Navigating the Anxiety Highways: Neurobiological and Treatment Differences between Amygdala-Focused Anxiety and Left-Cortex-Focused Anxiety

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Abstract

The brain utilizes its two largest speedways to identify and alleviate anxiety. The amygdala, a small structure in the limbic system, works reactively to stimuli once it has occurred and records the stimuli as dangerous. The left cortex allows for anticipation of a dangerous or triggering stimulus, recognizing the potential for a situation to be dangerous before danger is present. This article will address both pathways and how each identifies, codes, and responds to stimuli. This article will offer additional discussion on current best practices, both traditional and alternative, as well as limitations and ethical considerations. This article hopes to inform current practitioners on how to identify which pathway accurately and clearly is activated in a client and what treatment options are available.

keywords: amygdala, left cortex, anxiety, emdr

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Anxiety is a psycho-physiological reaction that is encountered day-to-day in most people and impacts individuals in significant ways. Anxiety is one of the most common symptoms experienced among clients diagnosed with psychological disorders (APA, 2013). Differentiating between amygdala-focused and cortex-focused anxiety can help therapists determine appropriate intervention and treatment planning. If a therapist does not know the pathways of an individual's anxiety, therapy can be a fruitless and frustrating experience, just as a road trip would frustrate a novice driver attempting to navigate a new city without a map or Global Positioning System (GPS). In the same way a GPS helps navigate to a destination, understanding the source of a person's anxiety can help the therapist and client reach the desired destination using appropriate therapeutic interventions. Using the metaphor of roadways, this article includes an explanation of the brain regions and their functions related to anxiety, research that illuminates both anxiety highways, and discussion of treatment options, and limitations for both amygdala-focused and left-cortex--focused anxiety (Craigmyle, 2013; Gray & McNaughton, 2003).

Multilane, high-speed interstates allow for the rapid transport of cargo and passengers to and through urban hubs. A little farther away from the metropolitan areas, quieter state highways

link small towns to one another. Amygdala-focused anxiety fires rapidly at one-twentieth of a second and is comparable to an interstate highway in its quick and focused delivery route, whereas left-cortex--focused anxiety tends to roam at a noticeably slower pace. Cortex-focused anxiety can take nearly half a second to find its way from the cortex origin to the amygdala. Similar to the highways in major cities, all roads lead to and from the faster interstate highways. Likewise, all anxiety originates in and through the amygdala; however, not all anxiety is processed and excogitated through the amygdala highway. More specifically, if an individual ruminates over a yet-to-materialize catastrophe, the anxiety begins in the left cortex and travels through the amygdala. Conversely, if a client awakes with high anxiety without rationale, the origin of the anxiety will be strictly amygdala-focused (Craigmyle, 2013).

Atlas of Anxiety

First, the brain's construction is important to understand when discussing the movement of anxiety. As previously stated, anxiety is common and occurs daily for the majority of humans. Diagnoses for generalized anxiety disorder (GAD) can start as young as early adolescence (APA, 2013). Anxiety is an unavoidable part of life for people across the lifespan. Symptoms of anxiety are theorized to be the results of disruption in the functioning of the emotional centers of the brain. The structures within the limbic system are considered the emotional processing headquarters. The limbic cortex, the hippocampus and the amygdala are most involved in emotional regulation and processing. The limbic cortex incorporates sensory, affective, and cognitive information regarding pain and the body's internal state, including internal symptoms of anxiety and stress (Spironhi, 2015; Gray & McNaughton, 2003).

The hippocampus is where episodic memories are shaped and assembled to be filed in long-term memory. The hippocampus also facilitates the association of memories with senses (e.g. pine scent with holidays), as well as controlling the brain's navigation and spatial orientation. Neurogenesis, the process during which new neurons are created from adult stem cells, also takes place in the hippocampus, hence making this part of the limbic system integral in the process of learning and memory. In the context of anxiety and mood regulation, stress sensitivity and resilience have been linked to hippocampal volume and neurogenesis which takes place in the hippocampus (Spironhi, 2015; Gray & McNaughton, 2003).

The amygdala, considered by some to be an ancient part of the limbic system, is the emotional regulation command center of the limbic system. It is involved in the expression of defensive behaviors such as fear and anger, as well as the creation and retrieval of emotionally heightened memories, and prioritizes the storage and retrieval of memories that are linked with the strongest emotions. With this map of the mind in view, this article will focus on two main routes of anxiety through the brain, beginning with the amygdala (Craigmyle, 2013).

Amygdala-Focused Anxiety

When things are moving smoothly and at a normal pace within the amygdala, most emotional responses and information can reach the chosen destination easily. However, when an emotional response is blocked or there is too much information flooding the senses, the amygdala responds by coding the memory of what is happening as either dangerous or not

dangerous (Craigmyle, 2013). The body responds accordingly, and often the responses manifest as a client stuck in anxious thoughts or exhibiting behavioral patterns that are maladaptive or not conducive to a good quality of life. The hope for clinical intervention with amygdala-based anxiety is that the anxious client is calmed and able to see the larger situation through the use of evidence-based therapies and alternative treatments (Craigmyle, 2013).

The amygdala works to keep the body prepared for trouble (Sah, 2017). While the left cortex is prepared to analyze risk associated with possible danger, the amygdala reacts quickly, with little time for analysis (Craigmyle, 2013). In fact, according to Pittman and Karle (2015) the amygdala has the capacity to override other high-functioning brain processes when it is activated, resulting in a hijacking of higher brain functions during times of real or perceived danger. The amygdala is an avid learner and will work tirelessly to learn associations between a seemingly benign stimulus and a perceived threat as quickly as possible (Blair et al., 2016). For instance, a dog may be just a harmless pet -- until someone gets bitten. Then the amygdala may associate it with a threat so powerful that a "beware of dog" sign or even a pet shop window displaying puppies will trigger anxiety.

When the dog that was once friendly bites, the lateral nucleus of the amygdala starts creating neural pathways to associate any sight, sound, or related stimuli to prevent future attacks or danger (Harper et al., 2009). Association, or experience, is critical to the language of the amygdala, and it is because experiences are coded so forcefully and deeply in the amygdala that traditional talk therapy alone may feel useless. The amygdala needs new and positive experiences with the object or situation for new learning to occur and for new associations to be made to overcome past associations. Much anxiety-related and fear-related research is focused on Pavlovian fear conditioning and potential, which compromises experience-dependent neuroplasticity, hence highly involving the amygdala (Blair et al., 2016). The amygdala needs to learn to take a new exit on the highway.

Treatment

Amygdala-focused anxiety requires new learning to replace old exposures. Unfortunately for people who experience severe panic attacks or extreme anxiety, this process usually means identifying triggers and then exposing oneself repeatedly to encourage new associations. Relaxation techniques such as guided muscle relaxation and various breathing exercises can also be helpful in treating amygdala-focused anxiety (Pittman & Karle, 2015).

Exposure-Based Cognitive Behavioral Therapy

While studies show that cognitive behavioral therapy (CBT) has some useful impact on reducing anxiety originating in the amygdala, many clients still require additional treatment to effectuate results (Gold et al., 2016). CBT is most effective when tackling cortex-based anxiety as it directly addresses the anxious thoughts that lead to maladaptive behaviors (Neukrug, 2018). However, research shows that the amygdala usually works outside conscious thought; therefore, CBT is not the gold standard in treating amygdala-based anxiety (Gold et al., 2016). Exposure-based cognitive behavioral therapy has been shown to reduce activity in the amygdala during situations identified by subjects as fearful or anxiety-producing in as little as four sessions (Reinecke et al., 2018). Exposure-based therapy works by gradually exposing someone to objects

or experiences that normally induce panic. Clients are asked to create a scale of exposure, which is essentially a ladder with a series of descriptive actions that ascend into more triggering activities. If a client presents with a disabling fear of dogs, they might indicate looking at pictures of dogs as a low-scale experience. Walking near a dog park and hearing dogs bark from a distance while the dogs are contained inside a fence may be a medium-scale experience. Actually petting a dog may be identified as a high-scale experience. Gradually, the client works to "level up" by slowly increasing their ability to stay in the moment and experience each rung of the ladder while using breathing techniques, mindfulness, and relaxation techniques to help encourage new amygdala-focused learning (Reinecke et al., 2018).

Eye Movement Desensitization and Reprocessing

As all clients are unique, what may work for one may not have the same therapeutic effect on another. Eye movement desensitization and reprocessing (EMDR) has been shown to be quite effective in calming the amygdala and facilitating new learning (Laugharne et al., 2016) but does so in a way that is markedly different from exposure therapy. EMDR involves working with a licensed mental health professional who has additional credentials in providing EMDR care. EMDR requires that the client attends 6 to 12 sessions of EMDR. For clients who struggle with the thought of being exposed to a traumatic stimulus, EMDR is an effective option to help reduce amygdala-based anxiety and help clients reclaim their lives.

While exposure therapy requires the continued exposure to a fearful or anxiety producing stimuli, EMDR does not. EMDR requires the client to recall a distressing memory while engaging in bilateral eye movement, usually with the support of a light bar. Engaging in bilateral eye movement while recalling fearful or distressing memories has been shown to reduce overall feelings of fear for up to 24 hours after a session (De Voogd et al., 2018). Research supports that one of the reasons bilateral eye movement is so effective is because it requires the amygdala to disengage to facilitate the learning associated with the new task at hand (De Voogd et al., 2018; Shapiro, 2014). EMDR appears to physiologically change the left amygdala, increasing its overall volume, which has been correlated to a reduction in symptoms related to anxiety and posttraumatic stress disorder (Laugharne et al., 2016). Clients experience a hyper activation of the amygdala during the recall of their traumatic experience, but the use of bilateral eye movement helps to regulate the amygdala's activation while simultaneously experiencing a traumatic memory. Repeated attempts of this therapy help to reduce the level of arousal previously linked to the memory (Pagami et al., 2015).

Alternative Practices

Mindfulness, progressive muscle relaxation, and yoga have all been shown to be effective in reducing amygdala activation (Desbordes et al., 2012; Goldin & Gross, 2010). While not as overtly effective as exposure therapy or EMDR, research supports that daily meditation training and practice can reduce amygdala arousal noticeably in as little as eight weeks (Kral et al, 2018). Utilizing alternative methods to change the amygdala's response to triggers within the environment is a great option for those who may lack access to certified therapists or who have not responded well to traditional treatments.

Mindfulness-Based Stress Reduction

Mindfulness based stress reduction (MBSR) is an evidence-based program that usually lasts from six to 12 weeks. In MBSR, a learner is taught various methods of decreasing arousal through meditation, breathing exercises, and yoga (Crane et al., 2017). In a study by Kral et al., (2018), participants who practiced MBSR were more likely to have a reduction in amygdala activation when shown negative stimuli (pictures) than those who did not practice MBSR regularly. Leung et al., (2018) found similar results regarding decreased activation in the amygdala when exposed to negative images. Kral et al., (2018) also found that when exposed to positive images, those who did not practice MBSR regularly were more apt to respond to positive images, whereas the long-term practicing group did not. This appears to be an effect of the central premise of mindfulness – a reduced responsivity to both overly positive and negative experiences, allowing each moment to pass without excessive emotional activation.

Progressive Muscle Relaxation

Progressive muscle relaxation (PMR) is a process in which the individual intentionally tenses and relaxes muscles throughout the body in a certain pattern. While the muscles tense and release, the individual practices good breathing and visualizes each muscle they flex and release. PMR can be taught once and then used throughout an individual's life without any additional supervision (Kobayashi & Koitabashi, 2016). It is a tool that is mobile, effective, and fairly inconspicuous, making it a good choice to use during nearly any anxiety-producing situation. In a study done by Kobayashi and Koitabashi (2016), researchers found that the limbic system was more active during PMR in those who had never practiced any type of meditation before, citing that the more a person practices PMR the more effective it becomes at reducing amygdala activation. In a study by Tsitsi et al. (2017), parents of children with cancer reported reduced levels of anxiety the more they practiced PMR while their children were in chemotherapy. This is concurrent with the research presented by Kral et al., (2018) which shows skills relating to meditation or muscle relaxation are only effective if practiced frequently.

Yoga

Yoga is a spiritual practice that integrates body movement, breathing, and mindfulness to help the individual reduce anxiety, depression, and stress (Gotink et al., 2018). While yoga has been practiced for centuries, its effects on the brain have only recently been studied clinically. Gotink et al. (2018) found that daily yoga practice greatly reduced the arousal of the amygdala and promoted a reduction of volume specifically in the right amygdala, which experiences and processes negative emotions and impulsive behavior as compared to the left amygdala, which is associated with positive emotions and memory. Yoga appears to reduce the volume of the right amygdala, which helps reduce anxiety and stress overall (Gotink et al., 2018). As with PMR and MBSR, the more an individual practices yoga the more effective it is.

The research concludes that daily mindfulness practice, which could include yoga and progressive muscle relaxation, can lower the activation of the amygdala when experiencing a normally emotionally charged environment or event. This is particularly helpful for those who may value connecting with friends and family, or attending public events, but feel ill-equipped to engage in such experiences due to their amygdala-based anxiety. Helping clients engage the full range of therapeutic interventions, especially breathing and mindfulness, may allow them to take their learned skills and reclaim the ability to live life without the constant and false activation of fear and anxiety in their amygdala.

Left-Cortex Catastrophizing

Moving away from the amygdala and focusing on the cortex, it is notable that the cortex is responsible for the ability to think, analyze, and ultimately anticipate (Pittman & Karle, 2015). Anticipation involves foreshadowing the future with the information currently available. The prefrontal cortex is deemed most responsible for these predictions because of the role it plays in the decision-making process. The left prefrontal cortex is responsible for memory; therefore, past experiences can greatly factor into the anticipation of future events (Xu et al., 2016). Sensorial perception, visual perception, and memory, combined with personal experiences, are all informational inputs which heighten anticipation or anxiety. Ultimately, outside information triggers the cortex to analyze and anticipate. Anticipation can be worrisome or even scary, and in an effort to protect oneself, the negative emotions which stem from anticipation signal the amygdala (Pittman & Karle, 2015). The amygdala then creates an anxiety response. It is this chronic anxiety response that can be addressed through different modalities of treatment.

Having established an understanding of the left prefrontal cortex's role in situational assessment and assignment of potential threat and chronic anxiety stimulus and response, it is necessary to understand the role of the amygdala in these anxiety-centric issues. For example, academic examinations can create anxiety that leads to left-cortex catastrophizing. A student who is not thoroughly prepared for an exam may jump to hasty conclusions imagining a failed future and inability to obtain a degree after looking at the first unanswerable question on a test. These negative thoughts result in negative emotions, which signal the amygdala. The amygdala sends the body into protection mode and an anxiety response is generated. In comparison, during amygdala-focused anxiety the amygdala acts in immediate response to triggers (Pittman & Karle, 2015). The treatment options below focus on slow onset and/or chronic anxiety, as opposed to acute anxiety centered in the amygdala which is situationally dependent. Acute amygdala-centered anxiety responses are response incidents caused typically by unforeseen events. Returning to the earlier example involving a dog, an anxiety-prone person may observe a neighborhood dog off leash yet contained within a fence. The dog may or may not be able to jump the fence. Instead of taking the time to process whether the height of the fence will be protective, an amygdala-centered response throws the body into fight or flight mode in an effort to protect the individual from the dog. In keeping with the analogy that the amygdala acts as the interstate, the amygdala remains the primary conduit for both chronic and acute anxiety responses. The amygdala is involved in both anxiety responses; however, only chronic anxiety is the target complaint for the following treatment options.

Treatment

There are multiple independent and combined treatment avenues available (Pittman & Karle, 2015). Psychotherapy, exercise, yoga, meditation and breathing, and medication can aid with progression. Utilizing these therapies, independently or in a multiphasic approach, these avenues ultimately are centered on changing an individual's perceptions.

Cognitive Behavioral Therapy

CBT is the first recommended treatment of choice (Neukrug, 2018). CBT involves identifying triggering thoughts and related beliefs, determining whether or not they are maladaptive, and further controlling and/or restructuring them in order to ultimately control the behavioral response that follows (Kaczkurkin & Foa, 2015). Creating positive coping strategies that allow for progressive management additionally acts as a key feature of CBT. Exposure-type interventions are most commonly used in accordance with CBT in order to address specific distressing events of the past. Providing new perspective allows for the identification of reality of the situation and the logic behind the possibility of re-occurrence. In turn, triggering events of the future do not elicit the same fear, i.e. the same anxiety response.

Prolonged Exposure

Prolonged exposure (PE) involves repeatedly revisiting the traumatic memories in a controlled setting (Fogger et al., 2016). This therapeutic approach is typically utilized in harmony with CBT. As the client revisits known distressing events of their past, they actively process their emotions from the experience by challenging inaccurate thought processes and restructuring maladaptive thoughts. In vivo and imaginal approaches to PE are utilized as determined by the client and the therapist (American Psychological Association [APA], 2017). Imaginal exposure involves reliving the experience through guidance by the therapist while in session. Emotions are discussed throughout therapy and sessions are typically recorded so that the client can replay the session to allow for further processing. In vivo exposure involves addressing stimuli outside of therapy. These stimuli are often ones the client typically avoids. Though this is completed outside of therapy, the client and therapist identify these stimuli in advance.

Person-Centered Therapy

Person-centered therapy (PCT) is another approach that has been shown to be successful with the treatment of anxiety (Elliott, 2013). PCT embodies a less authoritative method in order to foster self-discovery and ultimately reach the same goals set within CBT. The client may or may not be aware of triggers or stressors prior to attending therapy. Ultimately, client-centered care is a holistic approach to therapy which allows for adjustment, especially in the event there are many unknowns as deemed by the client. While effective, PCT lacks specific interventions and relies heavily on discourse for subtle exposure (Coulombe et al., 2016). PCT may work well with clients who are motivated and unafraid of exploration via conversation or reflection.

Acceptance and Commitment Therapy

Acceptance and commitment therapy (ACT) is an option that focuses on the present and what can be done moving forward (Hasheminasab et al., 2015). As opposed to altering maladaptive thought processes, ACT encourages acceptance of these thoughts and looks toward progression through recognition and understanding. Individuals take an authoritative approach to their own life, as they actively choose to make forward-thinking decisions regarding all aspects of their lifestyle. ACT ultimately places efforts toward change at the forefront.

Eye Movement Desensitization and Reprocessing Therapy

Eye movement desensitization and reprocessing therapy (EMDR) takes a different approach as it focuses on specific distressing memories as opposed to focusing on an individual's belief system or behaviors. As clients focus on a specific memory, they are tasked with bilateral

stimulation, rendering the memory as significantly less impactful (Landin-Romero et al., 2018). Clients facing cortex-based anxiety may create scenarios which provoke the amygdala based on past events which were distressing (Aranda et al., 2015). Addressing events of this nature could aid with controlling anxiety-provoking thought processes.

Brainspotting Therapy

Brainspotting therapy (BSP) is a holistic approach that focuses and links the direction of a client's visual field with their emotions (Hildebrand et al., 2017). Essentially, the provider is working with the client to identify an eye location that elicits a negative emotional response, i.e. a "brainspot." The evidence-based theory indicates that emotions are heightened when gazing in one direction vs. another, as the direction of the visual field fosters unconscious emotion. The brainspots are then utilized as a focus for rewiring maladaptive thought processes associated with the negative emotional response to positive, constructive associations. Ultimately, talk therapy is more effective when the visual field and the discussion are in alignment. Essentially, BSP has been shown to be as effective as EMDR and serves as an additional approach toward coping with and controlling cortex-based anxiety.

Mindfulness Meditation

Mindfulness meditation asks the client to pay attention in the present moment (Hofmann et al., 2010). As the client strives to identify their own reality, the client can determine whether or not the situation is fearful. An individual practicing mindfulness may be better capable of identifying an apparent threat, such as a dog behind a fence, and evaluating whether the dog is actually capable of imposing harm. Additionally, shifting focus from anxiety-provoking thoughts can aid in controlling cortex-based anxiety (Pittman & Rathert, 2012). Deciphering a situation requires focus, forcing an individual to calm their thoughts enough to accurately focus on reality. This treatment further requires the client to center attention on the actual facts, as opposed to unrealistic possibilities.

Breathing

Focused breathing is an example of a means to adjust one's attention and further reduce distressing symptomology (Hofmann et al., 2010). While the breathing method actively slows an individual's heart rate, focused breathing is twofold as it further acts as a distraction method (Ma et al., 2017). As anxiety-provoking thoughts flood the brain and an individual's heart rate begins to increase, focused breathing distracts from the thought process and simultaneously lowers the heart rate. This therapeutic method disrupts the oncoming anxiety attack.

Exercise and Yoga

Exercise and yoga can work independently or in harmony with mindfulness meditation and breathing. Both encourage neuroplasticity, which is the brain's ability to grow and adapt as it makes new connections (Mandolesi et al., 2018). As clients attempt to identify their situational reality, they also create new understanding, which is a significant task. Additionally, the nature of activity involved in yoga and exercise can aid with control of symptomology by fluctuating an individual's heart rate and blood pressure (Woodyard, 2011). In yoga, reduction of heart rate and blood pressure shifts the body from the sympathetic nervous system (fight or flight) to the parasympathetic nervous system. During exercise the opposite is noted. The body adapts to differing ranges in this respect, allowing for better control when placed in psychological

situations. Symptom relief is also achieved through these practices, allowing an individual to be more productive in all aspects of life, in turn creating a healthier lifestyle (Saeed et al., 2019).

Medication

Selective serotonin reuptake inhibitors (SSRIs) have historically been used for the treatment of anxiety (Pittman & Rathert, 2012). This medication class has been shown to aid with the development of neuroplasticity, thereby aiding a client in the ability to develop new patterns of response based on re-assessment of threat. Benzodiazepines work almost the opposite way that SSRIs do. While they have a greater immediate effect on the anxiety response, they do so by preventing activation of the amygdala, which ultimately impairs new learning. Therefore, maximum effectiveness would likely be achieved if the medication were used in harmony with one or several of the previously mentioned therapeutic approaches.

Cortex-based anxiety is important to understand because it provides the client and therapist specific treatment options which may increase the effectiveness of the client's ability to make decisions and appropriately anticipate the impact of perceived threats. As with all treatment options, limitations exist and should be considered when thinking about this research or its impact on client care.

Limitations

While there are effective therapeutic interventions for the treatment of amygdala-based anxiety, there are also limitations. Unfortunately, at this time research does not separate amygdala-based anxiety from cortex-based anxiety and therefore much of the available research intertwines the two, making solid conclusions on the efficacy of treatments for amygdala-based anxiety difficult. While the amygdala and cortex do work in tandem, they also experience and process anxiety differently. Research should work to delineate the differences in future studies. Limitation considerations for each type of anxiety are presented below followed by limitations applying to the entirety of this article.

At least two conceivable limitations exist for the amygdala-based treatments discussed earlier. The first limitation is cost and accessibility barriers to many of the above treatments. While yoga, mindfulness exercises, and progressive muscle relaxation exercises are readily available online either inexpensively or for free, a website or online video is not a viable substitute for a proper licensed mental health provider who leads a client through exposure therapy or EMDR sessions. Evidence-based clinical interventions, such as EMDR and exposure therapy, require the client to have access to mental health care, money, and time. Access to these types of therapies may be harder for those working multiple jobs, living on a low income, or lacking insurance coverage. Additionally, the length of these therapies may also create a barrier, as it could potentially be too costly for someone if therapy necessitated taking time off work to attend 12 sessions.

A second limitation is the individual's needs, perceptions, and beliefs. What the research says will be effective may fall short of ever creating normal, safe interactions with the ideas, objects, or situations clients fear most. Ethical and effective therapy understands the biological basis of anxiety, how it presents in the client, the research behind the interventions, and

awareness that despite these factors the carefully chosen treatment modality may not help. If the therapist can become creative and flexible in treatment planning without adhering strictly to evidence-based practices, the client may benefit. To return to the metaphor of driving a car, sometimes making quick decisions, and discovering alternate routes (i.e. getting creative and being flexible) will ultimately be the best way to reach a destination.

The amygdala has a powerful role in the storage and transport of anxiety. Several techniques and therapies can be used to calm the amygdala so new learning and fresh relationships can be made. The therapies mentioned are not without their limitations and may require flexibility and divergent thinking to maximize therapeutic efficacy.

Several treatments were listed in relation to treating left-cortex based anxiety. Two limitations to those treatment options come to mind even though others may exist. First, cortex-based anxiety is not always a stand-alone diagnosis but is often noted with other comorbidities such as posttraumatic stress disorder and depression (Salcedo, 2018). Additional comorbidities were not factored into treatment recommendations and suggestions. Adjustments may need to be made on an individual basis in the event a client suffers from mental health issues beyond anxiety.

The second potential limitation is that exposure-type therapies can be very complex and subsequently difficult to endure (Fogger et al., 2016). Anxiety and feelings of hostility can be provoked, leaving therapists to wonder if the treatment is causing more harm than good. Specifically, PE would not be recommended for clients with a history of suicidality, some personality disorders or cognitive impairment. The selection, adaptation, and implementation of these treatment strategies should take these limitations into account.

In addition to the specific limitations mentioned above, there are some general limitations which apply to the entirety of this article. Specific research has not been conducted to prove these theories. This article is an exploratory conceptual research and lacks focused qualitative research including comparative studies, brain studies including brain scans, and neuroscience trials.

Conclusion

Anxiety pathways in and through the amygdala and left cortex were discussed along with specific treatment options tailored to amygdala and cortex-focused anxiety. The amygdala's significance is that all known feelings of anxiety result in the amygdala. The amygdala's ability to process and spread sensations of fear throughout the body protects the individual from the potentially dangerous daily mayhem everyone encounters in life. While the amygdala plays a key role as the epicenter of anxiety, the role of the left cortex should not be devalued. The left cortex and left prefrontal cortex are invaluable in our ability to make decisions, to anticipate, and to remember. The executive functioning of the left cortex allows an individual to plan and avoid potential problems. However, at the intersection of the amygdala and the cortex, anxiety can be exacerbated. The amygdala can fire at false non-threats and the cortex can anticipate issues that never occur. Understanding the roles of the amygdala and the left cortex aids therapists in how each impacts anxiety, and how both regions work together to recognize false fears. Combining

the understanding of brain function with how the brain adapts is paramount in appropriate treatment planning. To work with anxious clients successfully, it is central to ethical treatment for therapists to understand the source of the anxiety. With that information therapists and clients can utilize known strategies to reach treatment goals.

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