Mental Imagery and Social Phobia: What Form of Mental Imagery – Based Cognitive Behavioral Therapy is Most Effective?

ABSTRACT

Mental imagery is the internal experience of representing sensory information that is normally perceived through the senses, entirely in the mind. Visual mental imagery, which is the most studied type of imagery, is commonly referred to as "visualization," or "seeing through the mind's eye." One of the defining features of imagery is that it does not require an external stimulus for the creation of a mental image. Imagery can also be either voluntary or involuntary. Involuntary mental imagery is important as it is the essential element of many psychological disorders, such as post-traumatic stress disorder, which is characterized by intrusive "flashbacks" of traumatizing memories in the form of imagery. Mental imagery has general significance in our lives as it is often used as a tool for remembering information, and it is increasingly being used in clinical fields both to study and to help treat mental health disorders. The purpose of this paper is to review literature on the neuroscience of mental imagery, emotion, and its clinical applications. This paper will also discuss different forms of cognitive-behavioral therapy (CBT) and their effectiveness in treating anxiety and mental health disorders, specifically social phobia. Additionally, this paper will attempt to fill in the gap in previous studies by providing insight into which form of CBT may be most effective for treating social phobia.

Introduction

Mental imagery is the internal experience of representing sensory information that is normally perceived through the senses, entirely in the mind. Visual mental imagery, which is the most studied type of imagery, is commonly referred to as "visualization," or "seeing through the mind's eye." Mental imagery includes not only visual imagery, but also auditory imagery, or hearing sounds in the mind, and motor imagery, or performing a movement in the mind without physically performing the action (Pearson, 2019). One of the defining features of imagery is that it does not require an external stimulus for the creation of a mental image. This means that imagery is distinct from sensation, although related to perception.

Mental imagery has general significance in our day-to-day lives as it is often used as a tool for remembering information, and it is increasingly being used in clinical fields both to study and to help treat mental health disorders. An important aspect of imagery for clinical purposes is that it can be either voluntary or involuntary. Involuntary imagery is not under conscious control by the individual and is spontaneous, whereas voluntary imagery is consciously controlled by the person. Involuntary mental imagery is important as it is the essential element of many psychological disorders, such as post-traumatic stress disorder, which is characterized by intrusive "flashbacks" of traumatizing memories in the form of imagery (Hirsch, 2007). However, although there is considerable research on using mental imagery to treat psychological disorders, it is not clear what form of imagery-based therapy might be the most effective. Thus, the purpose of this paper is to review the scientific literature on the neuroscience of mental imagery, as well as mental imagery in emotion, and its clinical applications. This paper will also discuss different forms of cognitive-behavioral therapy (CBT) and their effectiveness in treating anxiety and mental health disorders, specifically social phobia. Additionally, this paper will attempt to fill in the gap in the scientific literature by providing insight into which form of CBT may be most effective for treating social phobia.

Mental Imagery and Cognitive Processes

Mental imagery is implicated in many cognitive processes, such as sensation and perception (Pearson, 2019). Although sensation and perception are similar processes as they both help us understand stimuli, they also have important differences. Sensation can be described as what a person

experiences because of an external stimulus, whereas perception does not require an external stimulus and is more of an interpretation of sensation. Mental imagery shares many similarities to both sensation and perception because they both result in emotional responses and can give the feeling of "seeing". Yet, research shows that mental imagery has a stronger relation to perception rather than sensation as both imagery and perception occur internally in the mind without any external stimuli affecting it. However, mental imagery is distinct from perception and is often regarded as a "weak form of perception" (Pearson, 2019). To further elaborate, weak perception can be defined as how someone thinks they are perceiving information, rather than how they are perceiving it. Additionally, mental imagery is further related to perception as they are both higher-level cognitive processes, which are more complex, conscious processes that require more voluntary and intentional effort as opposed to lower-level processes. Lower-level processes, on the other hand, are not conscious or voluntary processes, and they include less complex, reflexive processes, such as sensation and involuntary imagery (Ganis, 2004).

Another distinction between higher-level and lower-level cognitive processes is how information is processed. Higher-level processes use a type of processing called top-down processing. Top-down processing is a form of conscious and deliberate information processing in which cortical brain regions, such as the prefrontal cortex, send information "down" to other subcortical areas of the brain, such as the amygdala and hippocampus (Pearson, 2019). Bottom-up processing, on the other hand, is associated with lower-level cognitive processes and is the opposite of top-down processing. Bottom-up processing involves information in the brain being processed in the subcortical brain regions and is then sent to the cortical areas of the brain (Pearson, 2019). Both voluntary mental imagery and perception are involved in top-down processing and have similar neural mechanisms, in contrast to sensation, which is a form of bottom-up processing (Pearson, 2019). Understanding the relationship between top-down processing and mental imagery is important because it provides evidence that mental imagery is a voluntary process, which has important implications for clinical disorders as discussed more in later sections of this paper.

Beyond perception and sensation, imagery also plays an important role in memory. Imagery especially plays a role in visual working memory, in which people tend to either pick out certain details of an image to remember it or create a mental image of the specific thing they are trying to remember. Indeed, evidence suggests that while doing most forms of visual memory tasks, people use mental imagery (Pearson, 2019). Additionally, imagery plays a role in autobiographical memory, as it is a very large component of remembering events in our lives. Again, research shows that while remembering these events, many people use mental imagery (Pearson, 2015). Furthermore, mental imagery is also related to and plays a role in many other psychological processes, such as planning, spatial navigation, conceptual thinking, and decision making.

Neuroscience of Mental Imagery

More recently the field of neuroscience has begun providing insight into the neural mechanisms underlying the process of mental imagery. Research on the neuroscience behind mental imagery has shown that several parts of the brain are prominent during mental imagery. The frontal areas of the brain, such as the prefrontal cortex, show elevated activity during mental imagery tasks according to functional magnetic resonance imaging (fMRI) studies (Pearson, 2019). In particular, the visual cortex plays a large role in imagery as well, as it processes visual information, which is a key component of visual mental imagery (Pearson, 2019). This information is significant because it provides further evidence that mental imagery is a top-down process, as there is increased activity in cortical areas of the brain. However, this is not true for activity in the visual cortex, as processing in the visual cortex is a lower-level process. This suggests that imagery is a voluntary process, which is important for the manipulation of imagery in psychological disorders. One study has concluded that an abundance of the neurotransmitter glutamate is present in the prefrontal cortex during the process (Huang, 2015). Glutamate is an excitatory neurotransmitter commonly present in synapses throughout the brain, so levels of glutamate are increased with

increased excitability. This study (Huang, 2015) tested the effects of mental imagery on glutamate levels in the brain, by having professional swimmers complete a "mental swimming" task. The study found that glutamate levels in the medial prefrontal cortex increased during mental imagery versus a resting period, and there was no glutamate concentration change in the audiovisual cortex based on mental imagery strength.

Additionally, it has been shown that with decreased mental imagery ability, there is an increase in excitability in cortical areas of the brain, and a decrease in activity in the visual cortex (Keogh, 2020) (Huang, 2015). This study is significant in studying mental imagery because it helps explain the mechanisms behind mental imagery, and the importance of glutamate in mental imagery, as it is an excitatory neurotransmitter, providing more evidence that imagery is a top-down process. Additionally, this study suggests that the medial prefrontal cortex plays a role in mental imagery. It is important to understand the mechanisms of mental imagery because activity in the cerebral areas of the brain indicates that imagery is occurring and the therapies are effective and being manipulated, which involves top-down processing. Additionally, if there isn't cortical activity in the brain, it provides the opportunity to change and manipulate imagery.

Mental imagery is also correlated with cortical excitability. According to a recent study (Keogh, 2020), when an individual has a decreased ability to produce mental images, cortical excitability is higher than someone with a stronger mental imagery ability. This study used the binocular rivalry technique to measure mental imagery strength, or the ability to create a clear mental image, and used fMRI technology to measure cortical excitability in the prefrontal cortex. Additionally, this study tested the effects of simulating excitability in the prefrontal cortex and decreased activity in the visual cortex of the brain using transcranial direct current stimulation (tDCS) and found that with increased excitability in the prefrontal cortex, mental imagery ability was reduced during this time. This part of the study tested the effects of excitability on imagery strength, whereas the fMRI portion tested the effects of mental imagery strength on excitability. This study is particularly important for understanding mental imagery because, in theory, cortical excitability changes in the brain during mental imagery provides further evidence that mental imagery is a top-down process because activity in the prefrontal cortex suggests that information is being processed in the higher-order brain areas. Additionally, most current mental imagery research primarily uses behavioral or observational data. Measuring neurobiological activity such as excitability gives researchers more solid, objective data, which can be more reliable than observational behavioral data.

Psychological Disorders: Social Phobia and Mental Imagery

Mental imagery also plays a large role in many psychological disorders, such as post-traumatic stress disorder (PTSD), phobias (e.g., social phobia), anxiety, and depression (Holmes, 2010). Mental images associated with such disorders are often negative, intrusive, or distressing, and play a large role in the emotions that a person experiences. In these disorders, imagery associated with the disorder is often involuntary, or not under conscious control of the individual. In PTSD for example, individuals have "flashbacks", or intrusive images of a certain distressing, traumatic event. Similarly, those who have social phobia, often referred to as social anxiety, imagine themselves experiencing severe symptoms of anxiety in social situations. They may, for example, "see" themselves displaying flushing or excessive sweating. The next section will go more in-depth on types of imagery-based therapies for treatment of social phobia.

Imagery-Based Therapies for Social Phobia

Mental imagery is sometimes used to treat mental illnesses such as anxiety disorders through cognitive behavioral therapy (CBT). Imagery-based cognitive behavioral therapy is a form of therapy which aims to treat psychological disorders using mental imagery. Traditional methods of exposure for treating anxiety disorders include in vivo exposure, or real-life exposure therapy. Flooding is a form of in vivo exposure in which the patient is rapidly exposed to a feared situation, and systematic desensitization is gradual exposure to a feared situation, and calming techniques are used when anxiety becomes too intense (Mcleod, n.d.). Because these traditional exposure methods rely on external stimuli to trigger imagery, the information processing method is likely bottom-up processing, meaning that conscious manipulation of mental imagery is not involved in this method. This reliance on bottom-up processing may be an important limitation of traditional exposure therapies. Although it may seem as though traditional therapies would have a greater effect than imagery-based CBT because they are being exposed to their "real-life fear" rather than just a mental image, research has shown that a percentage of patients are still symptomatic after treatment (Treanor, 2016).

Imagery-based cognitive behavioral therapy is a form of therapy which attempts to use imagery to treat psychological disorders. It has already been mentioned that imagery plays a large role in psychological disorders such as anxiety, depression, PTSD, and social phobia. Social phobia is an anxiety disorder in which patients get anxiety from social situations. A characteristic of this disorder is mental images portraying the patient experiencing extreme anxiety symptoms in a social situation. Research has shown that mental imagery has a stronger impact on emotion compared to verbal representations (Holmes, 2010). Especially when compared to a verbal representation, imagery has direct contact with emotional systems and creates an emotional response much greater than that created by a verbal representation of a stimulus. Verbal representations result in pairing a word with other associated words, resulting in less of an emotional response compared to imagery (Holmes, 2010). Emotional disorders can be characterized by having intrusive or distressing images, and in social phobia, this often includes mental images of the person having clear anxiety symptoms in social situations. This key characteristic of negative imagery involved in social phobia affects which form of exposure therapy would be most effective for treatment. This means that imagery could have more of an impact in therapy rather than just verbal-based therapy (Pearson, 2015).

To determine what type of imagery-based CBT might be most effective in treating anxiety-related disorders, a comprehensive recent review paper has compared relevant studies which harness emotional mental imagery in treating or improving anxiety (Pile, 2021). This paper compared several different applications of mental imagery in cognitive behavioral therapy, including imaginal exposure, systematic desensitization, hypnosis, imagery rescripting, guided imagery, enhancing positive imagery, and imagery-enhanced protocols. This paper not only compared these studies, but also gave a "traffic light rating" to all the studies that were investigated, based on the level of promise for each technique in treating anxiety and emotional disorders, which was determined by the outcome of each study. Green was the highest level of promise, or the most effective, orange was a somewhat good level of promise, and a red rating showed the least amount of promise for treating emotional disorders. The next few paragraphs will talk about this paper and the specific techniques used in the studies that were investigated.

Imaginal exposure is a strategy in which an individual is asked to repeatedly imagine a distressing image, and over time the amount of distress is reduced. Pile et.al. (2021) reports that six studies which tested imaginal exposure were reviewed, and 4 were given green traffic light ratings, whereas the other two were assigned orange. The two that were given orange ratings (or showed less promise), were the two oldest studies that were investigated, from 1984 and 1999. The others ranged from 2010-2018. Overall, three studies all showed improvement in PTSD symptoms, one study investigated adding eye movements (movement of the eyes in addition to mental imagery) to imaginal exposure, however, it showed no benefit, and another study showed no benefit of imaginal exposure unless the patients expected positive results from therapy. Additionally, the two studies rated orange aimed to treat anxiety, whereas the "green" studies were aiming to treat trauma. Based on the ratings of this paper, imaginal exposure shows less promise for treating anxiety rather than trauma. Because these results show less promise for anxiety, it would likely be less effective in treating social phobia, which is an anxiety disorder. Additionally, during imaginal exposure, the patient does not interact with the image so there may not be as much of a benefit to this technique compared to one in which they are interacting with the image. Interaction with the image is when the patient is "in the image" and changing the image by manipulating it while feeling as though they are experiencing the image. However, most techniques do not use interaction, in which the patient would just be "watching" the image occur. For example, if a patient were to imagine giving a speech, with no interaction they would just watch themselves give the speech or be passively giving a speech. On the other hand, interaction with the image would make them feel as though they are actively giving a speech, rather than passively watching themself, and they would be actively involved in changing the image. This could be important, as interaction with imagery could make it feel more real and produce a greater emotional effect because the individual would feel like they are experiencing the image.

Systematic desensitization with mental imagery is a technique in which the patient is asked to visualize a distressing image while practicing exercises to help them relax during the mental image. This takes place in a hierarchy format, in which the individual starts by visualizing the least distressing image of the stimulus, and increasingly visualizes more distressing images until their response is more relaxed during this image. According to Pile et al. (2021), all seven of the investigated studies were given a "green" rating, and were all either aiming to treat anxiety, depression, or both. Systematic desensitization is a somewhat more gradual approach compared to imaginal exposure seems as though it would have a similar effect as imaginal exposure. As with imaginal exposure, there isn't much active engagement with the image, as the patient is "getting used to" the image, rather than actively engaging with and changing the image to reduce emotional effect. Interaction with the image could be important, as it gives more of a sense of being a part of the image and being more present, rather than just watching it happen.

There was a total of eight studies that investigated hypnosis (Pile, 2021). Hypnosis is when the therapist induces a "trance-like state" in the individual and they seem to lose voluntary action, and this aims to help the individual face memories. One of the studies was given a red rating, and the other seven were given green ratings. However, the

number of sessions and participants of these studies varied greatly, so the data to support the effectiveness of hypnosis is questionable. Additionally, these studies all took place from 1972-2001, so there is no recent research on hypnosis. Thus, the evidence on the effectiveness of hypnosis is not supported very well, so before concluding how effective hypnosis is on treating anxiety, more current research would be helpful. Again, however, hypnosis does not involve active interaction with the image and thus may not be very therapeutically effective.

This review paper (Pile, 2021) also investigated imagery rescripting, in which participants were asked to imagine a distressing image, and then change the power or meaning of the image. A total of eight studies were looked at for imagery rescripting, and they were all given green ratings. Thus, results from this review paper suggest that imagery rescripting is likely very promising, perhaps specifically in terms of treating social phobia. This is because a defining characteristic of social phobia is mental images having severe and exaggerated symptoms of anxiety in a social situation, and changing the meaning or value of that image would be helpful (e.g., changing a negative outcome of a social situation to a positive one). Additionally, this could be helpful, as some people with social phobia have had past traumatic experiences which contributed to their disorder, so changing the meaning of past traumatic memories could also be beneficial (Wild, 2011). Importantly, unlike imaginal exposure, systematic desensitization with mental imagery, and hypnosis, imagery rescripting involves interaction with imagery, in which the image is changed by the patient, making the image feel more "real". This is because imagery rescripting involves both being present in the image, and manipulating the image, which would likely produce a greater emotional effect. Guided imagery was also looked at in this paper (Pile, 2021), which is where the individual is asked to focus on breathing and relax while imagining positive images, practicing a mindfulness-type state. Guided imagery had the largest number of studies with a total of 21, 16 of which aimed to reduce anxiety. Six of these were given an orange rating, whereas the other 10 were green. The other 5 studies related to trauma; 2 of these were rated orange, and 3 were rated green. One benefit of guided imagery is that the individual is practicing a form of mindfulness, or being aware of their surroundings, breathing, and sensory state while creating the mental image. This is a distinct benefit because it would create a sense of awareness in the mental image, and could make the person feel more present, as though the image is really happening. It helps the person recognize the details of the mental image in a way in which they would feel more like they are there. This is very similar to interaction, however, there is no conscious manipulation of imagery involved. However, again, a possible drawback of this is the person would not be interacting with any traumatic images, so there would not be a form of exposure that would provoke anxiety. Another method in the Pile et.al. (2021) review was enhancing positive imagery, in which the individual is given instruction on a detailed positive image to visualize, and there can be variation in what type of image they are instructed to imagine. A total of 12 studies using enhancing positive imagery were compiled and rated, 8 of which were given green ratings, and the other 4 were rated orange. Just like guided imagery, and hypnosis, there is not any interaction with traumatic or distressing images in this method, but this procedure would likely be more effective in helping to calm someone rather than identifying what is causing them distress and reducing the emotional response. This is because it does not target the source of anxiety, or even involve negative mental imagery, as the purpose of this method is to create positive mental images that would have a calming effect in an anxiety-provoking situation rather than reducing the emotional response directly coming from the situation.

The final technique this paper (Pile, 2021) looked at was imagery-enhanced protocols. This involves interventions using both positive and negative imagery (e.g., combining imagery rescripting of an aversive image with enhancing positive imagery). There were four studies that were rated, all of which were rated green; two aimed at reducing anxiety, and one aimed to improve depression. Pile et al. (2021) stated that imagery-enhanced protocols indicated the most potential, along with interventions with imagery rescripting for aversive memories, and positive imagery. This is because they had high success rates when being tested, and the method, in theory, seems as though it would have a great effect. This method could be very effective, as it involves both interaction with imagery combined with positive imagery, so this method shows a lot of potential.

In summary, this paper (Pile, 2021) suggested that imagery rescripting, enhancing positive imagery, and imagery-enhanced protocols showed the most promise out of all the techniques that were looked at. Evidence shows that imagery rescripting combined with positive imagery is a very effective tool used to treat emotional disorders, and it could be very useful in treating social phobia as well. Research has shown that negative images involved in social phobia are often linked to traumatic memories, and rescripting, or changing the meaning of these images has been proven to be effective with treating social phobia (Wild, 2011). This combined with positive imagery interventions, or enhancing positive imagery while changing the meaning of negative imagery could be very beneficial to those with social phobia. As far as singular imagery-based techniques, imagery rescripting seems as though it is the most effective singular method, but combination with positive imagery could also be effective. Imagery rescripting and imagery-enhanced protocols both involve interaction because of the conscious manipulation

and being present in the image, whereas positive imagery does not, so imagery rescripting and imagery-enhanced protocols would be more effective.

Some methods do not have current research yet, for example, Holmes and Matthews (2010) suggest the "seeing is not believing" method, recognizing that mental images are not reality (in terms of distressing images). They also suggest reduction through competition (ex. Performing a physical task to keep from imagining a distressing image). While directly encouraging positive imagery would be helpful in reducing anxiety temporarily, it seems as though it would not be as effective long-term, as it does not target the source of distress and attempt to fix it, rather, it "suppresses" the negative imagery by encouraging only positive images. Holmes and Matthews (2010) suggested that "seeing is not believing" could be a method used to differentiate between real situations and mental imagery, which I believe is also a very useful and important tool which could also be used to treat social phobia. This method involves recognizing that images are not reality. Because social phobia is associated with negative self-images which portray unrealistic symptoms of anxiety (Hirsch, 2007), recognizing that these negative self-images are not reality also seems like a very beneficial tool for treating social phobia.

Which Form of Therapy Would be Most Effective in Treating Social Phobia?

Social phobia is a disorder in which the person has a fear of social situations, resulting in feelings of anxiety. This disorder also includes negative mental imagery, often in which the person imagines themselves showing extreme anxiety symptoms in social situations (e.g., flushing or intense sweating). Social phobia can also result from a traumatic event which happened earlier in life (Wild, 2011).

From previous research, I believe that the most effective form of CBT for treating social phobia is imagery rescripting. Although the "seeing is not believing" method seems promising, there has not been much research done on this method, so there is more evidence on the effectiveness of imagery rescripting in general, and specifically for social phobia. A benefit of imagery rescripting for social phobia is that it targets several factors of the disorder. For example, social phobia can originate from a traumatic memory (Wild, 2011), so imagery rescripting can change the meaning of that memory (e.g., a memory in which they were embarrassed in a social situation, changing the meaning from "I am embarrassed" to "I am not embarrassed"). Additionally, the meaning of the negative mental images (not associated with memories) associated with social phobia can be changed (e.g., changing an image of a negative outcome from a social situation to a positive one).

Compared to other techniques used in imagery-based CBT, imagery rescripting also shows the most promise because it involves interaction with the image, rather than just passively "witnessing" the image. This could be important because it creates the feeling that the individual is a part of the image while changing the image, compared to other methods such as imaginal exposure or systematic desensitization, in which the individual is simply imagining the image, and not changing it in any way. For example, interaction would be like talking to a person, rather than watching a video of yourself talking to someone. This is because the patient would be present and actively manipulating the situation, rather than watching it happen. Additionally, this method identifies the negative mental images or source of anxiety, and changes them, as some other methods only use positive imagery. However, research has also shown that imagery rescripting combined with interventions of positive imagery has shown to be effective in treating emotional disorders, relating to both trauma and anxiety (Pile, 2021), so this could also be very effective in treating social phobia.

However, the "seeing is not believing" method could be effective as well, because imagery interaction is involved. Although this method hasn't been studied as much as imagery rescripting, it could be promising for treating social phobia. This is because social phobia is associated with often unrealistic mental imagery, portraying the individual experiencing exaggerated symptoms of anxiety in social situations. Through "seeing is not believing", this could help the patient come to terms with reality, and realize that their negative mental images are unrealistic, and not what would happen in a social situation, even without imagery interaction. Additionally, this method could also be used in helping the patient understand that even if they were experiencing these severe symptoms, people around them would not particularly care or have a negative reaction to their symptoms.

This leads to the question, is imagery-based CBT effective than traditional CBT exposure methods (for example, real-life exposure and systematic desensitization). I believe the answer is yes, for a few reasons. One reason relates to the neuroscience behind mental imagery, as mental imagery is a form of top-down processing, whereas real-life exposure to a fear is a form of bottom-up processing (as the emotional response results from external stimuli), that is primarily driven by sensation. Real-life exposure is based on using external stimuli to produce an emotional effect on a higher level of information processing, making it a form of bottom-up processing. Additionally, bottom-up processing primarily uses lower-level processes and does not involve conscious

manipulation of imagery, so you are not able to manipulate imagery to make therapy more effective. On the other hand, because imagery is a form of top-down processing, it could show a more beneficial outcome in therapy. This is because CBT can directly relate to interacting with imagery, involving conscious manipulation by cognitive processes, distinguishing it from traditional exposure methods.

Another reason traditional exposure therapy may be less effective is that it can be done in fewer situations than CBT. For example, you can use a form of CBT to reduce anxiety while driving a car, whereas traditional exposure can't be done while driving. Imagery-based CBT, however, can be done anywhere, as the only materials needed are the patient and their brain. This does not only apply to imagery rescripting, but most forms of imagery-based CBT, because they can be done even when the patient is alone. If the patient is exposed to a triggering stimulus outside of a clinical setting, they can possibly use imagery techniques to cope with their fear and know what to do.

Recommendations for Future Therapies and Research

Although imagery-based CBT could be more effective than traditional therapy, could they be better together? Combining real-life exposure and a mental imagery-based technique could possibly be an effective method for treating social phobia. This could not only help the person get more "used to" experiencing their fear in real life while gaining the benefits of imagery-based CBT, but also teach them how to utilize the mental imagery techniques they were taught in social situations, so they can use the techniques again and again. Forming this habit and getting used to using mental imagery to help overcome their fear could be a beneficial therapeutic technique.

Although many methods of imagery-based CBT could possibly be very helpful in treating social phobia (and other anxiety disorders), when combined with in vivo exposure therapy, these methods seem to show the most promise. A possible imagery-based CBT technique that could be combined with in vivo exposure therapy could be positive imagery, or "seeing is not believing". These could be effective because "seeing is not believing" helps the patient realize that their mental images are unrealistic and would not actually happen, and experiencing this fear in real life can assist with this. So, in vivo exposure therapy could assist the "seeing is not believing" technique, by helping the patient differentiate mental imagery from reality. The other method which could be combined with in vivo exposure therapy is enhancing positive imagery, which could be used more as an anxiety coping technique, rather than recognizing unrealistic mental imagery. Imagining positive images can help the patient cope with anxiety occurring from the situation, as well as help them build a habit of imagining themselves in a more positive situation while being exposed, so they can use this technique in real day-to-day life.

Another possible future method of treating social phobia could also be a combination of imagery rescripting combined with "seeing is not believing". This method would start with imagery rescripting, in which the meaning of the images is changed from a negative meaning to a positive meaning. After imagery rescripting, "seeing is not believing" could help the patient realize that their imagery was not only unrealistic, but even if it was realistic, it would not produce a negative effect. Imagery rescripting could also be followed by in vivo (real-life) exposure therapy, as it may produce a similar effect in terms of realizing that imagery is not reality.

In the future, possible research could include studying which treatment method could be most effective for treating social phobia, comparing all methods specifically for social phobia. Additionally, this could include in vivo exposure therapy compared to imagery-based CBT, for more solid research on this topic. This would create a more reliable conclusion on which form of CBT is most effective for treating social phobia, and whether in vivo exposure therapy is more or less effective than CBT.

Another research topic which could possibly be very helpful is the neural mechanisms of exposure therapy compared to cognitive behavioral therapy, as this would provide further evidence to decide which form of therapy is most effective, as well as give quantitative data rather than observational, for more evidence to support a claim.

Conclusion

In summary, this paper reviewed current literature to hypothesize which form of imagery-based cognitive exposure therapy is most effective for treating social phobia, more commonly known as social anxiety disorder. Mental imagery is related to many cognitive processes, including sensation and perception, but shares more of a relation to perception, as they are both forms of top-down processing, and don't require external stimuli to occur. Mental imagery is also involved in other processes, such as memory, spatial navigation, conceptual thinking, and decision making. Mental imagery also plays a very large role in emotional disorders, as many anxiety disorders involve involuntary imagery portraying negative situations or flashbacks. Imagery can also be used to treat these

disorders through imagery-based cognitive behavioral therapy, using methods such as imagery rescripting, guided imagery, systematic desensitization, etc.

It has been hypothesized that imagery rescripting is the most effective singular form of imagery-based cognitive behavioral therapy to treat social phobia for several reasons. One reason being that imagery rescripting can change the meaning of not only traumatic images, but current negative images that contribute to the disorder. Additionally, conscious interaction via manipulation of the images involves top-down processing, which could make it more effective. Lastly, in vivo exposure could be less effective than CBT for treating emotional disorders, as it is a form of bottom-up processing, so there is no conscious manipulation of imagery involved in this process, and it could be less effective than CBT.

References

Ganis, G., Thompson, W. L., Mast, F., & Kosslyn, S. M. (2004). The Brain's Mind's Images: The Cognitive Neuroscience of Mental Imagery. In M. S. Gazzaniga (Ed.), The cognitive neurosciences (pp. 931–941). Boston Review.

Hirsch, C. R., & Holmes, E. A. (2007). Mental imagery in anxiety disorders. *Psychiatry*, *6*(4), 161–165. https://doi.org/10.1016/j.mppsy.2007.01.005

Holmes, E. A., & Mathews, A. (2010). Mental imagery in emotion and emotional disorders. *Clinical Psychology Review*, *30*(3), 349–362. https://doi.org/10.1016/j.cpr.2010.01.001

Huang, Z., Davis Iv, H. H., Yue, Q., Wiebking, C., Duncan, N. W., Zhang, J., Wagner, N. F., Wolff, A., & Northoff, G. (2015). Increase in glutamate/glutamine concentration in the medial prefrontal cortex during mental imagery: A combined functional mrs and fMRI study. *Human Brain Mapping*, *36*(8), 3204–3212. https://doi.org/10.1002/hbm.22841

Mcleod, S. (n.d.). *Aversion therapy*. Behavioral Therapy | Simply Psychology. Retrieved August 4, 2022, from https://www.simplypsychology.org/flooding.html

Pearson, J., Naselaris, T., Holmes, E. A., & Kosslyn, S. M. (2015). Mental Imagery: Functional Mechanisms and Clinical Applications. *Trends in Cognitive Sciences*, *19*(10), 590–602. https://doi.org/10.1016/j.tics.2015.08.003

Pearson, J. (2019). The human imagination: the cognitive neuroscience of visual mental imagery. *Nature Reviews Neuroscience*, *20*(10), 624–634. https://doi.org/10.1038/s41583-019-0202-9

Keogh, R., Bergmann, J., & Pearson, J. (2020). Cortical excitability controls the strength of mental imagery. eLife, 9, e50232. https://doi.org/10.7554/eLife.50232

Treanor, M., & Craske, M. G. (2016). Exposure therapy. *Encyclopedia of Mental Health*, 181–185. https://doi.org/10.1016/b978-0-12-397045-9.00024-0

Wild, J., & Clark, D. M. (2011). Imagery rescripting of early traumatic memories in social phobia. Cognitive and Behavioral Practice, 18(4), 433–443. https://doi.org/10.1016/j.cbpra.2011.03.002

Pile, V., Williamson, G., Saunders, A., Holmes, E. A., & Lau, J. Y. (2021). Harnessing emotional mental imagery to reduce anxiety and depression in young people: An integrative review of progress and promise. *The Lancet Psychiatry*, *8*(9), 836–852. https://doi.org/10.1016/s2215-0366(21)00195-4