

THE SCIENCE OF GRATITUDE

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Abstract: Gratitude is the art of noticing and reflecting upon what we are thankful for. Gratitude has been a moral virtue for centuries. It has been practiced and encouraged across the realm of time and space across religions and cultures. Gratitude is treated as a positive psychological phenomenon that alters our affective states by modulating the neural activity in the brain. In this review, we have described several studies on the psychosocial effects of gratitude expression, the underlying neural underpinnings of gratitude, and the effect of the expression of gratitude on the individual brain. This will help us understand the psychosocial effects of gratitude expression and its neural basis and further the role of Gratitude-based methods as interventions under the positive psychology field to overcome mental health problems in our society.

Keywords: Gratitude, Science, Psychosocial effects, Neural Correlates, Gratitude based interventions

Psychosocial effects of gratitude expression

On the wheel of emotions, gratitude appears as a positive emotion that individuals feel or experience when another individual extends kind gestures or offers something valuable to them (Algoe et al., 2016).

It plays a significant role in helping individuals form and maintain interpersonal relationships (Algoe et al., 2008), and it tends to boost pro-social behaviour (Bartlett & DeSteno, 2006).

History of time recognizes the significance and relevance of experiencing the emotion of gratitude. Early philosophers such as Cicero expressed that he considered gratitude as the greatest virtue and the parent of all virtues (Cicero, 1851, p.139). Vastly followed and practiced religions such as Hinduism, Buddhism, Islam, Christianity, and Judaism have recognized and reiterated the importance of gratitude in their preaching (Nelson, Lyubomirsky & Friedman, 2016). Children are taught to express gratitude by saying “thank you” at a very early age. In a few countries like Canada and the United States of America, Gratitude is emphasized by having a few holidays like Thanksgiving to express gratitude towards each other. These practices around the globe have established the value of gratitude and signified how the emotion continues to grow in the modern culture. Despite the long prevalence of gratitude in history and culture, philosophy and practices of the modern era, researchers from the discipline of mental health have begun to explore its importance only in the last few decades. Despite its long prevalence, it has a very limited scientific database (Nelson, Lyubomirsky & Friedman, 2016).

In the past few decades, gratitude has been a topic of interest and has received great importance by researchers as it stimulates other positive emotions such as happiness and boosts wellbeing. It has been shown to improve overall psychological and physical wellbeing (Wood et al., 2007) as well as enhance sleep quality (Wood et al., 2009). However, very little is known about the effect that gratitude could have on the biology of the brain and the neural processes that govern these effects of gratitude on the mind (Boggiss et al., 2020).

Literature suggests that the emotion of gratitude could be linked to many advantages for individuals, such as enhanced physical and mental health, experiencing more joy and greater satisfaction with life, dissociation with materialism and many more. Few studies have suggested that more grateful individuals have better physical health. Other studies suggest that including practices designed with standard protocols to boost gratitude could help enhance physical health while letting individuals switch to healthier habits (Krause & Hayward, 2014). On examining the correlation between gratitude and aspects of psychological wellbeing, it has been found that individuals who practice more gratitude are happier, are more satisfied with their lives, detached from materialism and have fewer burnouts than those who express little or no gratitude. Practices such as gratitude journaling and letters of gratitude have been found to enhance overall positive mood and happiness in individuals (Hill, Allemand, & Roberts, 2013).

Being more grateful could additionally help individuals battle their medical as well as their psychological illnesses. In a study (Mills et al., 2015) with cardiac patients, it was found that individuals who maintained a gratitude journal for eight weeks or more had better sleep patterns and report lesser fatigue and a marked decline in cellular inflammation. Literature has highlighted that an attitude of gratitude could alleviate symptoms of depression and make individuals build resilience towards any such future traumatic events. As highlighted by Cicero (1851), gratitude has been regarded as the mother of all virtues, and the current scientific data backs up the suggestion of Cicero as Gratitude has been found to boost the development of other similar virtues such as patience, wisdom, and humility.

Neural Correlates of Gratitude Expression

The brain has an extraordinary capacity to rewire itself through learning and experience. Any experience – positive or negative – has the capacity to change the brain's connections and, in turn, our behaviour as a whole. When we choose to repeat certain behaviors, we rewire our brains to trigger changes in our behaviour through thoughts, feelings, or images (Ruff & Cohen, 2013). With recent technological advances, researchers have found ways to peep inside the functioning brain. The functioning of the brain while performing an action can be studied using tools like functional magnetic resonance imaging (fMRI), electroencephalography (EEG), or functional near-red spectroscopy (fNIRS). These techniques can help us understand the brain activity associated with the practice of gratitude.

The research on gratitude has gained momentum in the past decade; however, understanding the neural basis of gratitude is still in its infancy. Only a few studies have attempted to understand what happens inside the brain while practicing gratitude. A better understanding of the neural basis

of gratitude can help to understand the power of gratitude and its benefits if fostered as a part of a lifestyle. Also, understanding brain processes associated with gratitude practice can help psychologists and researchers optimize interventions based on individual needs (Kolb & Muhammad, 2014).

One of the studies found that making moral judgments involving abstract social behaviors such as honor, bravery, and gratefulness activates the superior temporal cortex. The activation of the superior temporal cortex is independent of the emotional valence, whereas enhancing the activity of medial pre-frontal regions for positive social concepts demonstrates its role in providing conceptual knowledge of positive social behaviors (Zahn et al., 2009). Furthermore, another study found that gratitude, pride, and punishment elicited activity in the right anterior superior temporal cortex (Zahn et al., 2007). Additionally, pride and gratitude evoked mesolimbic and basal forebrain activations, which are not activated in case of guilt or anger. The study demonstrated that we have one stable neural system for representing all the social values and another for coding specific positive social values like gratitude. Another study found that people with smaller cuneus and precuneus volumes were relatively pre-disposed to experience pride, whereas those with larger right inferior temporal volumes experienced gratitude more readily (Zahn et al., 2014). These studies laid the ground for our understanding that gratitude is a complex social emotion that utilizes a specific neural substrate distinctly different from similar social and moral constructs.

The practice of gratitude positively builds an individual's physical, intellectual, and social resources (Fredrickson, 2004). A recent prominent study attempted to study the impact of practicing gratitude on brain activity in laboratory conditions (Fox et al., 2015). The study conducted an experiment that induced gratitude in participants while they underwent functional magnetic resonance imaging. The participants were shown the scenes/excerpts from the stories of holocaust survivors having strong feelings of gratitude. At the same time, they received help in terms of life-saving clothing, food, medicine, or psychological support. While in the scanner, the participants were asked to place themselves in the storyteller's context and how they would feel while receiving such help. For each scenario, participants rated how grateful they felt. The results revealed that gratitude ratings correlated with brain activity in the medial pre-frontal cortex (MPFC). The activity in MPFC includes explicitly the regions of dorsal-MPFC (associated with mentalization or theory of mind), ventral-MPFC (associated with the reward circuitry of the brain), and pregenual ACC (associated with moral cognitions like fairness). These brain areas are also implicated in studies investigating pain relief (Ong et al., 2019). This strengthening of brain areas associated with pain relief could be explained the findings from previous studies that reported that patients who kept a gratitude journal reported reduced pain symptoms (Emmons & McCullough, 2003). Similar brain areas also play a role in overall well-being and anticipating positive future events. (Luo et al., 2018). The reported results suggest that gratitude can strengthen the brain networks associated with positive mental and physical health outcomes (Huffman et al., 2014; Emmons, 2008).

Another study attempted to understand the neural basis of gratitude practice and whether gratitude practice can have long-term effects on the brain's activity (Kini et al., 2016). The study recruited

the participants enrolling for psychotherapy for depression and anxiety. Half of the participants randomly wrote gratitude journal entries as part of psychotherapy, which involved composing letters of gratitude to the people in their lives. The other half received just the psychotherapy without gratitude practice. Three months later, all the participants underwent brain scans while participating in a monetary gratitude task. While in the scanner, participants repeatedly received a monetary gift and were asked to donate it to a charitable cause based on the extent to which they felt grateful. The gratitude was thus operationalized as monetary gifts which allowed to quantify the gratitude expression and subsequent brain activity was measured. The results revealed that the gratitude-based intervention show distinct activity in medial prefrontal cortex region of brain even after three months of intervention. The associated modulation is characteristically different from those associated with constructs such as empathy or theory of mind. The study suggests that the gratitude intervention has profound and lasting effects on neural activity and sensitivity.

All the above-mentioned neural changes occur due to the exchange of neuromodulators. Neuromodulators are the chemicals that change the activity of other neural circuits. Make specific neural circuits more active, others less likely to be activated. One major neuromodulator is Serotonin, released from the Raphe nucleus. When released in the brain, it helps us to retain certain behaviors. The brain areas that a gratitude practice can evoke are similar to high-intensity exercise. Effects are long-lasting. They found that "gratitude causes synchronized activation in multiple brain regions and lights up parts of the brain's reward pathways and the hypothalamus. In short, gratitude can boost the neurotransmitter serotonin and activate the brain stem to produce dopamine." Dopamine is our brain's pleasure chemical. The more we think positive, grateful thoughts, the healthier and happier we feel.

Interventions based on gratitude and their significance in mental health

In the last two decades, researchers in positive psychology have explored human strengths and virtues, strengthening the concept of having positive experiences, recognizing positive traits in oneself, and having positive institutions (Seligman & Csikszentmihalyi, 2000). It has dramatically impacted other disciplines, such as education, healthcare, and economics (Donaldson & Ko, 2010). Interventions based on positive psychology have been found to positively impact individuals' mental health and well-being (Sin & Lyubomirsky, 2009). Recently, Positive psychology-based interventions have been widely used in other sectors, such as for the well-being of working professionals. A meta-analysis (Donaldson et al., 2019) confirmed the effectiveness of positive psychology-based interventions in enhancing productivity rates and altruistic behaviour while alleviating work stress.

A detailed review (Wood et al., 2010), suggested two hypotheses regarding the emotion of gratitude. First is the schema-based hypothesis, which suggests that grateful individuals tend to have schemas that regulate positive perceptions of situations and circumstances. Second, the coping-based hypothesis suggests that grateful individuals use better, more positive coping mechanisms and hardly avoid or deny the problem completely. The other two general hypotheses of the review were a positive impact hypothesis and a broaden and build hypothesis. According to the positive impact hypothesis, practicing gratitude could protect individuals from psychological

health disorders and enhance emotional well-being. The last hypothesis revolves around the Broaden and Build theory, which suggests that positive emotional states help broaden individuals' thought processes, assist individuals in building solutions for future problems, and boost well-being.

The likelihood of the positive impact of gratitude on an individual's daily functioning and enhanced well-being was first explored by Emmons and McCullough (2003) through three separate research that differed on the intensity, duration, sample size, and procedure of the interventions. The first study required individuals to maintain a gratitude diary over nine weeks. The participants were divided into three groups, out of which the first group had to list down their daily barriers, the second one listed down their reasons to be grateful, and the third one made a list of everyday regular events. They were asked to report their well-being at the end of every week. The results of the study highlighted the positive impact of gratitude on well-being as the gratitude group reported a significantly higher level of well-being in comparison to the other groups. The results suggest that a regular practice of gratitude is efficient enough in enhancing well-being compared to other regular appraisals. This research project was the breakthrough for investigating and developing gratitude-based interventions. Participants are required to constantly exercise gratitude regularly over a long period as it helps broaden their view of things, they are thankful for. The commonly used exercise is creating a list of things an individual is grateful for in their life.

Gratitude-based interventions are designed to help individuals develop an attitude of gratitude (Dickens, 2017). One commonly used gratitude intervention is maintaining a gratitude journal, which requires an individual to maintain a list of things they are thankful for (Wood, Froh & Geraghty, 2010). Another exercise of gratitude encourages individuals to engage in a behavioural expression of being thankful by offering gratitude to people who must have done something for them. According to Seligman et al., 2005, the most used way of expressing gratitude to others is through a gratitude letter. The individual writes a letter of gratitude to another person, mentioning the things they are thankful for and reads aloud the letter for them.

Such interventions are directed towards enhancing the state gratitude of individuals. However, the short-term nature of state gratitude makes it difficult to assess it, so trait gratitude is commonly used to assess the outcomes of the intervention. The strengths attached to gratitude interventions are plenty. The purpose of these exercises is easily understandable and can be implemented without any difficulties due to their time and cost-effective nature, minimal dropouts, and do not require expertise in psychology to be facilitated (Dicken, 2017; Davis et al., 2016). Few meta-analyses and systematic reviews have highlighted gratitude's positive impact on different well-being variables, such as overall satisfaction with life, happiness, and positive state of mind. It has also been observed to help with physical health (controlling blood pressure and glycaemic levels as well as reducing inflammation) (Boggiss et al., 2020), fighting infections (Jans-Beken, 2021) as well as psychological health (lowering depressive and anxiety symptoms) across populations such as clinical and school-aged children (Thomas, 2019).

Different types of Gratitude based Interventions

Three good things: A study conducted by Seligman et al (2005) tried to investigate the significance of the exercise “Count your blessings”. The results reported the success story of the exercise. Individuals are expected to not only list down three good things that happened to them but simultaneously also mention what and who could have helped stimulate these three things.

Mental Subtraction: This activity is another customised version of the exercise “Count your blessings” The exercise expects individuals to imagine life without that one good happening that has changed their life for the better (Koo et al., 2008). One of the research projects carried out to understand the significance of this exercise had reported that individuals who practiced mental subtraction felt an elevated mood and it backed up the efficacy of the “George Bailey Effect”.

Gratitude visits or letter: Seligman et al., (2005) also utilised another exercise where participants were expected to write letters of gratitude to another person that expressed what they were thankful for and give the letters in person. Other studies (Lyubomirsky et al., 2011; Toepfer et al., 2012) in the past have also tested the significance of this exercise in improving mental and physical well-being.

Death Reflection: Researchers suggest that humans usually take their life for granted and begin to not be grateful or acknowledge our life. To be able to reflect on one’s own death could enhance the emotion of gratitude for people (Frias et al., 2011). Research reported that when college students were asked to reflect on their death, they experienced high levels of gratitude in comparison to students who were asked to think and reflect about a regular day.

Experiential Consumption: Walker, Kumar & Gilovich (2016) found a very interesting yet strange way of enhancing gratitude through their study. The study reported that individuals experienced more gratitude if they spent their money on experiences (hiking, rafting) rather than buying a materialistic thing (Watch, car).

The efficacy of these exercises varies across populations as well as personality of people. Literature suggests that gratitude interventions are more successful for people who have lower scores on neuroticism (W. Ng, 2016), experience less positive affect (Froh et al., 2009), are highly critical of themselves and are not very needy (Sergeant & Mongrian, 2011). Culture could also play a significant role in the success of a gratitude intervention for different individuals.

Conclusion

This review extends our understanding of gratitude expression beyond basic emotions to shade light on its role in psychological well-being. The brain areas involve in expression of gratitude are also crucial for emotion regulation, motivation as well as reward functions. Thus, opening an avenue to use the methods of gratitude expression as an intervention to overcome the mental health problems i.e., stress, anxiety, depression etc.

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