

Bachelor Degree Project



Psychological and Neuroscientific Perspectives on Gratitude as an Emotion

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Abstract

Gratitude is an emotional response when people feel grateful for the good things that happen to them or acknowledgment of a benefit received from another person. Gratitude is an important component of positive psychology and the world's largest religions emphasize the importance of gratitude in their teaching. Research has begun to explore factors that enhance human life and one such factor is the effect of positive emotions on mental health outcomes. Gratitude is considered to be a positive emotion and grateful individuals tend to be happier, less depressed, less stressed and more satisfied with their lives. Gratitude may have a strong link with mental health and wellbeing and research has recently started to understand its positive effects. Despite the research findings showing the effectiveness of gratitude interventions, the neural mechanisms involved in gratitude are relatively unknown. It is important to investigate the neural processes involved in gratitude because it may provide clues as to how gratitude as a positive emotion can influence mental health and wellbeing. Gratitude has many definitions and this essay will present the different definitions of the experience of gratitude, what happens in the brain when experiencing gratitude and as a positive emotion and how gratitude may benefit our wellbeing and mental health.

Keywords: Gratitude, positive emotion, mental health, wellbeing, circumplex model of affect, prefrontal cortex, ventral striatum, dopamine

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Introduction

For many years psychological treatments have been developed for treating common mental health problems like depression and anxiety. The mental health care system has primarily been focused on treatments of mental disorders rather than preventive efforts (Bolier et al., 2013). Seligman and Csikszentmihalyi (2000) argued that a negative bias dominated in psychology research and the focus was on negative emotions and treating what is bad. Furthermore, they suggested that although basic concepts of wellbeing, happiness and human flourishing have been studied, a lack of evidence-based interventions existed. Positive psychology is a growing research network and many clinicians and coaches use this framework and its interventions in their practice (Bolier et al., 2013).

Research on positive emotions on mental health outcomes has begun to grow in an effort to enhance human life and one theory that received a lot of attention is the *broaden-and-build theory* of positive emotions (Fredrickson, 2001). In 2013, Fredrickson described the ten most common positive emotions that were experienced frequently in people's lives and one such emotion was *gratitude*. Gratitude is an important component of positive psychology research and an essential part of human wellbeing and prosocial behavior (Kini et al., 2016). Gratitude is a positive emotion and we have access to it in everyday life. Being grateful does not cost anything and does not take much time, and research has begun to show the benefits of gratitude interventions on wellbeing (Kini et al., 2016; Watkins, Uher & Pichinevskiy, 2015; Emmons & McCullough, 2003; Froh, Sefick & Emmons, 2008). Even if research has shown the effectiveness in gratitude interventions, the brain mechanisms involved in gratitude have been unknown until recently and the literature regarding the brain mechanism of gratitude has barely been investigated (Kini et al., 2016; Fox et al., 2015). Knowledge of the neural basis of gratitude and the experience of gratitude may provide a window to its relationship on mental health and resilience (Fox et al., 2015). Fox et al (2015) explained that, examining the neural correlates of gratitude may resolve questions regarding the respective roles of reward and moral cognition in gratitude. This in turn may be relevant to the design of interventions for practicing gratitude (Fox et al., 2015). If gratitude is studied as a positive emotion in the brain, it has generally been suggested to increase activity in the prefrontal cortex, ventral striatum and increase of the neurotransmitter dopamine in the brain suggesting a rewarding function of gratitude. The study of emotions is a large scientific field and it is difficult to explain the meaning of gratitude because emotions overall are difficult to define. This essay will present emotions with the help of the circumplex model of affect that suggests that emotional experiences have two dimensional factors: valence (they are pleasant or unpleasant) and

arousal (they have high or low intensity). This model will be presented and explained because emotions are often termed in terms of affects and are divided into positive and negative affect.

In this essay the emotion of gratitude will be the focus and as an emotional experience. Gratitude has been suggested to be a positive emotion that may lead to an action, that can include expressing thanks to the benefactor or to act prosocially oneself. Gratitude has besides being a positive emotion also been suggested to be a moral emotion and a social emotion. Gratitude will be defined, presented through an evolutionary perspective (how come this emotion has survived for such a long time?), the different experiences of gratitude will be presented and how gratitude may include a behavior (like acting prosocially when being thankful), presented as a positive emotion, what happens in the brain during gratitude or gratitude as a positive emotion and finally how gratitude may benefit our wellbeing and mental health.

Gratitude

The importance of gratitude has been recognized throughout the history of time. Early philosophers, one of them was Cicero, wrote "gratitude is not only the greatest of virtues, but the parent of all the others" (Cicero, 1851m p. 139) and the world's largest religions (Christianity, Judaism, Islam, Buddhism and Hinduism), emphasize the importance of gratitude in their teaching (Nelson, Lyubomirsky & Friedman, 2016). To say "thank you" is taught to us at an early age and to be grateful has been given an entire national holiday (like in Canada and USA they celebrate a day of giving thanks for blessings), thus demonstrating the value of gratitude and how it continues to spread in modern cultural norms and institutions. Even if the importance of gratitude has been emphasized in both ancient and modern religious philosophical, and cultural traditions, researchers in the field of psychology have only begun to investigate it within the past decades. Gratitude has had a short scientific history despite the long past (Nelson, Lyubomirsky & Friedman, 2016).

Even if gratitude is a commonly occurring emotion, it is strange that psychologists specializing in the study of emotion, failed to explore its shape (Emmons & Shelton, 2002). For example the term gratitude appears not very often in the emotion lexicon (Shaver et al., 1987). Gratitude does appear in the index of the *Handbook of Emotions* (Lewis & Haviland-Jones, 2000), once in the *Handbook of Cognitive and Emotion* (Dalglish & Power, 1999), and not at all in the *Encyclopedia of Human Emotions* (Levinson, Ponzetti & Jorgensen, 1999).

Gratitude is often described as a pleasant emotion, but different from simple happiness, because gratitude is typically preceded by the perception that one has benefited from another person's generosity (McCullough, Kimeldorf & Cohen, 2008). This positive emotion of gratitude motivates people to act prosocially themselves (Algoe, Fredrickson & Gable, 2013). Emotions are most often caused by interacting with other people in everyday life and therefore they are suggested to have social functions (Algoe, Fredrickson & Gable, 2013). Gratitude is often experienced when someone does something kind for another person and this in turn can cause an action, like expressing thanks for the benefit received or to act prosocial oneself (Algoe, Fredrickson & Gable, 2013). Gratitude may therefore be a social emotion that makes us aware of things that others have done for us. This experience that may lead to an action, may serve as a communication between individuals and preventing one person from being seen as a free-loader (Fox et al., 2015). Gratitude may enhance social relationships and signals to others that we are fair partners (Algoe, Haidt & Gable, 2008).

Gratitude through Evolution

Evolutionary theories propose that gratitude is in favor of reciprocal altruism (the sequential exchange of costly benefits between nonrelatives) and maybe a pay it forward style (like when somebody has done something nice for you, this in turn may motivate you to act prosocial). Gratitude therefore may have played an important role in human social evolution and functional emotion theorists would likely speculate that gratitude was shaped by evolutionary pressures for generosity and helping (McCullough, Kimeldorf & Cohen, 2008). If someone is nice to you, you feel good and may be willing to be nice to somebody else, this behavior has been called *upstream reciprocity*, and appears to be an act of gratitude: you help somebody because somebody else has helped you (Nowak & Roch, 2007). Does this make sense from an evolutionary perspective? Evolutionary analysis of altruistic behavior began with kin selection (Foster et al., 2006) and group selection (Traulsen & Nowak, 2006). *Direct reciprocity* is the idea that cooperation emerges in repeated encounters between the same two persons according to "I help you and you help me" (Nowak & Sigmund, 1992). *Indirect reciprocity* is "I help you and somebody else helps me" (Nowak & Sigmund, 2005). Indirect reciprocity comes in two ways, *downstream indirect reciprocity*, that means when a person helped in the past has a higher chance of receiving help (Chalub et al., 2006). *Upstream indirect reciprocity*, means that a person who just received help has an urge to help someone too (Barlett & DeSteno, 2006). So, in essence, the recipient of an altruistic act experiences gratitude and is more likely to help the same person or another person. Nowak

and Roch (2007) tested gratitude on human subjects, and they found that it does indeed foster prosocial behavior. They found that the recipient of a favor is more likely to help both the donor (direct reciprocity) and a stranger (upstream reciprocity). Their analysis demonstrated that the willingness to help can evolve by natural selection and that upstream reciprocity is a by-product of emotions that have primarily evolved to facilitate direct reciprocity. They continue to argue that another promising extension is the idea that a person, who just received help, may not only help one other person, but also several other people. This can lead to an epidemiology of altruism according to Nowak and Roch (2007) resulting in an increase of altruistic acts and this behavior would be welcomed by all of us.

Defining Gratitude

The word gratitude comes from the Latin root *gratia*, meaning grace, graciousness, or gratefulness and “have to do with kindness, generousness, gifts, the beauty of giving and receiving, or getting something for nothing” (Pruyser, 1976, p. 69). Recognizing the feeling of gratitude is something we all can relate to, like when we receive a gift and we become grateful to the person who provided kindness to us. We know that the other person did not have to make this gesture, but did it out of goodwill toward us (Emmons & McCullough, 2004). Gratitude can be explained in many ways- it has been defined as an emotional state, personality trait, a moral virtue, a habit, a coping response, and an attitude linked with positive emotions, like contentment, happiness, pride, and hope (Emmons & Shelton, 2002). The experience of gratitude is to other-directed-persons, but also to impersonal (nature) or nonhuman sources (animals). Gratitude comes from the perception of a positive personal outcome, not just deserved or earned, but has to do with the actions of another person (Emmons & McCullough, 2003). In view of lay person’s descriptions of gratitude, it often includes feelings of gratitude for specific people and for specific kind acts, as well a general appreciation for the positive aspects of one’s life (Nelson & Lyubomirsky, 2016).

Psychological scientists has defined gratitude as the recognition of a positive outcome from an external source, including a felt sense of wonder or thankfulness for benefits received (Emmons & McCullough, 2003). The most common approach to studying gratitude involves investigating it as a trait, a mood, or an emotion (McCullough, Emmons & Tsang, 2002). As a trait, gratitude reflects individuals generalized tendencies to experience gratitude in their daily lives. As an emotion, gratitude refers to the specific feeling (a pleasant feeling) that individuals experience in response to a benefit (Nelson & Lyubomirsky, 2016). As a

mood, gratitude is a stable component that is attributable in part to individual differences among persons (some people experience more gratitude than others as the affective background of their day-to-day lives) (McCullough, Emmons & Tsang, 2002). Gratitude defies easy classification, but the core relational theme associated with gratitude is recognition or appreciation of an altruistic gift (Emmons & McCullough, 2003).

Emmons and Hill (2001) suggested that gratitude begins with the awareness that individuals have a choice of taking whatever attitude they prefer in a given situation. The next step is when the individual attains a certain level of self-reflection so the necessary internal work of being grateful can occur. The last step is when gratitude becomes a felt experience as result of a conscious attitude and intention to be grateful, which in turn is hoped to result in expression through action (thanking others for their generosity). This may be explained by suggesting that emotions consist of several steps that are followed by the perception of the emotion-triggering stimulus. These steps include a physiological response to the stimulus, a behavioral response and the subjective experience which also can be referred to as feelings (Gazzaniga, Ivry & Mangun, 2014). The process of gratitude can occur in different steps like other emotions and often it involves an experience and an expression. This essay will focus on gratitude as an emotional experience.

An Emotional Experience

Gratitude seems to be an intrinsically rewarding state, and may lead to other positive subjective experiences (Emmons & Shelton, 2002). Based on data that was collected by Gleason and Weintraub (1976), the experience of gratitude seems to be developed between the ages 7 and 10. They found that few children younger than 6 years old expressed thanks to adults who gave them candy, but most children of 10 years old or older expressed gratitude in the same situation. As mentioned earlier, gratitude involves several different steps and often the emotion felt when receiving something results in an action like expressing thanks for the generous gift. The emotion seems to develop when children improve their social competence that comes with empathy. This ability to empathize can be the strongest source to develop the emotional experience of gratitude (Saarni, 1999). Empathy refers to ways that people may respond to other emotional experiences. It includes both perspective-taking and empathic concern (Booker & Dunsmore, 2015). Empathy may promote positive evaluations of other people and may also promote positive social responses. It includes more prosocial behavior and fewer aggressive behaviors (Booker & Dunsmore, 2015).

Chesterton wrote that “gratitude produced the most purely joyful moments that have been known to man” (1924, p. 114). It is a pleasant state and linked with positive emotions that includes the perception of a positive personal outcome that is due to the actions of another person (Emmons & Shelton, 2002). Several theorists and researchers have noted that gratitude typically has a positive emotional valence (Lazarus & Lazarus, 1994). Research has demonstrated that gratitude is linked to greater positive emotion and less negative emotion (Nelson, Lyubomirsky & Friedman, 2016). For example, in one study trait gratitude was associated with experiencing more daily positive emotions and fewer negative emotions (Kashdan et al., 2006). Emmons & McCullough (2003), found that those participants who were assigned to count their blessings reported more positive emotions and enhanced feelings of connectedness to others over the course of 2 weeks. This was also tested with a younger population (6th & 7th grade students) who were instructed to count their blessings. They reported few negative emotions and great satisfaction with their school experience over the course of 3 weeks (Froh, Sefick & Emmons, 2008). More studies of gratitude showed that the experience of gratitude makes people feel more connected to others, and in turn leads to greater boosts in well-being over time (Wood et al., 2008). What many studies have shown is that there is evidence that suggests that gratitude leads to reports of feeling more positively and less negatively about one’s life. We can increase positive emotions with positive activities (like gratitude), this in turn may enhance our well-being (Lyubomirsky & Layous, 2013).

A Morally Motivating Experience

McCullough and colleagues (2001), described gratitude as a moral affect, one with moral precursors and consequences. They proposed that gratitude serves as a *moral barometer*, providing an individual’s perception of the fact that another person has treated them prosocially. Second, they explained that gratitude does serve as a *moral motive*, stimulating people to behave prosocially after they have been the beneficiaries of other people’s prosocial behavior. Third, they proposed that gratitude serves as a *moral reinforcer*, encouraging prosocial behavior by reinforcing people for their previous good deeds. To support this conceptualization, McCullough et al. presented evidence from a wide variety of studies in personality, social, developmental and evolutionary psychology (2001). They referred to gratitude as a moral affect, by proposing that gratitude results from and simulates moral behavior, behavior that is motivated out of concern for another person. Gratitude involves recognizing that one has been treated prosocially and being thankful for those acts. This may lead one individual who experiences gratitude to extend kindness to the same

benefactor or to other people (Booker & Dunsmore, 2015). It was explained earlier that empathy may be the strongest source to develop the emotional experience of gratitude, because empathy emerges in response to the feelings and thoughts of others (Gleichgerrcht et al., 2013). The emotion of empathy has been strongly related to moral judgment and morally good behavior is promoted by prosocial emotions such as empathy, sympathy and compassion for others (Gleichgerrcht et al., 2013). Emmons and Mishra (2011) suggested that gratitude is an essential part of creating and sustaining positive social relations and one explanation is that gratitude motivates moral behavior, an action that is undertaken in order to benefit another.

A Socially Interactive Experience

In an earlier section it was suggested that gratitude has been shaped by evolutionary pressures for generosity and helping, but other positive emotions can also promote prosocial behavior, so what distinguishes gratitude from other positive emotions? One important factor is that gratitude simulates helping even when it is costly to the helper. In one study it was found that participants in an experimentally induced state of gratitude voluntarily spent more time completing a boring survey as a favor to their benefactor than did participants in an amused emotional state (Bartlett & DeSteno, 2006). Gratitude is also distinct from obligation. People often use obligation-related phrases (“I owe you”) and gratitude-related phrases (“I’m grateful to you”), but still they are distinct and have distinct psychological effects. Obligation feels negative and uncomfortable, but gratitude is associated more with contentment and wellbeing (McCullough et al., 2001).

Emotions seems to evolve when we have the interactions of everyday life with other people was mentioned earlier, and emotions may therefore serve as social functions (Algoe, Fredrickson & Gable, 2013). The emotion of gratitude may also build a high-quality relationship between a grateful person and the target of his or her gratitude, the person who performed a kind action (Algoe, Haidt & Gable, 2008). Gratitude rises when a person perceives that another person has intentionally acted to improve the beneficiary’s well-being (Emmons & Shelton, 2002). Gratitude also requires an individual to empathize with others, and beneficiaries experience gratitude when they recognize and appreciate that the benefactor has expended effort to give them an altruistic gift (Lazarus & Lazarus, 1994). Gratitude therefore appears to be the urge to behave prosocially oneself, be it toward the benefactor, to others or to both, and this thought-action tendency broadens rather than narrows. Individuals who feel grateful appears to creatively consider a wide range of prosocial actions as possible reflections of their gratitude (Fredrickson, 2004). When you feel grateful, you typically act

prosocially to express your gratitude, over time the action inspired by gratitude builds and strengthens social bonds and friendships (Emmons & Shelton, 2002). This seems to go in line with Barbara Fredrickson's *broaden-and-build theory of positive emotions*, because according to this theory, positive emotions seems to broaden people's momentary thought-action repertoires and build their enduring personal resources (Fredrickson, 2004).

The emotion of gratitude has through history focused on its role in social exchange, but new evidence suggest a different and important role of gratitude in social life. This new evidence is called *the find-remind-and-bind* theory of gratitude. The theory posits that the positive emotion of gratitude serves the evolutionary function of strengthening a relationship with a responsive interaction partner (Algoe, Haidt & Gable, 2008). Algoe found that when the emotion of gratitude is experienced in response to a benefit, it is produced because the recipient has noticed a particularly responsive action on the part of a benefactor (Algoe, 2012). This responsive gesture stands out, because this signals that the person understands, approves, or care about the self (Reis, Clark & Holmes, 2004). In the moment this is experienced, gratitude updates our view of the benefactor, it finds new or reminding of current high-quality relationship partners, and helps to bind the people in the relationship more closely together (Algoe, 2012). Much earlier empirical work has focused on gratitude as a mechanism for exchanging costly benefits, this theory suggests that gratitude serves a broader social function, by promoting relationships with responsive others. This goes in line with Fredrickson's model of positive emotion, gratitude may broaden one's cognition in the moment with interpersonal implications beyond tit-for-tat repayment (Algoe & Haidt, 2009). Algoe and Haidt (2009) discussed a study where they asked over 2000 children to imagine someone giving them something that they wanted. Many of the children reported repaying the action in some way, and it was about doing things that would connect them more closely with the benefactor, like participating in an activity they both enjoyed, or offering friendship or faithfulness in return for the favor. This is why we have to consider that gratitude is much more than tit-for-tat repayment, as gratitude may promote the good of society.

Gratitude, a Positive Emotion

What is so special about this emotion of gratitude? First it's the prosocial and relational nature of gratitude that leads to strengthened social bonds that might help us to increase our wellbeing. Second, gratitude is almost always felt in retrospection, helping a positive cognitive framework to an already present benefit. Gratitude may be extracted from present life circumstances ("I am grateful for all the benefits that I have received today"), and

from the past (“I am grateful for the love and support that I received the past three years from my family and friends”), this supports a more expanded positive emotional experience (Emmons & Mishra, 2011). Gratitude as we have understood by now has many definitions, but we can agree that it is a pleasant and positive emotion. In one review paper Fredrickson (2013) described ten key positive emotions and she choose to focus on these ten because they was evidence from the Positive Emotions and Psychophysiology Laboratory (PEP lab) that these were experienced relatively frequently in people’s life. These ten positive emotions were; *love, joy, gratitude, serenity (contentment), interest, hope, pride, amusement, inspiration and awe* (Fredrickson, 2013). In one other study they examined similarities and differences of eight positive emotions, and they found that the eight emotions shared one quality of high positive valence, but in other ways these emotions were different. The eight emotions were; *amusement, awe, contentment, gratitude, interest, joy, love and pride* (Campos et al., 2013).

It is difficult to explain the meaning of gratitude when we even now cannot explain what an emotion is. Lewis, Haviland-Jones and Barrett (2010) suggested that a good definition of an emotion has yet not been presented. The study of emotions is an extensive scientific field that has many definitions and as mentioned earlier emotions may consist of several steps following the perception of the emotion-triggering stimulus. These steps may include physiological response to the stimulus, behavioral response and the subjective experience or feeling (Gazzaniga, Ivry & Mangun, 2014). Scherer (2005) explained that emotions may be seen as a set of component processes and the stimulus can be an external event or internal events. Scherer (2005) continued to explain that our behavior may also be the triggering event for emotional processes, like when we feel grateful that in turn motivates the behavior to thank the benefactor or to act prosocially oneself. One way to measure experiences of emotions is by using self-reports to examine how people use words to represent experiences (Russel, 2009). Self-report studies includes participants that characterize their experiences using emotion words to reveal states of pleasure or displeasure as well the intensity of the emotional experience, in other words valence (Russel, 2009). Emotions are often termed affects and can be divided into positive and negative affect (Gazzaniga, Ivry & Mangun, 2014; Russel & Barret, 1999; Snyder, Lopez & Pedrotti, 2010). There is one theory that does explain this, the core affect theory of emotions (Barett et al., 2007). In this theory emotions are suggested to be triggered by level of arousal and pleasure vs displeasure that is influenced by our perception, cognition and behavior (Oatley & Johnson-Laird, 2014). Russel (2003) claims that emotional experiences have at their base two

dimensional factors, valence (pleasure/displeasure) and arousal (high/low). James Russel developed a model that suggest that emotions can be divided in a two-dimensional circular space that contains arousal and valence dimensions (Posner, Russel & Peterson, 2005). This model is called *the circumplex model of affect* (CMA), and emotions can be represented at any level of valence and arousal (Rubin & Talerico, 2009). The vertical axis represents *arousal* and the horizontal axis represents *valance*. The center of the circle represents a neutral valence and a medium level of arousal (Remington, Fabrigar & Visser, 2000). Valence can be explained by the hedonic character of the subjective experienced emotion that can range from high negative emotions to high positive emotions (Russel, 2003). Arousal refers to the state of response of an individual or the neurophysiological alertness related to a sensory stimuli (Colibazzi et al., 2010).

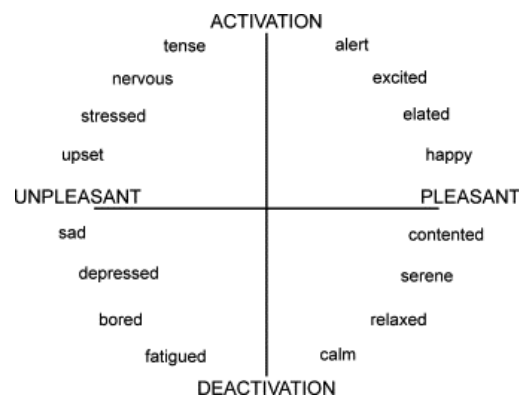


Figure 1. The Circumplex model draws each emotion along continuous dimensions of arousal (vertical axis) and valence (horizontal axis). Adapted from “The circumplex model of affect: An integrative approach to affective neuroscience, cognitive development, and psychopathology”, by J. Posner, J. A., Russel, and B. S. Peterson, 2005, *Development and psychopathology*, 17, p. 715-734.

Several theorists and researchers have noted that gratitude typically has a positive emotional valence (Lazarus & Lazarus, 1994). In one study they measured 30 emotions, they wanted to investigate if the emotions were pleasant or unpleasant (valence), or if they had high arousal or low arousal (Reisenzein, 1994). Gratitude was among those 30 emotions, and was presented as a pleasant emotion with medium activation, so gratitude was put slightly under medium level of arousal. CMA of emotion proposes that all affective states arise from “cognitive interpretations of core neural sensations that are the product of two independent neurophysiological systems” (Posner, Russel & Peterson, 2005, p. 1). Theories of

basic emotions, often presents every emotion to have a discrete and independent neural system, but the CMA suggests that all affective states arise from two systems in the brain (valence and arousal systems) (Posner, Russel & Peterson, 2005). Colibazzi et al (2010) studied the neural systems involved in valence and arousal when inducing different emotions. The researchers tested the CMA and if emotions had two independent dimensions in the brain, in other words valence and arousal dimensions. This study used functional magnetic resonance imaging (fMRI) to find the neural network that reacted to valence and arousal. They used 10 participant (5 men and 5 women) to find the BOLD (blood oxygen level-dependent) response in the two dimensions. Findings supported the existence of two distinct neural systems, valence and arousal and therefore supporting the CMA. Colibazzi et al (2010) found that emotional responses that are related to arousal rating were found to correlate with activity in the parahippocampus and right amygdala. They also found that emotions that was rated as pleasant or unpleasant (valence), was found to activate regions such as the frontal pole, supplementary motor area (SMA), the anterior midcingulate cortex/rostradorsal anterior cingulate cortex (ACC), cerebellar hemisphere and dorsolateral prefrontal cortex (DLPFC). When they looked at activation that increased with pleasant emotions/valence (Colibazzi et al., 2010), activity was found to be greater in the midbrain, ventral striatum and right caudate nucleus. It is unknown how the brain works generating the range of feelings associated with gratitude, and knowledge of what the brain is doing during the experience of gratitude provides a window into its relationship to mental health and resilience (Huffman et al., 2014).

Gratitude, as a Positive Emotions, in the Brain

In an earlier section, the core affect theory was presented and explained. Russel (2003) claims that an emotional experience can be presented by the two dimensional factors, valence (pleasant/unpleasant) and arousal (high/low activity). One other thing that Russel (2003) presented in the article was that core affect may control cognitive processing guidance, influence behavior, implicated in preferences and attitudes, influence motivation, reward and reinforcement. Russel (2003) was the first to introduce the core affect and the two dimensions are considered states of central nervous system that are subjectively experienced. The core affect theory is widely recognized and may be helpful when trying to describe an emotional experience (Kuppens et al., 2013). Besides explaining emotions with the help of the CMO, more recently studies of emotion have become more detailed and complex and the network involved in these studies has included, *thalamus*, *somatosensory cortex*, *higher order sensory*

cortices, amygdala, insula, medial prefrontal cortex, orbitofrontal cortex, ventral striatum, and ACC (Gazzaniga, Ivry & Mangun, 2014).

The experience of gratitude may involve experience of intense positive emotions, like joy, appreciation or happiness. When benefit is received from a benefactor, the recipient may feel appreciation or even joy (Emmons, 2008). The emotional experience of gratitude is likely to elevate felt happiness, and this can be explained by that gratitude fosters the savoring of positive life experiences and situations, when people apply maximum satisfaction and enjoyment for their circumstances. Counting blessings can decrease hedonic adaption, because gratitude prevents people from taking the good things in life for granted and makes people return their happiness over and over again (Emmons, 2008). Experiencing gratitude requires a process where the benefactor has to 1) recognize that a gift is received, 2) calculate cost-benefits that is associated with the gift, 3) experience the emotion gratitude, 4) include memory involvement when we remember benefit and the benefactor as well the emotion gratitude, and this in turn motivates individuals to return the favor to the same person or to others (Emmons, 2008). These four steps involves a limbic-frontal interaction, and the neurology of gratitude would include 1) fusiform face-processing areas near the temporal-occipital junction, 2) amygdala and limbic emotional processing, and 3) “interaction between these two subcortical centers with the prefrontal regions that control executive and evaluative processes” (Emmons, 2008, p. 483). Gratitude may rely on limbic-prefrontal networks to mediate positive emotions on the individual (Emmons, 2008). To test these conclusions about gratitude and that it relies on limbic-prefrontal networks, Emmons and McNamara (2006) tested this on individuals who had prefrontal dysfunction. If the emotion of gratitude does depend on prefrontal activity, than measuring gratitude should activate this brain region. Individuals with prefrontal dysfunction should not display normal benefit in mood that comes when the individual tries to remember a memory of an experience that produced gratitude. Emmons and McNamara (2006) explained that when asking somebody to remember a situation that produced gratitude, it usually produces a happy mood. To test this, they used self-report and compared individuals with prefrontal dysfunction with healthy individuals. They found an enhanced mood in the healthy individuals but not on the individuals with prefrontal dysfunction (Emmons & McNamara, 2006). They also found that healthy individuals did activate prefrontal cortex when inducing the emotion of gratitude and no activity in this region correlated with gratitude in individuals with prefrontal dysfunction (Emmons & McNamara, 2006).

The literature on brain structure and brain function related to the experience of gratitude is relatively sparse. Even though, some examples of studies where brain structure and/or activation associated with gratitude explicitly has been investigated do exist. For example, Fox et al (2015) tested what brain regions would activate the experience of gratitude. In this study they used 26 participants (13 female) and they induced gratitude in the participants while they underwent fMRI. The stimuli used in this study that would produce gratitude, were stories of survivors of the Holocaust. Survivors told stories about being sheltered by strangers or receiving food and clothes from strangers and they also told how grateful they were for such gifts. In the scanner the participants were told to place themselves in this situation, being a Holocaust survivor and how they would feel when receiving such gift if they were in need. For each gift, the participants rated how grateful they felt towards the gift received. Results revealed that gratitude correlated with brain activity in the anterior cingulate cortex (ACC), medial prefrontal cortex (MPFC) (regions involved in moral cognition), ventral MPFC (reward), dorsal MPFC (theory of mind), and insula (basic emotion). Activity in the regions of MPFC, ACC and ventral/dorsal MPFC has been linked to reward and moral cognitive processes (Fox et al., 2015).

Kini et al (2016) also conducted a study to test the effect of gratitude and what brain regions would be active during gratitude. They tested the effect of gratitude experience and expression, and it was explained before in this paper that the experience of gratitude may motivate an action (like expressing thanks for the generous gift or act prosocial oneself). In this study they used 43 participants (32 females) and they used two conditions (22 of the participants in gratitude intervention condition and 21 in the psychotherapy-only condition). Kini and colleagues (2016) developed a trust game called *pay it forward task* (PIF), where the participants in gratitude intervention acted as trustee and received a sum of money from a benefactor whose face was shown on the screen in the fMRI scan. The participants were also shown a potential third party beneficiary, and the trustee could share a portion of the money given by the benefactor. The participants (trustee) were told that the benefactor did not want the money back, but they could if they wanted to pass it forward if they felt gratitude for the gift received. Participants were in the scanner and performed repeated iterations of the PIF task. The results revealed that gratitude intervention for the PIF task, participants gave an average of 60, 5% of their endowment to the beneficiaries on each trial. This indicates that the task was effective when trying to produce altruistic donations, the participants did not give all the money away but they did not keep it all either. Brain activity that produced gratitude was found in parietal and lateral prefrontal cortex and the desire to help activated regions such as

left mid-occipital region, left precentral gyrus, left superior parietal lobule and left cerebellar declive (Kini et al, 2016).

Gratitude as a Positive Emotion – Functional Findings

Borod and colleagues (1998) proposed that pleasant emotions are dominantly associated with structures in the left hemisphere of the brain, and vice versa. This possibility that pleasant and unpleasant emotions may be lateralized was overlooked in earlier research and pleasant and unpleasant valence was also not always distinguished from arousal (Spielberg et al., 2008). One study wanted to find out the neural activity when presenting words to participants that evoked positive/negative valence and high/low arousal, based on the CMA. Posner et al (2009) used fMRI in 10 subject (5 men/5women) to find out BOLD signal with ratings of valence and arousal during the presentation of the different words. Posner and colleagues (2009) found that activity in right dorsolateral PFC (DLPFC) and right precuneus was increased with words that was negatively valenced. When they looked at network that was active during emotional valence overall it included left DLPFC, bilateral medial PFC, amygdala, cingulate gyrus, insular cortex and precuneus. Network that was increased when presenting positive stimulus and increased positive valence, was found in the left insula. BOLD signal with ratings of arousal was activated in the dorsal ACC, left parahippocampus, left DLPFC, and dorsal cerebellum. These findings suggest that there are different brain regions that are activated during positive and negative valence and arousal is distinguished from valence.

Positive emotions have been found to be associated with activation in the frontal lobe, and especially in the prefrontal cortex. There have been electroencephalography (EEG) studies that have generally suggested that greater activation of the left frontal activation is associated with more positive valenced emotions (Posner, Russel & Peterson, 2005; Posner et al., 2009). One review paper written by Miller et al (2015), discussed different studies that supported frontal differences in activation when tracking emotional valence among other. The studies in Miller et al (2015), presented that left-frontal activation was associated with positive stimuli and right-frontal activation associated with negative stimuli. A study (Baumgartner, Esslen & Jäncke, 2006) used 24 females where emotions was induced with visual and auditory stimulus. Baumgartner and colleagues wanted to evoke three basic emotions: *happiness*, *sadness*, and *fear*. EEG activity showed greater activity in left hemisphere when happy condition increased compared to negative emotional conditions. Basic emotions can be characterized by that they are discrete and that they have evolved from

our surroundings (Ekman & Cordaro, 2011). According to Ekman's theory there are seven different basic emotions and these are: happiness, sadness, surprise, contempt, fear, disgust and anger (Tracy & Randles, 2011). According to Ekman and Cordaro (2011) it is more important to contextualize the basic emotions into families or groups rather than listing how many emotions there are. Ekman and Cordaro (2011) continues to explain that each emotion is not a single affective or psychological state but they are rather a family of related states. Like the basic emotion of happiness, it includes feelings that are enjoyed and sought by the person. In addition, there are different enjoyable emotions that each are triggered by different events, involving a different signal and behavior (Ekman & Cordaro, 2011).

Hamann, Hoffman, and Kilts (2002), examined the neural correlates of viewing positive and negative photographs, interesting and uninteresting neutral photographs in 10 right-handed male students. They used positron emission tomography (PET) in this study and what they found was that the left amygdala and ventromedial prefrontal cortex were activated during positive emotions. This study also support that positive emotions are activated in the frontal lobe and more on the left side of the brain. Cerqueira et al (2008) conducted a study where they examined happy emotional states using fMRI. They investigated brain regions that was activated when inducing happiness in 11 healthy participants (6 male and 5 female). The BOLD changes were recorded during auditory presentation of a personal script that the participants wrote, it included happy content, neutral and negative content. Happy condition was associated with the activity in a number of anterior cortical areas, including medial and lateral parts of the prefrontal cortex and also in the dorsal anterior cingulate gyrus.

Research has come far, using EEG and neuropsychological task performance, although inconsistent findings have been found when it comes to right hemisphere activity in depression. Soon they started to find greater right than left prefrontal EEG activity in depression and this led researchers to believe that there was different pattern of activity in prefrontal and posterior cortical regions (Spielberg et al., 2008). In one study (Northoff et al., 2000) they found that the orbitofrontal cortex was active during emotional processing and depending on positive or negative emotion this region was divided into medial and a lateral part. In the study they used positive and negative pictures to induce the different emotions in subjects. The study found that negative emotional processing was strongly activated in medial orbitofrontal area, and positive emotional processing was strongly activated in lateral prefrontal cortex (Northoff et al., 2000).

Research in the last decade has started to use functional neuroimaging studies to identify emotions and their neural correlates and have found support for a valence and arousal

activation in the brain when it comes to emotions. These brain regions has been reduced mostly to amygdala and prefrontal cortex (Nielen et al., 2009). The amygdala is one of the brain structures that scientists generally accept to play an important role in emotion processing (LeDoux, 2003; Wendling et al., 2015). Amygdala has been mostly associated with fear (LeDoux, 2007), but research started soon to find activation of amygdala when presenting both negative and positive stimuli (Hamann, Hoffman & Kilts, 2002; Sergerie, Chochol & Armony, 2008). Nielen et al (2009) suggested that the amygdala instead is sensitive when it comes to arousal and prefrontal cortex is active during both negative and positive valence.

From a neurobiological framework, positive emotions are often described as a subjective experience that is evoked by reward and reward has been linked to positive emotions (Schultz, 2013). Studies on animals have been used to create reinforcement or punishments to increase or decrease a behavior that will occur again in the future. This has been called *Instrumental conditioning*. Inducing this condition in animals, taught them to know what response to choose for rewarding or punishing outcomes. Instrumental conditioning has also been tested in humans while scanning them in fMRI and found that the dorsal and ventral striatum was activated (O'Doherty et al., 2004). The instrumental task included two trials, reward and neutral. In the reward trial participants choose between two stimulus, one associated with high chance of receiving a juice reward and one with low chance of receiving a juice reward. In neutral trail, participants choose between two stimulus that was high or low chance to receive a neutral solution (O'Doherty et al., 2004). When inducing positive emotions in humans by recalling positive memories, it was found that those areas that were activated were the striatum and MPFC suggesting a rewarding process involved. In earlier studies they used electrical brain stimulation to different brain areas in human psychiatric patients. The patients would press a button to make themselves feel better. During this self-stimulations the patients reported that the stimulations produced positive emotions and described it as the happy button. They found that the nucleus accumbens was responsible for this feeling of laughter and euphoria (Burgdorf & Panksepp, 2006). Of interest also is the study of patients with psychological symptom like anhedonia, people who don't feel pleasure or interest in rewarding stimuli and is a core of major depression, it has been suggested that anhedonia is the inability to sustain positive emotions and reduced experience of pleasure. A study conducted in such patients, used positive images to induce positive emotions. They found that these patients failed to sustain nucleus accumbens activity (Heller et al., 2009). The nucleus accumbens is part of the ventral striatum (Gazzaniga, Ivry &

Mangun, 2014). The results in this study suggested that because of decreased activity in this area, these patients have an inability to feel positive emotions or reward (Heller et al., 2009).

Gratitude as a Positive Emotion – Neuroendocrine Findings

Isen (1990) assumed that moderate levels of dopamine is increased slightly when individuals was induced with positive affect than with neutral condition. Different theories have been presented to explain the neural mechanisms underlying positive emotions and one such theory is *the dopaminergic theory of positive affect* (Chiew & Braver, 2011). This theory suggests that positive emotions is linked to broadened cognition and psychological effects of positive emotion are specifically linked to increased dopamine release via substantia nigra pars compacta (SN) and ventral tegmental area (VTA) to areas like PFC and the striatum among other (Chiew & Braver, 2011). When we use gratitude journaling to think back on the positive emotions and situations that we experienced during the day, it's like bringing back happy memories and the pleasant feelings that comes with them. Speer, Bhanji and Delgado (2014) wanted to investigate in their study the neural circuitry that underlies the rewarding aspect when we think back of positive and pleasant memories that in turn may bring back positive emotions that we experienced during those moments. Speer and his colleagues suggested that when we bring back happy memories and those pleasant feelings that is tied to them we do it because it is intrinsically rewarding. This capacity to bring back positive feelings and maintaining them is associated with emotion regulation that in turn may lead to adaption to stress (Speer, Bhanji & Delgado, 2014). They used 19 participants in this study (10 female and 9 men). The participants had before undergoing the fMRI scan told stories that were related to positive emotions (like vacation) and also to neutral emotions (like packing). When the participants recalled positive memories that induced positive emotions, activity was found especially in the prefrontal cortex and the striatum. The basal ganglia is a collection of nuclei that includes caudate nucleus, putamen, globus pallidus, subthalamic nucleus and substantia nigra. Caudate nucleus and putamen together is called the striatum. The basal ganglia is known to have many dopamine receptors and these dopamine signals has a rewarding function (Gazzaniga, Ivry & Mangun, 2014). It has been suggested that the subcortical areas represent reward information, including the dorsal and ventral striatum, hypothalamus, amygdala, and lateral habenula. Much of the work that is presented on reward, has focused on the neurotransmitter dopamine (Gazzaniga, Ivry & Mangun, 2014). Dopamine cells are primary located in the SN and VTA. From the SN, dopamine neurons project to the dorsal striatum and nucleus of the basal ganglia. From the

VTS, dopamine neurons is projected through two pathways. *The mesolimbic pathway*, travels to nucleus accumbens (NAc) (that is part of the ventral striatum) of basal ganglia, the amygdala, hippocampus and ACC. *The mesocortical pathway*, is the second one and dopamine neurons travels to especially medial portions of the frontal lobe (Gazzaniga, Ivry & Mangun, 2014). Hoffmann and Nicola (2014), conducted a study on rats and found that dopamine dependent signal in NAc is necessary for reward-seeking behavior. The ventral striatum has been connected to multiple forms of positive emotions and induced positive emotions has been found to be positively correlated with increase in dopamine in the ventral striatum in humans (Burgdorf & Panksepp, 2006).

We can use emotion regulation to control how we internally feel and recently research has been using neuroscience techniques to understand the mechanisms underlying emotion regulation (Ochsner, Silvers & Buhle, 2012). One review paper (Ochsner, Silvers & Buhle, 2012) discussed different functional imaging research on emotion regulation and presented four brain systems that might be involved when we try to regulate our emotions. The first was amygdala that is involved in reward or punishments and to facial expressions of emotions. The amygdala signals us when we approach potential threats, like expressions of fear. The second brain system involved in emotion regulation is the ventral striatum that might predict rewarding or reinforcing outcomes. As mentioned earlier the ventral striatum seems to be involved in bringing back positive emotions and in turn can teach us to adapt to stress. Bringing back happy memories and the positive emotions that is tied to them is intrinsically rewarding to us (Speer, Bhanji & Delgado, 2014). The third brain activity that was presented (Ochsner, Silver & Buhle, 2012) was the ventral medial PFC that tracks positive or negative valuation of a stimulus that in turn makes us behave in a certain way. Fox et al (2015) found that ventral medial PFC was active when the participants was experiencing gratitude. Other studies that was presented in this paper also found activation in ventral medial PFC during positive stimulus that was linked to positive emotions (Hamann, Hoffman & Kilts, 2002). The fourth brain system presented during emotion regulation is the insula (Ochsner, Silvers & Buhle, 2012) and is associated with negative affective experiences in general. The study that we presented in this paper conducted by Posner et al (2009) found in their study that insula was active when presentation was negatively valenced.

There have also been studies suggesting the importance of serotonin for reward and positive emotions and the amygdala contains neurotransmitters like dopamine, glutamate, norepinephrine, serotonin and acetylcholine (Gazzaniga, Ivry & Mangun, 2014). Using music to produce pleasant and unpleasant emotions in participants, it was found that the serotonin

level was higher during perception of pleasant music compared to unpleasant music when serotonin level was lower (Evers & Suhr, 2000). Serotonin neurons have been suggested to be a major modulator for PFC function (Puig & Gullledge, 2011). In biological psychiatry, it has been important to find out how to manipulate serotonergic system with drugs to treat depression among others. Serotonin has been found to play a role in treating not only depression, but also susceptibility to depression and suicide (Young, 2007). In earlier work the serotonergic system has been manipulated with drugs, but now research has started to look how to increase serotonin in the human brain without drugs (Young, 2007). Happiness and wellbeing are important to protect us against mental and physical disorders, and one way is to find nonpharmacologic methods to increase serotonin in the brain (Young, 2007).

Gratitude Benefits Well-being and Mental Health

A grateful outlook does not require a life full of material comfort but an attitude of thankfulness regardless of how your life circumstances look (Emmons & Shelton, 2002). Gratitude has been suggested to cure excessive materialism and negative emotions of envy, resentment, disappointment, and bitterness (Csikzentmihalyi, 1999; Schimmel, 1997). The problem with envy, explained by Bonder (1997), is that people seems to be unaware of the blessings that surrounds them and the ability to notice the positive things in our live and how enjoying them allows us to have more fulfilling experiences (Langston, 1994). The practice of gratitude can be useful to decrease the craving and grasping for things we do not have or need. This craving can result in subjective distress and often a dissatisfaction with our circumstances. One useful tool to address this problem is to experience and express gratitude (Miller, 2006). Gratitude has been linked to subjective wellbeing, and happy people tend to be more grateful people (Watkins, 2004). Gratitude can be practiced and this in turn can lead to positive affect and sustained level of subjective wellbeing (Lyubomirsky, Sheldon & Schkade, 2005). The literature on well-being promoting gratitude exercises is relatively young, starting with Emmons and McCullough (2003), but still many empirical studies have been conducted and especially in the more recent years. Even earlier, suggestions for how to go ahead with such gratitude focused exercises has been put forward. For example, Miller (1995) he described a four-step cognitive-behavioral approach; 1) identify grateful thoughts, 2) formulate gratitude-supporting thoughts, 3) substitute the gratitude-supporting thoughts for the no grateful thoughts, 4) translate the inner feeling of gratitude created by these thoughts into outward action.

Empirical research on cultivating gratitude has also been done, in one study college students were instructed to keep gratitude journals on a *weekly* basis, they found that these college students exercised more, reported fewer physical symptoms, felt better about their lives as a whole, and were more optimistic about upcoming week compared to those who recorded hassles or neutral life events (Emmons & McCullough, 2003, study 1). In their second study, Emmons & McCullough (2003) asked college students to keep a *daily* gratitude journal, and they reported higher levels of the positive states of alertness, enthusiasm, determination, attentiveness and energy resulted compared to a focus on hassles or a downward social comparison. Those participants in the daily gratitude condition were more likely to report having helped someone with a personal problem or having offered emotional support to another, compared to the hassles or social comparison condition. Emmons & McCullough (2003) replicated this in a third study, in adults with neuromuscular diseases. These patients in the grateful condition showed an advantage in positive affect and life satisfaction in self-reports, and also in the report of significant others. This was also tested in younger population, when Froh, Sefick, and Emmons conducted a study by examining the effects of counting blessings in early adolescence (2008). This study replicated Emmons & McCullough's experiment, by examining the effect of a grateful outlook on subjective wellbeing and other outcomes of positive psychological functioning but instead in 221 middle school students. The students were randomly assigned to gratitude, hassles, or control conditions. Froh, Sefick, and Emmons (2008) also found positive results, counting blessings was associated with enhanced self-reported gratitude, optimism, and life satisfaction, as well as decreased negative affect. There was also a robust relationship found between gratitude and school satisfaction at both immediate posttest and at a 3-week follow up. Gratitude in response to aid was positively correlated with positive affect. This relationship was in line with what Emmons and McCullough's results showed (2003) and strongest at the 3-week follow-up. The author's concluded that counting one's blessings seems to be an effective intervention for enhancing psychological wellbeing in a younger population (Froh, Sefick & Emmons, 2008). When studying gratitude, many researchers replicate Emmons and McCullough's (2003) study. Watkins, Uher and Pichinevsky (2015) tested the effectiveness of a gratitude 3-blessings treatment for enhancing wellbeing in 129 participants. They were interested to see if gratitude does work because previous studies only used control treatments that could have caused a decrease in wellbeing. Like in the study conducted by Emmons and McCullough (2003), they used a hassles condition besides a gratitude condition, which could have decreased wellbeing. Watkins and his colleagues used instead two other conditions that

could also increase wellbeing of the participants. Besides gratitude condition, they used memory placebo condition wherein subjects were told that research has shown that a person's mood can be improved by focusing on memories and trying to think back on those memories. The third condition included the pride 3 blessings, and subjects listed three things that went well during the previous 48 hours. All the subjects were told that this study was designed to improve their happiness before they were randomized in the different conditions. This study found that gratitude 3-blessings treatment did indeed outperform the comparison treatments in enhancing wellbeing (Watkins, Uher & Pichinevsky, 2015).

Gratitude seems to be foundational to wellbeing and mental health throughout the lifespan. From childhood to old age, and evidence documents the wide range of psychological, physical, and relational benefits associated with gratitude (Emmons & Mishra, 2011). On the promises of previous empirical studies, Emmons and Mishra (2011) suggested possible explanations for why and how gratitude promotes wellbeing and the hypothesis that has been associated between gratitude and wellbeing will be presented.

Gratitude Facilitates Coping with Stress, because it builds more positive thoughts, like increasing the focus on the benefits in our life and others (Fredrickson, 2004). This coping style that is linked with gratitude might be based on that we can recognize stronger social bonds and that gratitude promotes prosocial motivation among other (McCullough et al., 2001; Algoe & Haidt, 2008; Algoe & Haidt, 2009; Algoe, Fredrickson & Gable, 2013). Coping style is suggested to include strategies to manage behaviors, emotions and cognitions when we feel stressed. One such coping style is adaptive emotion-focused coping, like when we use positive emotions to accept a situation that is stressful. According to the broaden-and-build theory, positive emotions are adaptive mechanisms and gratitude is a positive emotion. Gratitude like other positive emotions broaden our thoughts and provides flexible thinking that in turn can improve our coping skill (Lin & Yeh, 2014).

Gratitude Reduces Toxic Emotions Resulting from Self and Social Comparisons, grateful people appreciate positive qualities in others and they are able to feel happy over the good fortune that happens to others people than themselves. So grateful individuals are less likely to engage in social comparisons that can result in envy, because grateful people reported being less envious of others when grateful disposition was measured in over 1000 undergraduate psychology students (Emmons & Mishra, 2011; McCullough, Emmons & Tsang, 2002).

Gratitude Reduces Materialistic Strivings, in one study they found that gratitude mediates the relation between materialism and wellbeing, and that material success is not a very important factor in the happiness of highly grateful people (Froh et al., 2011). Tsang et al (2014) found in their study that those who scored high on materialism are less happy than those who scored low on materialism. They found that materialism decreases life satisfaction in 246 undergraduate marketing students.

Gratitude improves self-esteem, this can be explained by how grateful people focus on how they are supported by others and therefore feel more secure and less likely to seek material goods to strengthen their self-esteem (Emmons & Mishra, 2011). In one study that was conducted by Kong, Ding, and Zhao (2015) in 427 undergraduate Chinese students, they found a correlation between gratitude and self-esteem when using measurement such as *Gratitude Questionnaire* and *Rosenberg Self-esteem Scale* among other.

Gratitude can enhance the access to positive memories, by enhancing positive experiences, like when we try to bring back memories with positive information and when we try to have a grateful attitude on upsetting memories, it has been shown to promote better emotional processing and closure of the upsetting memories (Watkins et al., 2008). Watkin, Grimm, and Kolts (2004) found that people who scored higher in gratitude reported more positive events than less grateful people, suggesting that grateful people are more likely to recall pleasant life events and are more satisfied with their lives. This is why gratitude probably increases access to positive memories.

Gratitude builds social resources, as mentioned before gratitude promotes social resources by broadening the thought action repertoire, like “via initiation of friendships or consideration of a wide range of strategies by the beneficiary as a form of repayment” (Fredrickson, 2004, p. 150).

Gratitude motivates moral behavior, it promotes individuals to be aware that another person has treated them prosocially (a moral barometer), motivates people to behave prosocially themselves after this awareness (a moral motive), and last encourage prosocial behavior by reinforcing them for their precious good deeds (a moral reinforce) (McCullough et al., 2001).

Grateful people are spiritually minded, many of the world’s largest religions sees gratitude as a desirable human trait and can cause spiritual and religious people to have a grateful outlook. There have been found a couple of studies that had a relationship between religion, spirituality, and gratitude (Emmons & Kneezel, 2005; McCullough et al., 2001; Watkins et al., 2003; Kendler et al., 2003).

Gratitude facilitates goal attainment, in one study on gratitude and well-being, participants were asked at the beginning of the gratitude journaling study to also write down a list of goals they wanted to accomplish over the next two months. The participants were students and they were divided into, gratitude condition, hassles condition and control condition. Participants in the gratitude condition reported more progress toward their goals over 10-week period than the other two conditions (Emmons & Mishra, 2011).

Gratitude promotes physical health, gratitude interventions (gratitude journaling) have been shown to reduce bodily complaints, increase sleep duration and promotes exercise among other (Emmons & McCullough, 2003). Kendler et al (2003) wanted to test the role of religion in mental illness and mental health. The study included over 2000 men and women and used assessment that included broadly religiosity, spirituality and related attitudes, including forgiveness and gratitude. A different measurement was used to include these, 78 items in total, and they also did clinical interviews that assessed psychiatric and substance use disorders by personal interview, using an adaption of the structured clinical interview for DSM-III-R. The disorders that were included were five internalizing (major depression, phobias, generalized anxiety disorder, panic disorder and bulimia), and four externalizing (nicotine dependence, alcohol dependence, drug abuse or dependence and adult antisocial behavior). In the result section thankfulness was found to reduce risk for both internalizing and externalizing disorders in both men and women (Kendler et al., 2003).

Positive emotions are studied in the field of positive psychology (PP). It is about understanding and foster the factors that allows individuals, communities and societies to flourish (Fredrickson, 2001). Positive emotions may contribute to flourishing and optimal wellbeing because positive emotions are characterized by feeling joy, contentment, love, and gratitude among other. PP is about adding knowledge to human suffering, weakness and disorder, it is not about replacing applied psychology. It is about looking at what is right with people besides what is wrong. PP believe that the science of psychology should include an understanding of relieve suffering and how to increase happiness (Seligman et al., 2005).

PP studies *happiness* among other, it involves studying a) positive emotions and pleasure (pleasant life), b) engagement (engaged life), and c) meaning (meaningful life). Over 100 interventions has been applied to study happiness and 40 of them was selected in a manual. One of the interventions that was presented and worked to increase happiness was *three good things*, it also decreased depressive symptoms for six months. *Three good things* is a gratitude exercise, where participants write down three things they are grateful that

happened each day for one week. This exercise helps individuals to focus on the positive instead of the negative (Seligman et al., 2005).

Discussion

The aim of this essay was to clarify the concept of gratitude, explore what happens in the brain when we experience gratitude as a positive emotion and to describe its connection to wellbeing and mental health. Gratitude can be defined in many ways, but one thing that almost all the classification has commonly, is recognition or appreciation of an altruistic gift (Emmons & McCullough, 2003). Gratitude often involves steps of experience and expression, this essay aimed to focus on the experience of gratitude as a positive emotion. As an emotional experience gratitude is linked with positive emotions (Emmons & Shelton, 2002) and less negative emotions (Nelson, Lyubomirsky & Friedman, 2016). The experience of gratitude may motivate beneficiary to repay the benefactor and to involve the generosity to third parties. Gratitude can be distinctive from other related positive emotions, evolutionary theories propose that gratitude was shaped for generosity and helping and is in favor of reciprocal altruism (Nowak & Roch, 2007) (a pay-it-forward style). Gratitude may have played an important role in human social evolution (McCullough, Kimeldorf & Cohen, 2008).

The importance of gratitude has been recognized throughout the history of time, yet psychologists specializing in the study of emotion has in some sense failed to explain it. Gratitude is a pleasant emotion and this paper tried to present the experience of gratitude in four different ways; *as an emotional experience, a morally motivating experience, a socially interactive experience* and *as a positive emotion* and they all commonly can describe gratitude as a pleasant and positive emotion. Furthermore gratitude was linked to *the broaden-and build theory of positive emotions*, because when we feel grateful we consider a wide range of prosocial actions and this broadens rather than narrows (Fredrickson, 2004). One other theory that was linked to gratitude was *the find-remind-and-bind theory*, explaining that gratitude as a positive emotion strengthen social relationships (Algoe, Haidt & Gable, 2008). Fredrickson (2013) presented ten key positive emotions and gratitude was among those. The ten positive emotions were evidence from PEP lab and was those emotions that was relatively frequently experienced in people's life.

With the help of the CMA, gratitude as a positive emotion is characterized by pleasant valence and with a medium arousal. Research in the last decade has started to use

fMRI studies to identify emotions and their neural activation in the brain and have found support to a valence and arousal activation in the brain when it comes to emotions (Russel, 2003; Russel, 2009). These brain regions have been reduced mostly to amygdala and prefrontal cortex (Nielen et al., 2009).

The neurobiological framework of positive emotions is linked to reward and instrumental conditioning has been tested in humans during fMRI scanning to test this. By scanning humans when inducing rewarding or punishing outcomes, it was found that the dorsal and ventral striatum was active (O'Doherty et al., 2004). People who suffer from depression may not feel pleasure or interest in rewarding stimuli, and studies have been conducted in such patients to find out what happens in the brain when suffering from depression. It was found that patients who suffered from depression failed to sustain NAc activity that is part of the ventral striatum (Heller et al., 2009). In earlier studies electrical brain stimulation was used on psychiatric patients, where they pressed a button to feel better and during self-stimulation a *happy button* was found. Nucleus accumbens was responsible for feeling better, laughter and euphoria (Burgdorf & Panksepp, 2006).

Positive emotions have been found to be activated mostly in the prefrontal cortex and brain imaging studies have generally suggested a greater activation of the left frontal cortex (Posner, Russel & Peterson, 2005; Posner et al., 2009; Cerqueira et al., 2008; Northhoff et al., 2000; Hamann, Hoffman & Kilts, 2002; Spielberg et al., 2008). Studies have used different strategies to induce positive emotions, through visual or auditory presentation of a stimulus to find out the brain regions that respond to positive presentations. It was found a pattern of greater activity in left hemisphere in positive conditions compared to negative emotional conditions (Baumgartner, Esslen & Jäncke, 2006).

Little is known about how specifically the brain works when experiencing gratitude besides looking at gratitude as a positive emotion. Emmons (2008) suggested that gratitude may involve a limbic-frontal interaction to mediate positive emotions on individuals because of the process gratitude requires. Fox et al (2015) found that the experience of gratitude activated brain regions such as ACC, MPFC (involved in moral cognition), ventral MPFC (reward), dorsal MPFC (theory of mind) and insula (basic emotion). Finally Kini et al (2016) found that brain activity associated with gratitude was found in parietal and lateral prefrontal cortex and the desire to help activated regions such as left mid-occipital region, left precentral gyrus, left superior parietal lobule and left cerebellar declive.

The neurobiological framework of positive emotions is linked to reward, and the neurotransmitter dopamine and its release into prefrontal brain regions may be influenced by positive emotions (Isen, 1990) and supported by the dopaminergic theory of positive affect (Chiew & Baraver, 2011). This theory explains that positive emotions is linked to increased dopamine release via SN and VTA to areas like PFC (Chiew & Baraver, 2011). When individuals use gratitude journaling, they think back to those positive emotions that was experienced during the day. It is like bringing back happy memories and this is seen as a rewarding aspect, it is intrinsically rewarding (Speer, Bhanji & Delgado, 2014). When bringing back happy memories and thinking back of the positive emotions that was experienced, it has been found that prefrontal cortex and the striatum was active (Speer, Bhanji & Delgado, 2014). The striatum includes nucleus and putamen that is part of the basal ganglia. The basal ganglia is known to have dopamine receptors and signals a rewarding function (Gazzaniga, Ivry & Mangun, 2014). When inducing positive emotions in subjects, it was found that dopamine increases in the ventral striatum (Burgdorf & Panksepp, 2006). One other neurotransmitter that may be important for reward and positive emotions is serotonin, found in the PFC (Puig & Gullledge, 2011). If serotonin levels are reduced it can lead to depression (Farhud, Malmir & Khanahmadi, 2014). When treating depression serotonergic system is manipulated with drugs, but research has started to look how to increase serotonin in human brains without drugs (Young, 2007). Because negative emotions has been associated with increased mental and physical disorders like depression, suicide and mortality (Young, 2007). Positive emotions may protect us against these outcomes. Happiness and wellbeing are important and may protect us against mental and physical disorders (Young, 2007).

Positive psychology has the mission to study what is best in people (Seligman, & Csikszentmihalyi, 2014). Positive interventions are treatments methods and the purpose of them is to cultivate positive feelings, positive behaviors or positive cognitions. They focus on increasing wellbeing and decreasing levels of depression (Gander et al., 2013). Wood et al (2008) examined the relationships between traits of gratitude (people whom frequently experience gratitude), perceived social support, stress and depression. They examined two longitudinal studies in students (18-19 years of old), and both studies supported a direct model whereby gratitude led to higher levels of social support, lower levels of stress and lower levels of depression (Wood et al., 2008). It seems that gratitude may foster social support, protect people from stress and depression (Fredrickson, 2004; McCullough et al., 2001; Lin & Yeh, 2014; Wood et al., 2008). Gratitude and other positive interventions may be used to promote

positive emotions and wellbeing and prevent from a chain of negative experiences that may lead to depression. Positive emotions has a pleasant valence and typically characterized by medium to high arousal (Lang, 1995). Experiencing positive emotions is linked with increased activity in regions of the left prefrontal cortex (Posner, Russel & Peterson, 2005; Posner et al., 2009; Cerqueira et al., 2008; Northhoff et al., 2000; Hamann, Hoffman & Kilts, 2002; Spielberg, 2008) and increased neurotransmission in mesolimbic dopamine pathways (Isen, 1990; Chiew & Braver, 2011).

How can people maintain, increase or decrease emotions? “Emotion regulation represents a range of processes through which people can change the nature, frequency, and duration of emotions “(Carl et al, 2013, p. 345). How we regulate our emotion everyday is very important for us and our wellbeing. Emotions does not force us to respond in a particular way, but more likely that we will respond in a particular way (Gross, 2002). Emotion regulation is when we try to influence the types of emotions we experience, when we experience these emotions and how they are experienced and expressed (Tugade & Fredrickson, 2007). Cultivating positive emotions may be useful to us for building resilience to stressful events. Research attention has been devoted first on understanding how people regulate negative emotions to cope and not so much to the regulation of positive emotions (Tugade & Fredrickson, 2007). Emotion regulation may involve the maintenance of affective experiences and one strategy aimed to enhance and maintain positive emotional experiences is counting your blessings (Tugade & Fredrickson, 2007). When experiencing negative occasions, we may pause and consider the blessings in our lives instead, which may enhance feelings of gratitude and can be effective for coping with negative experiences (Tugade, & Fredrickson; Emmons & McCullough, 2003; Watkins, Uher & Pichinevskiy, 2015). Recently research have been using neuroscience techniques to find out brain regions involved in emotion regulation (Ochsner, Silver & Buhle, 2012). Ochsner, Silver and Buhle (2012) presented four brain systems that might be involved in emotion regulation, and these were the amygdala, ventral striatum, ventral medial PFC and insula. Bringing back positive emotions experienced during the day can be achieved with gratitude journals. Speer, Bhanji and Delgado (2014) found that PFC and the ventral striatum was active when thinking back to positive emotions that was experienced in the past. Gratitude journaling may be used as positive emotion regulation to maintain positive emotions.

Conclusions and Future Directions

Positive psychology is a field that is new and still growing, people can use interventions into their lives to improve their wellbeing and mental health. It is about focusing on what is right instead of what is wrong. PP helps us to focus on enhancing our positive emotions and they in turn may help us buffer against stress and improve our wellbeing. One intervention that is used in PP and to increase positive emotions is counting your blessings through gratitude journaling. The research on gratitude as a positive emotion suggests that by building positive thoughts and focusing on benefits in our life, we may reduce psychopathology like depression, build social relationships and improve our physical health by making us cope better with stress.

This essay wanted to clarify the concept of gratitude, explore what happens in the brain when we experience gratitude as a positive emotion, and last describe its connection to wellbeing and mental health. Gratitude can be experienced in many ways and it was presented as an emotional experience, it is an intrinsically rewarding state that might lead to other positive subjective experiences. Gratitude is also suggested to report feeling more positively and less negatively about one's life. As a morally motivating experience, gratitude serves as a moral barometer, moral motive and as a moral reinforce. As a socially interactive experience, gratitude was linked to the broaden-and-build theory of positive emotions and the find-remind-and-bind theory of gratitude. Finally as a positive emotion, Fredrickson (2013) described 10 positive emotions that people frequently experienced in their lives and gratitude was among those 10 emotions. One existing model of emotions and that was presented in this paper, was the CMA. This model explains that emotions can be characterized by two factors, valence and arousal. Gratitude was presented as a pleasant emotion with medium activation.

When looking into the literature on brain activity related to the experience of gratitude it is relatively thin. Some research has focused on the experience of gratitude and found brain regions in the frontal cortex active during this experience. When looking into research on gratitude as a positive emotion, we found that areas like PFC and ventral striatum get activated during positive emotions. Positive emotions have been linked to reward, and neurotransmitters such as dopamine and serotonin may increase in PFC and the ventral striatum during the experience of positive emotions. How the brain works during the experience of gratitude may contribute to mental health and future research is needed when it comes to the brain mechanisms of gratitude and how it relates to wellbeing. Gratitude may be useful when highlighting and increasing on the positive in clinical psychology and future research regarding clinical population using gratitude intervention is needed to find more

support on gratitude and benefit to mental health. Research have shown that gratitude interventions can increase positive emotions and contribute to positive outcomes on our wellbeing, but still studies needs to test the long-term effect of gratitude on wellbeing. Most studies have used gratitude journaling for two weeks and future research may use it for a longer period. Future research on the experience of gratitude needs also to include younger population and consider how gratitude may promote a positive youth development. Research may prevent the outcome of depression in an early age and therefore more research on gratitude in younger population is needed.

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