light, and other environmental and physiological factors influence this hormone [48]. Melatonin levels vary in 24-hour series with a higher level between 21 and 22 and lower in the morning [48]. Like serotonin, melatonin is related to happiness, but the two play opposite roles, i.e., melatonin level increases during dark whereas serotonin boosted under light [49]. Melatonin also has a role in depression, as evidenced by the fact that some of the antidepressants raise melatonin levels in blood [48]. Melatonin helps in relaxation and sound sleep and thus aids in the restorative processes that occur during rest and sleep [49].

The quintessential constituent for melatonin generation is light. Unimportant acts like watching your phone before bed, or how much sunshine one gets each day can play a role in the making of melatonin. Electronic gadgets like laptops and phones emit light that warns the brain through the retina and in return, seals down the melatonin discharge. Also, the sun's natural radiance helps in the creation of serotonin, the precursor to melatonin. Daylight lets early melatonin production in the dusk and allows sleep without a struggle. Faint lights in the bedroom enhance the sense of repose and trigger melatonin formulation [50].

Different foods, such as corn, asparagus, pomegranate, cucumbers, walnuts, flax seeds, barley, etc., support the release of night melatonin. Plenty of water and caffeine-free drinks can also benefit. Researchers have revealed that caffeine minimises the quantity and quality of sleep and stretches the range of sleep initiation [51]. A warm bedtime bath helps reduce stress hormones and create melatonin. Meditation mitigates tension, induces muscle relaxation, lessens nervous system arousal, and supports melatonin release. Also, routine workouts can assist in the synthesis of melatonin [50].

g. Epinephrine

Epinephrine, the "energy molecule," contrarily perceived as adrenaline, is produced during intense stress and stimulates and prepares us for a fight-or-flight response. Epinephrine allows the body to respond quickly to stress by increasing heart rate and raising oxygen consumption in the tissues. It supports the liver's glucose production, while declining insulin release by the pancreas, leading to enhanced muscle ability and giving the feeling of vigour and vitality. It is also a cure for apathy and uneasiness [17].

When one comprehends a situation as dangerous and stressful, a sudden release of adrenaline occurs, known as an adrenaline rush. The information is sent to the amygdala (a part of the brain), which plays a task in emotional processing. In turn, the amygdala signals the hypothalamus, which corresponds with the adrenal medulla to free epinephrine into the bloodstream [52]. Thus, epinephrine could commit to happiness by reducing grief and intensifying the capacity to strive despite suffering.

As some tension is profitable for our well-being, we must learn specific techniques to counter the body's reply to stress. Persistent adrenaline waves can damage the blood vessels, raise blood pressure, and increase our risks for heart illnesses. Activating the parasympathetic nervous system, the "rest-and-digest system" can regulate epinephrine by improving equilibrium and supporting the body's rest and reconstruction [52].

There are some tricks to get the epinephrine act on our call. Going up the stairs could help elevate epinephrine and make us feel more alert [53]. Yoga, meditation, sharing with family or mates about stressful conditions, consuming a well-balanced diet, frequent exercise, curbing liquor, and reducing caffeine intake can control adrenaline. Shunning mobile phones, flashing lights, computers, heavy music, and television before sleep also help in adrenaline regulation [52].

h. Norepinephrine

Norepinephrine, also known as noradrenaline, is another neurotransmitter to be connected with happiness [5]. It is synthesised inside the nerve axon, deposited within vesicles, and delivered by the nerve when an action potential moves down the nerve [54].

Studies illustrate that vast concentration of norepinephrine lead to delight and exaltation, while low levels have been linked to despair [55]. Antidepressants such as the reboxetine, a selective norepinephrine re-uptake inhibitor, also provoke a positive emotion in healthy subjects. It implies that norepinephrine undoubtedly adds to human emotional perception [5].

Norepinephrine helps a person be sharp in times of danger, just like the epinephrine's fight-or-flight retort. Therefore, despair, apathy, and, consequently, sadness is some of the emotions associated with decreased norepinephrine production [56].

The balance in norepinephrine levels can be achieved by eating foods that contain the amino acid, tyrosine. Foods that enhance norepinephrine are similar to that of dopamine. Cheese and other dairy products, nuts, banana, meat, chocolate, etc., are advised. Norepinephrine is also accessible as a pill or drug for use in the therapy of patients with low blood pressure [56]. Cold exposure enhances norepinephrine levels by two to three folds within minutes [57]. Similarly, heat exposure, through sauna also increases the synthesis of norepinephrine [58].

i. Cortisol

Cortisol is consistently recognised as a marker for depression, a different dimension to happiness. The central role of this hormone is to handle anxiety [5]. Hence, it is known as the body's stress hormone. It is a glucocorticoid discharged from the adrenal cortex. The hypothalamus-pituitary-adrenal axis controls both the production and discharge of cortisol. Cortisol supports the body to be on high alert [59]. Raised cortisol level in the daylight is connected to grief, while scarce salivary cortisol is a reliable predictor of happiness. However, the precise relation of cortisol and satisfaction is still unclear [5].

The human body follows a regular cycle to produce cortisol during the day with more in the morning and less while going to bed. Extreme stress makes our body produce high cortisol levels, leading to severe difficulties in body systems when extended for months or years. Very limited cortisol too, is known to produce ill-effects in humans. A natural equilibrium in the cortisol levels encourages us to be confident and robust [60].

Good sleeping practices like resting and rising at the same time every day, seven hours of continuous sleep, and restricting the use of digital devices before bedtime will stabilise cortisol levels. Further, the body's circadian cadence can be reset by receiving loads of daylight. A diet loaded in vegetables benefits our body in sustaining cortisol levels. Vitamin C, vitamin B5, magnesium are known to lessen cortisol levels [60]. Badrick E et al., through their study, have shown a positive connection between cortisol and units of liquor consumption per week [61].

GENETICS OF HAPPINESS

Genetics contributes to about 35-50% of human happiness. Happiness research on twins using the well-being scale revealed that around 50% of the variation in satisfaction and joy between people is connected with genetics. The retest on the representative twins after a few years, affirmed that 80% of the well-being is hereditary. The genes observed to be linked with happiness are 5-HTTLPR and MAO-A [5].

The 5-HTT gene codes for the serotonin transporters located in the cell wall, a protein that reabsorbs the serotonin from the synaptic cleft. The serotonin transporter gene has been investigated widely. It is found that the gene influences personality and mental health [62]. There are two functional alleles of this gene: Long (L), and Short (S). Some individuals have two S alleles, and others have one L, and one S. People with one L have their life content 8% more than others. In those with two L alleles, their life satisfaction is 17% more than that of people with just one S allele. According to a study, in individuals with L variant, 35% were found to be delighted with life, 34% were satisfied while in subjects with S version, only 19% were happy [5].

MAO-A gene is located on chromosome X. It is implicated in mood management and is a catalyst for serotonin, dopamine, and noradrenaline. *MAO-A* genotypes are both with low-activity *(MAO-A-L)* and high-activity *(MAO-A-H)* alleles. The *MAO-A-L* allele is a hazard for stress-related adverse outcomes such as drunkenness, aggressiveness and antisocial behaviours. Studies in women have revealed that low expression allele *(MAO-A-L)* is predictive of higher self-reported happiness [5].

ANTHROPOMETRIC TYPOLOGY

Researchers have recognised the relationship between happiness and the physical attributes of humans. Ectomorph (person with a lean and delicate body built) humans are more fragile, capable, confident, and vulnerable to schizophrenia. Being physically beautiful is worthwhile as such people are preferred as companions, and they carry a positive attitude [5]. A meta-analysis observed that bodily good looking people were perceived as more friendly, authoritative, sexually passionate, psychologically sound, thoughtful, and socially-proficient than physically unattractive people [63]. Even in schools, this bias to beautiful and unattractive children is visible. Tutors perceive a charming child to be intelligent automatically [5].

CONCLUSION(S)

The happy hormones/neurotransmitters, genetic factors and typology outlined in this paper are undoubtedly precious biological factors that contribute to bliss and contentment. However, there is no doubt about the role of these factors in enhancing happiness but details of the measures to intensify them are lacking.

Understanding the factors, both extrinsic and intrinsic, that decide the state of happiness is critical in neuroscience research. Such information would be fundamental in deciphering the interplay of brain chemicals and the neural pathways that influence our behaviour, which could lead to an improved diagnosis in the field of psychology. It is becoming increasingly evident that genetic factors play a vital role in our responses to certain situations. Thus, systematic studies on understanding the pathways that influence the release of these hormones could be crucial in defining and monitoring depression and stress, two major negative emotions that affect society.

The elements covered here are mainly for joy, an emotion that can be derived from simple things without involving any cost. Thus, we must enhance our understanding of these factors and analyse the signaling pathways that control happiness. Finally, from the review, we infer that satisfaction is a selection, not a consequence. Nothing can make us comfortable until we choose to; no person will satisfy us unless we decide to be satisfied. Happiness can never happen to us; it can only originate from us.

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PARTICULARS OF CONTRIBUTORS:
1. Research Scholar, Department of Child Health Nursing, Nitte Usha Institute of Nursing Sciences (NUINS), Nitte (Deemed to be University), Mangalore, Karnataka, India.
2. Professor and Deputy Director, Division of Molecular Genetics and Cancer, Nitte University Centre for Science Education and Research (NUCSER), Nitte (Deemed to be University), Mangalore, Karnataka, India.
3. Professor, Department of Community Health Nursing, Nitte Usha Institute of Nursing Sciences (NUINS), Nitte (Deemed to be University), Mangalore, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Jacintha Veigas,
Professor, Department of Community Health Nursing, Nitte Usha Institute of Nursing Sciences (NUINS), Nitte (Deemed to be University), Mangalore, Karnataka India
E-mail: jacintha@nitte.edu.in

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