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The Scientific Effects Of Gratitude: A Review

Nour Abdullah

American Heritage School
12200 W Broward Blvd, Plantation, FL 33325
Email:nourabdullah479@gmail.com

Abstract

Objective: to examine the scientific evidence of the impact of gratitude on the body, including the psychological and physical benefits. The focus of the review was directed towards the impact of gratitude on happiness and depression, in addition to the changes that were observed in the brain using magnetic resonance imaging, as well as, the scientifically-based gratitude practices. Methods: Data was collected and analyzed from the following databases: PubMed, Taylor, and Francis Online, NCBI, and ProQuest. Specific effects of gratitude in controlled studies were discussed. Results: The well-rounded results strongly confirmed that scientific evidence supported the benefits of gratitude and was consistent with the hypothesis that gratitude has a positive impact on the mind and body. Furthermore, the active practice of gratitude was found to stimulate the neurological functions controlling positive emotions and social interactions, impact the physiology of the heart while also increasing the feeling of happiness and decreasing depressive symptoms. Conclusion: Gratitude is associated with greater physical and psychological health. This was supported by scientifically based evidence including function magnetic resonance imaging, heart rate, and validated questionnaires for depression and anxiety. Incorporating gratitude practices such as writing a gratitude list is a useful element in the improvement of well-being while promoting mental and physical health.

Keywords: gratitude, mental health, physical health, neurological functions, well-being.

Introduction

Gratitude is generally defined as the state of being thankful and appreciative towards what one has or to certain individuals. The Latin word gratia found in the word gratitude means graciousness, grace, or gratefulness. Gratitude is shown to incorporate these meanings. When the feeling of gratitude arises, people tend to focus on the positive and good in their lives. Gratitude also aids individuals in consolidating something greater than themselves This may include nature, a higher power, or even other individuals ("Giving thanks can make you happier," n.d). Historically, gratitude is considered a feeling that generates positivity and is seen to be promoted in holidays such as Thanksgiving, as well as, in religious teachings. Gratitude has been recognized in several religious faiths including Christianity, Buddhism, Islam, Judaism, Hinduism, and several others. In addition to the emotional state of gratitude, research has started to focus on gratitude's several health benefits and to seek scientific evidence to support how people can cultivate, as well as, learn to practice gratitude (Boggio et al., 2019; Wong et al., 2015).

The mechanism behind the benefits of gratitude are not widely known and until recently were not extensively studied. Despite some reports showing promising results, several of these studies were inconclusive or had limited data to formulate a final conclusion. Many of these studies limited their research solely to Europe and North America without branching out to different cultures, limiting the generalizability of these studies (Wood et al.,2010; Davis et al., 2016; Dickens, 2017). To further evaluate these missing components, this review sought out randomized clinical trials focussing on the scientifically-backed evidence
supporting both the psychological and physical effects of gratitude.

Preliminary research has focused on several of the understudied aspects of gratitude on well-being and promising clinical interventions have been suggested. As such, gratitude has started to become recognized in the field of research as more than a fleeting emotion. A wider conceptualizing of gratitude was developed and scales to assess the different aspects of gratitude
have been developed (Wood et al., 2010).

In order to evaluate the scientific effects of gratitude, earlier reports attempted to identify certain scales that measure gratitude. When attempting to examine the effects of gratitude on happiness and depression, two main challenges arise. The first challenge correlates with how to define gratitude during experimental methods and the second challenge is to determine the best reliable scales to use for depression and happiness that corresponds with gratitude. In order to measure gratitude, several reports suggested that the display of gratitude towards others is a valuable tool to measure (Lambert et al., 2010). Some of the investigated methods by which
gratitude can be expressed include random acts of kindness such as: helping a stranger struggling with carrying bags, donating to charity, aiding an individual who is lost, or simply opening the door for someone (Hill et al., 2013; Deichert et al., 2019).

In turn, studying the health benefits of gratitude has been done by investigating self-reported physical health and symptoms (Hill et al., 2013), as well as, measuring happiness adopted by self-reported questionnaires, for example, asking individuals how happy they are. This evidently invited a variety of answers that are seen as inductive reasoning rather than the preferred form of deductive reasoning but many studies lacked more objectively validated scales. Similarly, little research has been conducted on evidence linking gratitude and depressive symptoms (Lambert et al., 2010). In order to assess valid measurements of happiness and depression as a result of gratitude, this review paper proposes to include such research using
scientific measurement scales, and validated questionnaires were included. In order to identify evidence-based research, therefore, this review focuses on research articles addressing the benefits of gratitude on happiness using the following scientifically validated scores: Subjective Happiness Scale (SHS) and the Depression scale (CES-D). The Happiness Scale (SHS) is a self-evaluation that measures the overall happiness of an individual. The Center for Epidemiological Studies Depression Scale (CES-D) is a self-report questionnaire that measures symptoms related to depression (Lambert et al., 2010, Harbaugh et al., 2014). These scales provide an accurate and reliable base on the impact of gratitude in correlation to happiness and depression.

In addition to the research on the psychological effects of gratitude on happiness and depression, this review also sought to assess studies focusing on its physical effect on brain function. Gratitude provokes positive emotion, and since emotions are based on brain released neurotransmitters such as dopamine and serotonin that are known to increase mood, as

well as, happiness, these neurotransmitters' roles are crucial in the vertebrate nervous system. In support
of the effect of gratitude on the brain, neurotransmitters such as dopamine, serotonin, and norepinephrine that control emotions, stress response, and anxiety are impacted by gratitude on the neurochemical level (Korb, 2015). Therefore, this study sought to review research that could depict how brain activities and function scientifically respond to gratitude by demonstrating a change in the function of the brain using Functional magnetic resonance imaging (fMRI). This is commonly used as a brain technique to depict neural activity in relation to the emotionally prominent stimuli. fMRI has been used to analyze the different brain structures and their
action in response to emotion and behavior, in particular, the prefrontal cortex (Kini et al., 2015).

Since neuroscience studies have suggested that gratitude impacts certain areas in the brain, it has been anticipated that gratitude could be an essential component of the human experience during evolution, as well as, development. As a result, some studies have begun exploring the effects of gratitude on child development while other studies have highlighted genes that may underlie the propensity to experience gratitude. In addition, it has been increasingly recognized that gratitude is likely, therefore to affect cognition and behavioral structures as it impacts childhood development, and that practicing gratitude can be learned at a young age. Since gratitude can be a component of childhood development, it is, therefore,
reasonable to consider that gratitude practices can be taught and learned and would significantly have an impact on the health of an individual (Cunha et al., 2016; Kyeong et al., 2017; Tsang et al.). There are several gratitude practices that are widely advertised, however, the scientifically proven interventions are the subject of this review paper (Heckendorf, et al., 2019).

The focus of this review is to investigate research measuring the benefits of gratitude. Specifically, the review intends to illustrate the effects of gratitude on happiness, anxiety, depression, brain function using fMRI imaging, and scientifically proven beneficial interventions. This review intends to present an appreciation of gratitude as it is strongly relevant to the well-being and a potential to use simple techniques to promote gratitude as a broad wellness and clinical intervention. Based on the formulated hypothesis, scientific research will suggest positive benefits of gratitude on the mind and body and will support cultivating evidence-based gratitude practices on a regular basis. It is anticipated that scientific research will
find an association between gratitude and positive emotions including happiness and reduced depressive symptoms that can have an impact on the functionality of the brain. In addition, the implementation of gratitude practices in a simple and practical manner to promote wellbeing will be determined (Wood et al., 2010, Nezlek et al., 2016). This paper will examine the scientific evidence of the impact of gratitude on the body, including psychological and physical benefits. The focus will be on the impact of gratitude on happiness and depression, the changes observed in the brain using MRI imaging, and the scientifically-based gratitude practices.

Methods

An electronic-database search was conducted from the following databases: PubMed, NCBI, ProQuest, Taylor and Francis. These databases were chosen as these are comprehensive and commonly utilized search engines for scientific research. Search parameters were identified based on the objective of the research proposal and included: Science, gratitude, psychological, physiological, brain function, intervention A literature review was conducted using the parameters listed above. Articles were selected for including the following criteria: randomized

controlled trials, published in peer-reviewed journals, focused on adults with measurable outcomes, including control groups those with quantitative results, and studies conducted between the years 2010-2020. Articles were then analyzed and findings were described as well as interpreted. 201 articles were screened for eligibility. The amount of articles rejected based on title and abstract was 167. Thirty-four of the articles were found to be relevant and retrieved for full-text review. Thirteen articles were excluded based on the exclusion criteria and twenty-one articles were left.

Results

This comprehensive literature review included 21 relevant articles evaluating scientific research on the effects of gratitude on adults as published between 2010 and 2020. One clinical trial evaluated the effect of gratitude practices on relationship satisfaction between couples. The study included 146 participants and was based on self-reported global relationship satisfaction measures on a scale of zero (not at all important) to six (extremely important). Practicing the behavior of praising the other person, predicted perception of the other partner's responsiveness, general positive emotion, and love (Algoe et al., 2016). Another clinical trial evaluated the benefit of gratitude on mental health and wellbeing. This randomized controlled trial sought to assess the effect of gratitude on wellbeing in 1,337 participants, randomized into three groups: a gratitude intervention group and two control groups. The gratitude intervention group was asked to write daily lists for fourteen days expressing moments the participants have been grateful for during the day. One control group (Hassles group) was asked to write a daily list of five annoying situations. The second control group (Neutral group) was asked to write about five situations that impacted them whether it was positive or negative. The trial analyzed the outcome of the gratitude intervention on mood, depression, happiness, and life satisfaction using the following measures: the positive affect and negative affect schedule (PANAS), center for epidemiological studies depression scale (CES-D), subjective happiness scale (SHS), and satisfaction with life scale (SWLS) at three-point intervals including after the end of the intervention. The main findings exhibited that the gratitude intervention increased positive affect, subjective happiness, life satisfaction, and reduced negative mood and depression. Of note, the Gratitude group had a greater change than in the control group for positive emotion (Cunha et al., 2019). Furthermore, a meta-analysis of thirty-eight studies analyzed the outcome effects for gratitude versus neutral comparison, gratitude versus negative comparison, and gratitude versus positive comparison. The results reiterated that a variety of outcomes, specifically happiness are consistently positively impacted by gratitude (Dickens, 2017). An additional study examining the effect of a two-week gratitude list concluded that gratitude exercises decreased depression especially among participants who had high depressive symptoms at baseline (Harbaugh and Vasey, 2014). A more recent study utilizing a modern internet-based app for gratitude practices examined the effect of this intervention on the reduction of a form of psychopathology known as repetitive negative thinking (RNT), a variant of anxiety and depression. The study recruited 260 participants that were randomized into a five-week internet and app-based gratitude intervention that includes adherence-focused guidance compared to the control group of participants on the waitlist. The main outcome measured was based on the reduction in RNT while the other outcomes assessed included resilience factors and other mental health problems. Results depicted that the gratitude intervention clearly improved anxiety and depression overall minimizing RNT. However, the benefit on resilience factors was less apparent (Heckendorf et al., 2019). Moreover, another

large clinical trial including 2,973 participants sought to evaluate the mechanisms mediating the effects of gratitude on depressive symptoms. Gratitude was found to have a direct link to the improvement of depression, as well as, through positive emotions and reframing mechanisms (Lambert et al., 2012). Equally important, a study of one-hundred twenty-seven college students explored the benefits of gratitude experienced when receiving support under a stressful situation (giving a speech). The results depicted that students who received social support during the speech experienced more gratitude and significantly less stress than those who did not receive support (Deichert et al., 2019). Several additional clinical trials assessed the outcomes of gratitude on the function of the brain. One study utilized a simulation experiment of Holocaust survivors using functional MRI resonance imaging (fMRI). The participants were asked to complete an open-ended questionnaire rating their gratitude during a simulation experience by watching a four-phased documentary depicting real survivor stories of the Holocaust. The participants immersed themselves into this experience as if it was their own. During the stimuli creation process, the participants were asked to imagine receiving specific gifts that would have helped during a time of high need. As an example: a bakery leaving a piece of bread outside or a fellow prisoner risking their life to steal food for their sick friend. In addition, personality questionnaires were completed by participants to assess how individual differences in personality affect how a gift was perceived. These questionnaires included: Interpersonal Reactivity Index, the Six-Item Gratitude Questionnaire, the Maslow Need Scale, and the Big Five Personality Index. In addition, participants were asked to fill out a homemade questionnaire to analyze their experience in the study using a 7-point Likert scale. The fMRI was designed to detect the response of participants to gratitude using several measures such as blood oxygenation level-dependent (BOLD) response. The results suggested that gratitude was associated with brain activity in the specific regions of the brain related to positive emotions and moral experience, including the cingulate and prefrontal cortices (Fox et al., 2015). Another study was conducted to evaluate the effect of gratitude on cognitive flexibility, which is an executive function that allows the individual to switch between a variety of concepts, including ninety-five participants divided into two groups. The group placed into the gratitude condition was asked to list five events that generated a feeling of gratitude over the past week, while the participants in the control condition group were asked to list five events that occurred over the past week. The effect of gratitude on cognitive flexibility was measured using an established task-switching paradigm technique which included the Magnitude-Parity Switching Task. The results of this study did not find any benefits of gratitude on enhancing cognitive flexibility by using the measurement of the task-switching. The authors indicated possible limitations of the study in view of using a single test and concluded that the results came contradictory to the hypothesis (Hartanto et al., 2017). Another study sought out to examine whether self-reported propensity toward gratitude correlates with neural activity on fMRI of the brain, specifically focusing on changes in the ventromedial prefrontal cortex (VMPFC) which is the medial portion of the prefrontal cortex and serves as a highly interconnected region for emotions, decision processing, memory, self-perception, and social behavior. This double-blind study included thirty-three participants who were randomly assigned to a gratitude-journal or active-neutral control journal group for the period of three weeks using the Gratitude Questionnaire (GQ-6). Participants wrote a journal entry for at least ten minutes every evening. Self-reported gratitude was seen to be strongly related to the neural contrast in the VMPFC regions. These analyses

supported the hypothesis that gratitude correlates with altruistic tendencies, and impacts value-sensitive regions in the brain most significant in the VMPFC region (Karns et al., 2017). Moreover, another trial looked to evaluate the effect of a gratitude practice consisting of writing letters and participating in charitable donations (experimental group) compared to a controlled group that did not take part in this intervention. The trial analyzed the impact of these interventions on the neurological activities of the brain using an fMRI. The study similarly concluded that gratitude practices increase neural modulation in the medial prefrontal cortex three months post-intervention (Kini et al., 2015). A recent study attempted to not only determine the neuroimaging effect of gratitude but to analyze it in combination with a social intervention. The study combined fMRI, as well as, a human social interactive task consisting of cost and benefit as two components of gratitude analyzed by the beneficiary's brain. Through an elaborate scientific model, the study that used dynamic causal modeling suggested an effect of gratitude on neural signals and connectivity in the perigenual anterior cingulate cortex (area of the brain that represents gratitude). In addition, this function played a role in converting gratitude into reciprocal behavior suggesting a neural mechanistic account of gratitude and as a significant contributor to "social-moral life" (Yu et al., 2018). One of the initial studies to examine the benefits of gratitude on physical health was conducted with 962 individuals using a large-scale survey of self-reported physical health. The study sought to test a form of gratitude known as dispositional gratitude which refers to an attitude of a life approach focusing on noticing and appreciating the positives in the word almost as a gift. Gratitude was measured by utilizing a Gratitude Questionnaire (GQ-6) and physical health was measured by a Subjective Scale (Short Form SF12), as well as, the 5-Item Healthy Activities Scale designed for this study to evaluate five different areas of health behavior: nutrition, exercise, personal well-being, social well-being, and drug use. The results concluded that individuals who exhibit more gratitude tend to report greater physical health. These outcomes were due to not only greater psychological health, but also engagement in healthy activities, and willingness to seek aid related to health concerns (Hill et al., 2013). Another trial used an fMRI and the measurement of heart rate (HR) to test the effect of gratitude. The study sought to investigate the impact of gratitude, as well as, resentment interventions on mental well-being. Functional connectivity (FC) of the fMRI was initially conducted to identify the gratitude effect on the following: default mode, emotion, and reward-motivation networks. The association of these effects with the average heart rate was measured. The heart rate was found to be positively impacted (lower) during the gratitude intervention compared to the resentment intervention. There was also a positive correlation between the functional connectivity and heart rate during the gratitude intervention, however not the resentment intervention. The observed decrease heart rate during the gratitude intervention but rather an increase in heart rate during the resentment intervention likely corresponded to the results of response to gratitude and resentment (Kyeong et al., 2017).

Discussion

This review confirms the abundance of scientific evidence behind the impact of gratitude on both the psychological and physiological levels. Several evidence-based gratitude practices were suggested to result in significant benefits. Gratitude correlates with psychological benefits that promote happiness and reduce depression. In addition, gratitude impacts relationships as it was shown to promote positive emotions within families and among couples when receiving an expression of gratitude or kindness from the other individual. The practice of other praising

behavior predicted perception of the other partner's responsiveness, general positive emotion, and love (Algoe et al., 2016). Practicing gratitude, therefore, is suggested to improve relationships. Therefore, it is desirable that couples and families cultivate more praise and kindness as a form of improving relationships because these practices generate gratitude from the other individual in return. Overall this approach improves the overall quality of life and nature of relationships. Practicing gratitude can be done in a variety of ways to positively impact mental health. One of the effective gratitude interventions would be maintaining a daily gratitude listwhich improves mood and well-being while decreasing depressive symptoms. For example, writing a daily gratitude list for fourteen days was shown to have a positive effect on subjective happiness, life satisfaction, and a decrease of negative emotions or depressive symptoms (Cunha et al., 2019). The scientific evidence reviewed in this analysis clearly supports that writing a daily gratitude list would be recommended as a practical and easily implemented practice with far-reaching implications that anyone can incorporate in their daily routine. Beyond improving mood, wellbeing and relationships, the impact of gratitude on happiness is equally desirable and further corroborated by a meta-analysis of thirty-eight studies reiterating that gratitude positively impacts happiness (Dickens, 2017). Since meta-analyses represent one of the highest levels of evidence, one can safely conclude that gratitude can be a cornerstone of promoting happiness. In addition to evidence supporting that gratitude can be an essential driver of happiness, gratitude was also suggested to decrease depression. This was based on a well-conducted trial of a two-week gratitude list which was shown to be effective in reducing depression among participants who suffer from high depressive symptoms (Harbaugh and Vasey, 2014). Accumulating research, therefore, backs the evidence that gratitude has a substantial impact on positive emotions and overall mental health including improved symptoms of those suffering from baseline depression. Since depression is a devastating and prevalent condition in society, identifying safe and non-invasive techniques such as keeping a gratitude list to aid in the fight against this condition would be highly rewarding. In addition to writing a gratitude list, other effective ways to practice gratitude include using an internet-based app intervention for five weeks to reduce anxiety and depression as suggested by an important research on this timely topic (Heckendorf et al., 2019). This technology could be a more accessible way to encompass a large group of individuals to maximize the benefit of gratitude through this intervention. As noted by extensive research, gratitude improves many mental health-related conditions such as anxiety and depression, in addition to improving a psychopathological condition known as repetitive negative thinking (RNT). Of importance, the mechanisms mediating the effects of gratitude include a variety of direct, as well as, indirect ways through positive emotions and reframing thoughts (Lambert et al., 2012).

Furthermore, gratitude was also found to correlate with stronger perceptions of support and greater social relationships during stressful events (Deichert et al., 2019). As a result, gratitude evidently increases psychological well-being during social interactions and stressful situations. This was supported by a study that was beneficial in determining the effects of gratitude during stressful situations, such as public speaking, and would potentially be useful in similar social stressful situations. Furthermore, when evaluating the effects of gratitude on the function of the brain during stressful situations using an fMRI, gratitude correlates with activity in the brain regions related to positive emotions, behavior, morals, values, and social judgment (Fox et al., 2015). It is therefore conceivable that practicing gratitude is not only important for

mental health and social relationships but also could shape moral values and improve overall character.

In addition to the mental health benefits detailed above, gratitude also impacts several physiological functions of the body, including brain function, physical health, and heart function.Gratitude correlates with neural activity and brain function related to positive emotions, cognitive behavior, morals, values, personality, social judgment, memory, and decision processing as confirmed by neurologically-based studies (Fox et al., 2015; Kini et al., 2015; Karns et al., 2017; Yu et al., 2018). However, gratitude was not evidently associated with impacting high executive functions of the brain, such as cognitive flexibility which allows individuals to switch between a variety of concepts (Hartanto et al., 2017). More research is needed to assess the role of gratitude in impacting similar high complexity functions. As concluded by the study referenced above using only a single task-switching test which may not be conclusive, therefore, more research is needed to further evaluate the study's findings. Furthermore, fMRI studies confirmed that several forms of gratitude practices such as writing and taking part in charity can be effective due to their positive impact on the neurological function of the prefrontal cortex of the brain. By exerting a significant effect on brain function, this analysis provides more supporting evidence that gratitude conclusively impacts behavior including social and moral interactions.

Neveretheless, practicing gratitude has significant additional benefits on physical health. This is supported by the positive outcomes noted in a study that encompasses health behavior including nutrition, exercise, personal well-being, social well-being, and drug use (Hill et al., 2013). Gratitude was found to impact physical health in a variety of forms promoting an overall social and personal well-being based on a healthier lifestyle. This is important because a healthy lifestyle is an important goal for every individual to seek, as it it affects the quality of life and potentially reduces diseases. More specifically, gratitude was shown to affect the neural network functional connectivity and brain-heart coupling. The benefit of gratitude can be measured by decreased heart rate when practicing gratitude seen in a study-based gratitude and a resentment intervention (Kyeong et al., 2017). This study indicates that gratitude is likely to be associated with the parasympathetic and sympathetic nervous systems which control the physiological responses of the body. As such, the effect of the autonomic nervous system on the heart rate is increased during stressful events and decreased when experiencing certain positive emotions such as gratitude. Overall, the totality of the evidence supports the significant improvement of mental and physical well-being by practicing gratitude. Gratitude can execute emotional regulation by modulating functional areas in the brain related to emotions and motivations in addition to the effects on the heart.

While the strength of this analysis included gathering data from a heterogeneous sample of adult participants with implications for generalizability, this could also pose some limitations. As such, this review compiled studies that had different participants ranging from college students to couples and patients with a psychiatric disease. The results from one study may not be applicable to the participants from another study as the review was not focused on a homogeneous sample (Deichert et al., 2019). During the clinical trial of one study, a procedural malfunction occurred, as well as, poor sound quality, overall prohibiting data from fifteen gratitude conversation interventions (Algoe et al., 2016). In addition, several of the analyzed gratitude intervention trials were received online from the participants and experienced a limitation characterized by dropout rate, as well as, the lack of follow-up. While this prevented more data from being collected, the studies mentioned there was no significant difference impacting the

results from the losses (Cunha et al., 2019; Dickens, 2017; Karns., et al 2017). It would, therefore, be crucial to remind participants in similar studies daily, if needed, to send in requested materials to further prevent a higher dropout rate. Another study reported that due to a misunderstanding of instructions, one participant was removed from the trial (Yu et al., 2018). Even though the effect was not drastic, this situation displayed the importance of communication between the participants. Moreover, one study using a Holocaust simulation to allow participants to imagine receiving a gift during that time, reported a limitation that led to three individuals being removed from the study due to a scanner and computer malfunction. Nevertheless, this malfunction did not strain the simulation (Fox et al., 2015). In addition, one study limited itself to using a single task-switching paradigm, excluding the results from encompassing a more generalized task measuring of cognitive flexibility (Hartanto et al., 2020). In the future more measures should be utilized to guarantee a more generalizable outcome, overall allowing the results to be applied to a larger majority. Most of the examined interventions were reported to last for a limited amount of time, whether it was three weeks or five weeks. It was, therefore, difficult to see the long-lasting effects of the gratitude interventions on the participants (Kyeong et al., 2017). Future studies should focus more on analyzing the long-lasting implications of the gratitude interventions in addition to the short-term effects since it can be more difficult to conclude the effects of gratitude when limited to a shorter follow up. Further research is also needed to explore the benefits of gratitude on specific populations, as well as evaluate more modern practices that could apply to a wide variety of individuals, specifically younger generations. It would be important to incorporate in future studies an organized approach where participants can adhere to instructions and consider ways to limit the drop out rate while also preventing as much software malfunctions as possible.

Conclusion

This analysis supports that the benefits of gratitude extend well beyond the historical and religious teachings to incorporate scientifically-backed health evidence. Gratitude was shown to execute several positive psychological and physical benefits based on evolving scientific research. Practicing gratitude was found to elucidate positive emotions including happiness and reduce depressive symptoms, as well impact the functionality of the brain using neuroimaging. As such, gratitude was found to correspond with psychological benefits that, in turn, increased happiness and reduced depression. Gratitude was shown to promote positive emotions within families and among couples leading to improved relationships. By practicing simple gratitude interventions such as writing a daily gratitude list, several positive emotions can ensue including subjective happiness, life satisfaction, less negative emotions, decreased depressive symptoms, and improved mood and well-being. Gratitude was found to improve a variety of mental health-related conditions including anxiety, depression, and a psychopathological entity known as RNT. The mechanisms behind the beneficial effects of gratitude were suggested to be both direct or indirect ways. Gratitude was also noted to correlate with stronger social interactions including better perceptions of support and greater social relationships during stressful events. In addition to increased psychological well-being and mental health, this analysis supported gratitude's impact on the physiological functions of the body including brain function and physical health. Gratitude specifically stimulated several brain activities in the anterior and prefrontal cortices related to personality, emotions, self-perception, cognitive function, social behavior, memory, and altruistic

tendencies. The effect of gratitude, however, on high complexity neurological functions such as cognitive flexibility was less evident. In addition to gratitude writing, other potential practices were found to also positively impact the brain's cognitive functions including taking part in charity. Furthermore, gratitude was found to have a significant impact on physical health and on practicing a healthier lifestyle. It's effect on reducing heart rate and on regulating the neural network functional connectivity and heart coupling which supported a crucial role for gratitude in relation to emotions and motivations in addition to the effects on cardiac health. In essence, gratitude evidently exhibited several individual health and social positive outcomes and can be considered as a tool to promote overall well-being. This analysis improved the understanding of the many far-reaching implications of gratitude on social life and overall physical and mental health. Applying gratitude in daily life and social interactions could provide a simple and effective tool to decrease stress making life more enjoyable as backed by an abundance of scientific research.

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Graphs/Charts/Table

Table Depicting Several Convenient Gratitude Practices/Interventions

Table One: Effective Gratitude Practices, gratitude practices/interventions with included benefits

Practices/Interventions	Outcomes	References
Writing and sharing gratitude	Aided in utilizing emotion	(Boggio et al., 2019)
gratitude and participating in charitable donations for three months	neurological function of the prefrontal cortex of the brain	
Writing letters containing gratitude to others	Decreased negative emotions, increased positive emotions, and overall greater mental health	(Wong et al., 2018)

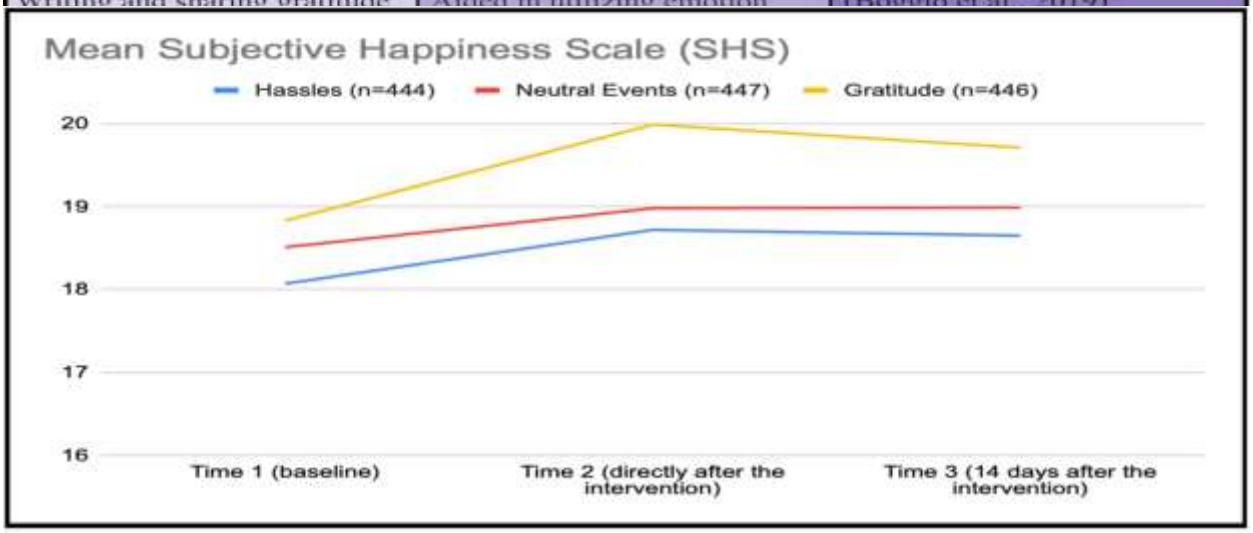
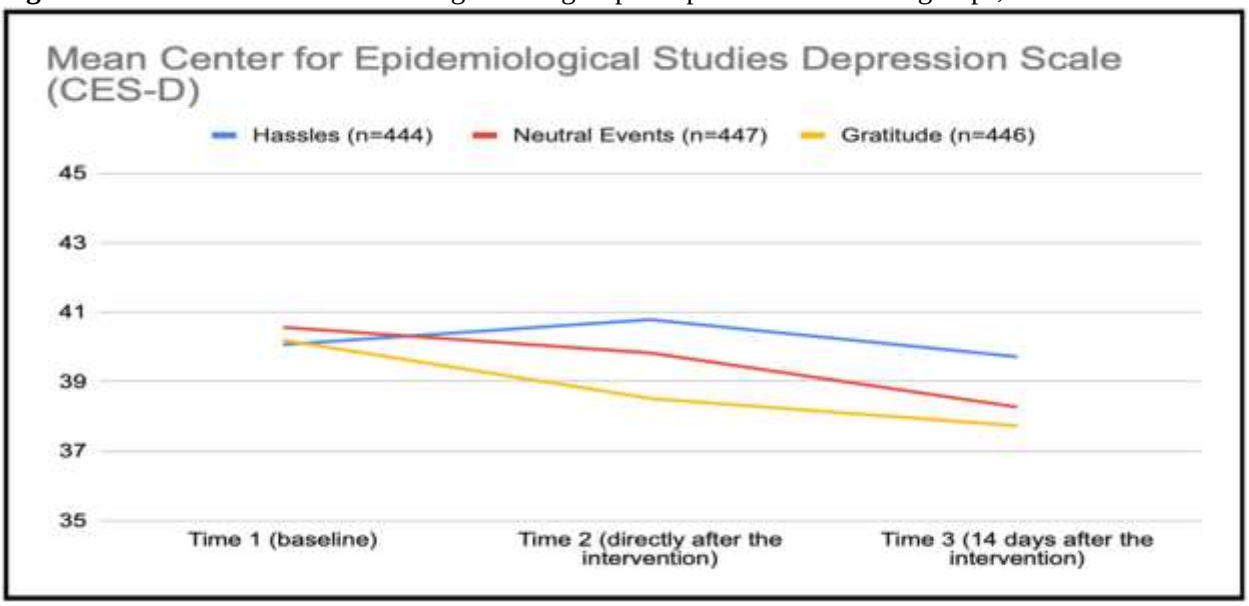


Figure One: Improved SHS in the gratitude group compared to the control groups, Mean SHS scores in three groups: gratitude, hassles, and neutral, (Cunha et al., 2019)

Figure Two: Decreased CES-D in the gratitude group compared to the control groups, Mean CES-D scores



in three groups: gratitude, hassles, and neutral, (Cunha et al., 2019)

Figure Three: Improved PANAS-PA in the gratitude group compared to the control groups, Mean PANAS-PA scores in three groups: gratitude, hassles, and neutral, (Cunha et al., 2019)

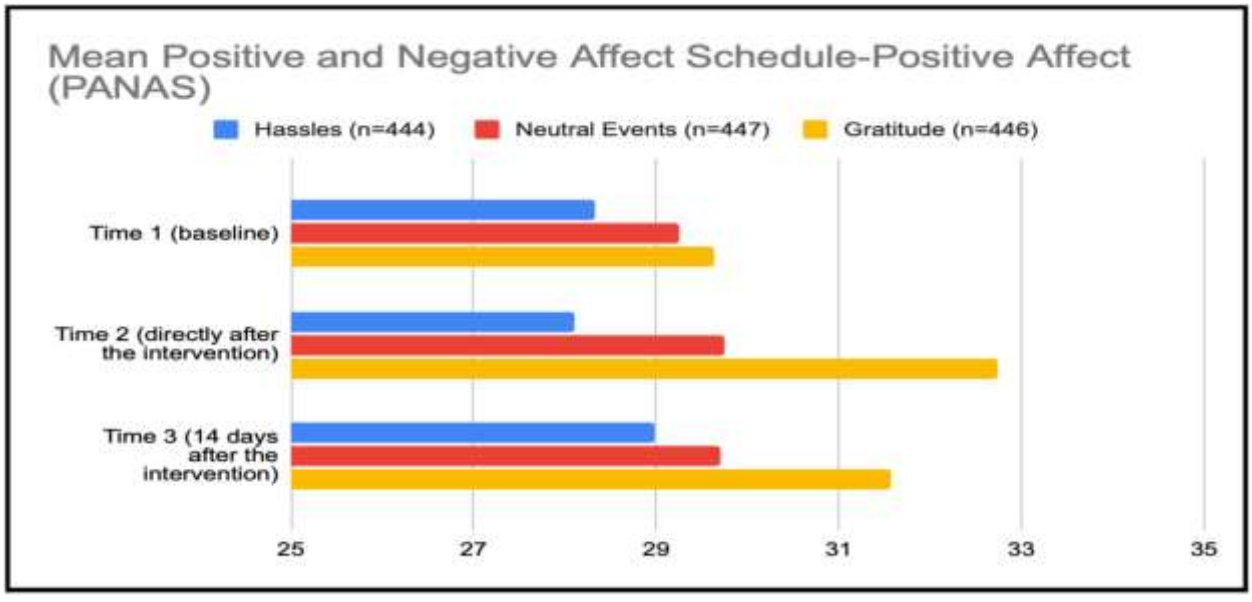
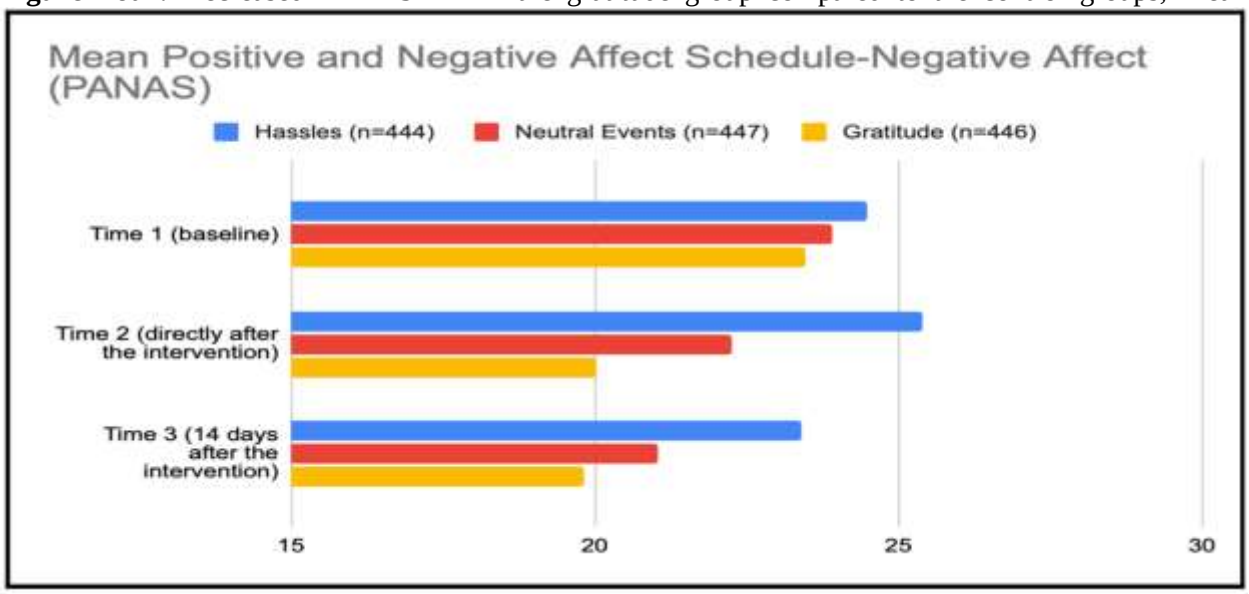


Figure Four: Decreased PANAS-NA in the gratitude group compared to the control groups, Mean



PANAS-NA scores in three groups: gratitude, hassles, and neutral, (Cunha et al., 2019)