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Contrast avoidance model of worry and generalized anxiety disorder: A theoretical perspective

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Abstract: The Contrast avoidance model (CAM) suggests that individuals with generalized anxiety disorder (GAD) avoid negative emotional contrasts (shifts) by creating and sustaining negative emotions through worry, and the main fear in these individuals is negative emotional contrasts. The purpose of the present study is to review studies on the CAM and its underlying assumptions, studies supporting and criticizing the model, and emotional factors related to the development of contrast avoidance (CA) tendencies with a focus on the transdiagnostic nature of the CAM and respective principles. Moreover, we reviewed a two-pronged treatment method based on the CAM. Finally, we proposed several research suggestions and emphasized on the importance of studying different aspects of the CAM in order to support its applicability to emotional disorders other than GAD.

Subjects: Psychiatry & Clinical Psychology - Adult; Anxiety in Adults; Cognitive Behavior Therapy; Anxiety & Mood Disorders

Keywords: contrast avoidance model; worry; generalized anxiety disorder; emotion; theoretical perspective

1. Introduction

Worry as a form of repetitive negative thinking is a transdiagnostic construct, and it is a core mechanism in anxiety and mood disorders (Drost et al., 2014; McEvoy et al., 2013). Besides, worry has an impact on the manifestation of numerous psychological symptoms such as anxiety, depression, paranoia, and abnormal eating patterns (Freeman et al., 2011; Muris et al., 2005; Sassaroli et al., 2006). Worry is defined as a chain of repetitive and uncontrollable thoughts about possible future negative events (Roemer & Borkovec, 1993). Almost all individuals experience worry during their lifetime, but in GAD, worry is experienced as extreme, chronic, and uncontrollable (American Psychiatric Association,

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PUBLIC INTEREST STATEMENT

Given the high prevalence of generalized anxiety disorder, different theoretical models have been proposed to explain its etiology and maintaining factors. However, Contrast Avoidance model with a unique emphasis on the shifts between negative and positive emotions in the development and maintenance of generalized anxiety disorder presents an entirely new perspective on this subject. This study aims to take a closer look at this model and review the studies supporting its tenets. With the knowledge presented in this article, researchers would able to conduct further studies for developing the model.

2013). Because of transdiagnostic features, GAD is considered as basic disorder (Ruscio et al., 2007). The lifetime prevalence of GAD was estimated to be 4.3%-5.9% (Bandelow et al., 2013). Also, GAD has high comorbidity with other disorders, especially major depression (Kessler et al., 2005). It has also been reported that GAD causes role impairment as much as clinical diseases (e.g., Autoimmune disease, Arthritis, Alonso et al., 2011). Considering that worry causes long-lasting cardiovascular activity so that it may affect the incidence of these diseases (Barger & Sydeman, 2005).

According to the above, it seems that the detection, prevention, and treatment of GAD are vital. In this regard, several therapies have been designed based on various theoretical models. Although traditional cognitive-behavioral therapy has been shown efficacy in GAD treatment, however, symptoms of the disorder remain in more than 50% of the patients (Fisher, 2006; Hunot et al., 2007). Therefore, an extensive understanding of GAD possibly improves its treatment.

Over recent years, research interest in GAD has increased, and several models have been proposed for explaining this disorder. These models mainly emphasize on the role of worry as a means to avoid distressing emotions. They claim that worry has an avoidance function (e.g., Behar et al., 2009). The initiation of these theories was based on Borkovec's cognitive avoidance theory (Borkovec et al., 2004). This model is based on the two-stage theory of fear (Mowrer, 1947), as well as the Foa and Kozak's emotional processing model (Foa & Kozak, 1986). The cognitive avoidance model claims that worry has a verbal-linguistic nature and acts as an avoidance strategy to inhibit clear mental images and associated somatic and emotional activation (Borkovec et al., 2004). The inhibition of somatic responses and mental images prevents the emotional processing of fear, and thus prolongs worry. In line with the cognitive avoidance model, intolerance of uncertainty model (IUM, Dugas et al., 2004) and emotion dysregulation model (EDM, Mennin, 2004) also claim that worry is a way to decrease sympathetic arousal.

In contrast, many studies have shown that worry, creates and sustains the arousal in individuals with or without GAD, instead of reducing mental and physiological arousal (For a review, Newman & Llera, 2011). Newman & Llera (2011) introduced the CAM in order to describe the emotion regulation difficulties with an emphasis on the arousal, negative mood, and psychological distress caused by worry, which underlies the worry maintenance. The present study aims to review studies supporting the CAM and emotional factors related to the development of CA tendencies. Our focus was on the studies that indicate the CAM could be a transdiagnostic model, and its principles could be applied in a range of emotional disorders. Also, along with supporting studies, we reviewed studies that criticized the CAM. We also included a treatment method based on the CAM in our study.

2. Contrast avoidance model

The affective contrast theory proposed by Bacon et al. (1914) is rooted in cognitive psychology. It suggests that the effect of emotional experience is conditional on the degree of contrast that has with the preceding emotional state. That is, the preceding emotional state determines the effect of an emotional experience. An unpleasant emotional state following a pleasant emotional state is perceived as more unpleasant, and following an unpleasant emotional state is perceived as less unpleasant. Newman & Llera (2011) , inspired by this theory as well as new laboratory findings (Llera & Newman, 2010), established the CAM. This model attempts to answer these two questions: (a) why people with GAD have a positive view about worry; and (b) given the awareness that chronic worry prolongs negative emotionality, why do they engage in worry. According to the CAM, the main fear of people with GAD is negative emotional contrasts. They actively use worry to create and maintain a constant and stable emotional state. Being in a negative emotional state helps them to be emotionally prepared for possible negative events in the future and avoid a sudden shift in their negative emotion. In other words, it keeps people with GAD in a state of vigilance and anxiety, and if something bad happens, they will not experience a sharp increase in their negative emotion, because they are already in a negative emotional state. This refers to avoiding from a negative emotional contrast.

This model also assumes that the worry increases the probability of experiencing positive emotional contrast. Positive emotional contrast occurs when a person is worried about a bad and negative event in the future. However, contrary to his/her expectation, that event does not happen, or something good happens instead. In this case, his/her emotions will shift from a negative state to a neutral or positive one. Studies have revealed that the majority of worries of people with GAD do not come true. The percentage of untrue worries in two different studies was calculated as 85–91% (Borkovec et al., 1999) and 91.4% (LaFreniere & Newman, 2019a). Thus, the possibility of experiencing positive emotional contrast in these individuals is very high. Positive emotional contrasts implicate that the person experiences a relief after worry. Positive emotional contrast, due to the elimination of the aversive nature of worries, is negatively reinforced, leading to continued worry. That is, in order to avoid a sudden negative emotional shift, the person puts himself/herself in a negative emotional state through worry.

On the other hand, if that feared negative event happens, the individual will not experience aversive negative emotional contrast because he/she already was emotionally prepared for this and was in a negative emotional state. Considering that he/she will experience positive emotional contrast more likely following worry or will not experience negative contrast following a feared negative event in the future, a vicious cycle is formed. In general, based on the CAM, the emotion regulation strategy in individuals with GAD is to keep themselves in a negative emotion through worry, so that they will not experience a sharp shift in negative emotions. In other words, these individuals, in addition to actively use of worry for reducing the possibility of experiencing a negative emotional shift, will continue to worry to maintain a prolonged and stable emotional state in order to prevent experiencing a negative emotional contrast in the future.

3. The principles of the CAM

Llera and Newman (2017) introduced three basic principles of the CAM. Preliminary evidence suggests that the CAM could be applicable as a transdiagnostic model (Newman et al., 2018; Kim & Newman, 2016). Therefore, our purpose is to define the principles of the CAM, to review studies supporting these principles, and to highlight the transdiagnostic importance of the CAM.

3.1. The main fear in individuals with GAD is a sharp shift in negative emotions

The CAM claims that the main fear of individuals with GAD is a negative emotional contrast, which has a unique position among other theoretical models (Dugas et al., 2004; Mennin, 2004; Wells, 2006). Contrary to previous models, the CAM suggests that worry is used as a way to avoid a sharp increase in unpleasant emotions by increasing and sustaining negative emotions. According to the CAM, worry actively induces negative emotion as a way to avoid an emotional contrast. Many studies show that individuals with GAD experience emotions as threatening, intense, out of control, and distressing more than those with other anxiety and mood disorders (Newman & Llera, 2011). Problems in controlling and regulating emotions in GAD are also more than other disorders (Mennin et al., 2009). From the viewpoint of these individuals, the emotions are difficult to understand and hardly could be relieved. Also, people with GAD perceive emotions as overwhelming and dangerous, which affect their behavioral performance and sense of well-being (Mennin et al., 2002). Moreover, individuals with GAD have difficulty regulating their emotions and believe themselves as poor emotion regulators. As well as, These individuals less frequently use adaptive emotion regulation strategies such as cognitive reappraisal than the control group (Kerns et al., 2014). These emotion regulation problems may lead the individuals with GAD to engage in worry actively in order to be emotionally prepared against a sudden increase in the negative emotion.

Data from a neuroimaging study supports the notion that individuals with GAD have difficulty in experiencing negative emotional shifts. So that, they demonstrated more connectivity in the emotion-related brain areas (Middle Cingulate Cortex of left posterior, amygdala and insula) when experiencing a negative emotional shift compared to those with social anxiety disorder, panic disorder, and healthy control group, indicating more emotional reactivity in facing with these emotional shifts (Buff et al., 2016).

Studies on the CAM provide supporting evidence for the first principle. In an 8-week experience sampling study, it was found that individuals with more GAD symptoms rated their negative emotional contrast experiences as the worst events during the week leading to more negative emotional experiences (Crouch et al., 2017).

Intolerance of uncertainty (IU) is the tendency to react negatively at an emotional, cognitive, and behavioral level to uncertain situations and events (Dugas et al., 2004). IU consists of prospective and inhibitory components. Individuals high in trait prospective IU (which is uniquely associated with GAD) were unable to disengage in worry, even when certainty provided, and they experienced sustained negative emotions (Ranney et al., 2018). Maybe uncertainty about experiencing a negative emotional contrast lead these individuals to keep themselves in a negative emotion through worry. However, more studies are required to investigate the contribution of intolerance of uncertainty in CA.

The studies mentioned above indicate that individuals with GAD experience difficulty in experiencing negative emotional contrasts. However, it is essential to investigate that the avoidance from negative emotional contrast might be a transdiagnostic process that can be observed in other disorders. An experimental study aimed to investigate the contribution of rumination (which have discussed in detail below) in CA, found that individuals with GAD and major depressive disorder (MDD) compared to controls reported that the worry and rumination lead to more negative emotions (Kim & Newman, 2016). Preliminary evidence suggests that other forms of repetitive negative thinking (such as rumination) acts as an emotion regulation mechanism proposed by the CAM, which facilitates avoidance from negative emotional contrasts. The findings of the other studies regarding the rumination and principles of the CAM are discussed below in the respective parts.

Consistent with the first principle of the CAM, these data indicate that individuals with GAD have difficulties in experiencing negative emotional contrasts, and that is because they prefer to be in a negative and stable emotional state. So, they would not experience negative emotional contrasts. However, this process might be present in other emotional disorders.

3.2. Worry creates and sustains negative emotion

The CAM claims that worry causes heightened negative emotionality. Therefore, worry just before experiencing a negative or unpleasant event prevents an increase in negative emotions (Llera & Newman, 2014). This claim is based on numerous studies suggesting that worry, compared to baseline or a nonworry period, creates and sustains negative emotions, and physiological arousal (Llera & Newman, 2010). This aspect of the model is unique among other models of worry and GAD.

Considering the association between IU and higher levels of worry (Dugas & Robichaud, 2007), a study found that during worry induction, participants with high levels of IU indicated lower high-frequency heart rate variability (HRV) (Deschênes et al., 2016). In another study, it was found that in general, people with GAD have lower HRV than healthy controls which indicates that these individuals show more stress responses (Aldao & Mennin, 2012; Levine et al., 2016; Ottaviani et al., 2016; Seeley et al., 2016). Also, trait worry is associated with higher heart rate and skin conductance and lower HRV during sleep (Brosschot et al., 2007; Weise et al., 2013). A study which used daily worry reports and morning cortisol level to examine the relationship between adolescents' worry and the Hypothalamic-Pituitary-Adrenal (HPA) axis activity and health symptoms, found that cortisol level increased after days full of worry. However, the increase was seen only in females. This study showed that worry increases the activity of the HPA axis (Arbel et al., 2017), which leads to the emergence of stable physiological symptoms. These findings indicate that worry compared to baseline increases physiological arousal, which is consistent with the second principle of the CAM.

In the subjective measurement of arousal caused by worry, similar results were achieved. In a prospective study on the CAM, it was shown that worry and negative contrast are related to negative emotionality. Meanwhile, in the same study, worry reduced the effect of negative

emotional contrast (Crouch et al., 2017). It has also been found that worry is associated with a concurrent and prolonged negative emotional state and predicts less contrast in negative emotion during the next hour (Newman et al., 2016).

Worry Outcome Journal (WOJ) is a cognitive behavioral therapy for GAD that was developed to target the untrue predictions specifically. In a study conducted by LaFreniere and Newman (2019a), it was revealed that individuals with GAD at the beginning of the treatment rated their worry-related distress a moderate to high, which is consistent with the CAM representing that worry has a high relationship with distress.

Studies mentioned above are consistent with the second principle of the CAM, and all agree that worry creates and sustains emotional and physiological arousal. However, reviewing the other types of Repetitive Negative Thinking (RNT) could help us to acquire a broad and transdiagnostic point of view to the CAM. Rumination—one of the hallmark symptoms of MDD- is another form of RNT, and it is a transdiagnostic factor in emotional disorders (McLaughlin & Nolen-Hoeksema, 2011). While rumination, individuals with MDD repetitively think about negatively valenced content about past failures, current problems, and mood states (Davidson et al., 2002; Martin & Tesser, 1996). Rumination is a vulnerability factor in the development of MDD (Just & Alloy, 1997) and exacerbating negative mood (Nolen-hoeksema & Morrow, 1993). Rumination and worry are similar to each other in some respects. For example, Rumination is associated with a more extreme and prolonged depressive mood (McLaughlin et al., 2007; Moberly & Watkins, 2008; Nolen-Hoeksema, 1991). Besides, it increases physiological arousal like systolic and diastolic blood pressure, heart rate, and subjective distress compared to distraction (Ottaviani et al., 2011). Heightened negative affect caused by rumination leads to reduced ability to engage in effective problem-solving and maladaptive behaviors (McLaughlin et al., 2007; Nolen-Hoeksema et al., 2008).

Finally, individuals with MDD, similar to those with GAD, hold positive beliefs about rumination (Papageorgiou & Wells, 2003; Watkins & Moulds, 2005; Watkins et al., 2005). Thus, it is essential to review whether rumination, like worry, facilitates avoidance from emotional contrast and leads to the maintenance of the disorder. A neuroimaging study showed that during worry and rumination, there was prominent activity in the anterior cingulate cortex (ACC), left insula, bilateral dorsolateral prefrontal cortex (DLPFC), right hippocampus and bilateral inferior temporal gyrus (ITG) in contrast to the neutral state. Also, participants reported more unpleasant feelings during worry and rumination induction compared with neutral thinking, which states that the presented words are associated with the activation of emotional networks. In both types of RNT, increased insula activity was observed in the present study. This finding is in contrast to the findings of previous studies that have shown reduced insula activity during worry condition compared to the neutral state. The function of the insula is the perception of the feeling states (Craig, 2003; Critchley et al., 2004), and it is involved in the recall and generation of emotions (Damasio et al., 2000). However, the results of the study show that the participants have actively engaged in worry and rumination (Steinfurth et al., 2017). As shown in the study by Andreescu et al. (2015), worry induction increases the functional association between the insula and orbitofrontal cortex (the brain region that plays a role in anticipating the negative affective value of the future events). In addition to neuroimaging studies, empirical studies also indicate that worry and rumination may have shared underlying mechanisms that result in the maintenance of GAD and MDD, respectively.

Another finding of Kim and Newman's study (Kim & Newman, 2016) was that compared to the baseline state, in individuals with GAD and MDD, worry and rumination before exposing to negative emotional film clips, decreased the chance of experiencing negative emotional contrast after exposing to those film clips in both disorders, while relaxation has led to increased negative emotional contrast.

Preliminary data suggest that emotion regulation mechanisms proposed by the CAM could apply to rumination and MDD. To broaden our knowledge about CAM, it is important to investigate the underlying mechanisms related to the development and maintenance of a range of emotional

disorders from the perspective of the CAM. It has been demonstrated that individuals with obsessive-compulsive disorder (OCD), social anxiety disorder, and Panic disorder have lower HRV than healthy controls (Pittig et al., 2013). This finding could represent that contrast avoidance tendencies may have a role in the etiology of the mentioned disorders. Consistent with the CAM, a study demonstrated that worry is related to the hyperarousal symptoms of Post Traumatic Stress Disorder (PTSD), and hypervigilance observed in PTSD eliminates danger through eliminating uncertainty (Bardeen et al., 2012). Again, uncertainty about experiencing negative emotional contrast might explain this finding. Nonetheless, no study directly investigated the assumptions of the CAM in the general category of emotional disorders.

3.3. People with GAD enjoy transient positive emotional states (positive emotional contrast)

Given that individuals with GAD avoid negative emotional contrasts, so the positive emotional state for these people is undesirable. Therefore, they try to create and sustain a negative and lasting emotional state. In this case, they will not be vulnerable to the negative emotional contrast experience because they are already in a negative emotional state. The purpose of traditional cognitive-behavioral therapy is to reduce worry, which, due to the mentioned problem, faces difficulties in the treatment of GAD. In other words, reducing worry for people with GAD means losing a protective shield against possible future events (Llera & Newman, 2014). Based on the CAM, individuals with GAD do not avoid all the positive emotions, and transient positive emotional states (for example, a relief after a feared outcome) are pleasant for them (Llera & Newman, 2017). However, they prefer to sustain a negative emotion in order to prevent getting caught by negative events.

Applied relaxation (AR; Ost, 1987) is introduced as an essential component of cognitive-behavioral therapy for GAD (Chambless & Ollendick, 2001). AR is a coping strategy that helps people to get relaxed and decrease anxiety response quickly. AR has shown efficacy in the treatment of anxiety (Barlow et al., 1992; Bolognesi et al., 2014; Borkovec & Costello, 1993; Ost & Breitholtz, 2000; Siev & Chambless, 2007). AR in some individuals, however, paradoxically increases anxiety, which is referred to as relaxation induced anxiety (RIA) (Heide & Borkovec, 1983). RIA is defined as a sudden increase in anxiety, body tension, or anxious thoughts and mental images while trying to be relaxed (Heide & Borkovec, 1983).

Kim and Newman (2019), considering the commonalities mentioned above of GAD and MDD, investigated the negative contrast sensitivity as a mediator of the relationship between both disorders and RIA. Results indicated that the negative contrast sensitivity construct fully mediated the relationship between GAD and RIA and partially mediated the relationship between MDD and RIA. They proposed that MDD may have an additional mediator and anhedonia, one of the hallmark symptoms of MDD, which characterizes with inability in feeling pleasure and decreased interest in positive activities, could be this additional mediator. Anhedonia might exacerbate the RIA by preventing feeling pleasure from relaxation. This finding is consistent with the principles of the CAM that being in a transient positive/neutral emotional state leads to the emotional vulnerability of these individuals to the experiencing negative emotional contrast (Llera & Newman, 2014). Also, these findings indicate the role of negative contrast sensitivity in MDD.

Moreover, studies that have conducted so far demonstrated the RIA in individuals with panic disorder (Cohen et al., 1985; Ley, 1988; Wells, 1990). It seems that negative contrast sensitivity and RIA are transdiagnostic constructs and contribute to other disorders (Kim & Newman, 2019). Thus, future studies could develop the CAM by transdiagnostic examination of contrast sensitivity in emotional disorders.

The role of relaxation in anxiety and fear of losing control as potential reasons for RIA are similar to the tenets of the CAM. Unlike the previous models that claimed worry decreases anxiety, the CAM suggests that worry in individuals with anxiety increases negative emotion. These individuals prefer to sustain heightened negative emotion as a protection against a sharp increase in negative affect. Like what we see in RIA, the CAM proposes that being in a relaxed state increases the possibility of

experiencing a sudden increase in negative emotions in facing a stressful event. Consequently, fear of losing control causes anxious individuals to prefer feeling anxious over feeling relaxed during the relaxation process (Kim & Newman, 2019; Llera & Newman, Llera & Newman, 2014).

In a study, Newman et al. (2018) showed that 80% of a GAD sample that received progressive and applied relaxation as a part of their treatment, experienced moderate to high peaks in RIA. In another study, which asked participants with GAD to reduce their negative emotional state by adaptive methods, similar results were obtained. After experiencing a negative emotional state, these patients experienced more distress (Newman et al., 2018). At a neutral level, during the worry reappraisal task, individuals with GAD have indicated a higher relationship between the paraventricular nucleus (PVN) and right amygdala than the nonanxious control group, suggesting that attempts to reduce their worry, is a trigger to stress response (Andreescu et al., 2015). The finding which is consistent with recent studies suggests that although worry may reduce the possibility of experiencing a negative emotional contrast, it will increase the likelihood of experiencing a positive emotional contrast (Newman et al., 2016; Llera & Newman, 2014; Kim & Newman, 2016).

Efforts of individuals with GAD in order to control worry is another essential aspect of GAD. For example, these individuals use more cognitive and behavioral avoidance, safety behaviors, and reassurance seeking strategies to control their worries than healthy controls. This finding could be considered from the perspective of the CAM. It seems that these behaviors reduce the worry in individuals with GAD in the short term, but this reduction makes them vulnerable to experiencing a sharp increase in negative emotion. So, in order to escape experiencing negative emotional contrast, they actively start to worry again (Llera & Newman, 2014). This could be a research suggestion for future studies.

To sum up, the studies reviewed above provide considerable empirical support for the three principles of CAM. Also, We reviewed studies that indicate the principles of the CAM, might apply to disorders like MDD, OCD, and PTSD. These studies also indicate that CA tendencies could be applied as a transdiagnostic construct in a range of emotional disorders, and there might be shared mechanisms among these disorders. However, it should be noted that the application of one or two principles to another disorder like MDD, does not mean that CAM can explain that disorder. Besides, these principles are mainly proposed for GAD, and there is a need to develop principles based on the CAM, which primarily addresses CA in other disorders or transdiagnostic mechanisms that cut across anxiety and mood disorders. To the best of our knowledge, no study in the literature has studied CAM directly in the context of anxiety and mood disorders. Fortunately, research on this subject from the perspective of the CAM continues to develop, and future studies will reveal the applicability of the model to the emotional disorders other than GAD.

4. Emotional factors related to the development of contrast avoidance tendencies

Some different factors are related to the development of CA tendencies. Here, we mainly focused on the emotional vulnerability factors that may contribute to the pathologic process proposed by the CAM. First, individuals with GAD are more sensitive to emotion than others (Rutter et al., 2019). A study aimed to compare emotional sensitivity in individuals with GAD, social anxiety disorder, and healthy controls showed that GAD participants have higher emotional sensitivity compared to other diagnostic groups (Bui et al., 2017). So, it could be understood that they prefer to keep a stable emotional state rather than experiencing ups and downs. Heightened emotional intensity is another important emotional factor related to the development of emotional problems in GAD. Heightened emotional intensity strongly associated with GAD (Mennin et al., 2009). However, it could not lead to the development of psychopathology in itself, but increases the need for proper emotion regulation strategies. Studies have shown that GAD has a unique and robust relationship with emotional intensity and maladaptive emotion regulation strategies (Mennin et al., 2007). Emotion dysregulation problems in individuals with GAD leads them to use maladaptive emotion regulation strategies, such as worry. (Mennin et al., 2005). Therefore, emotional sensitivity, heightened emotional intensity, and maladaptive emotion regulation strategies might lead the

individuals with GAD to experience negative emotional contrasts as extreme, aversive, and out of control. Consequently, worry is reinforced because of preventing negative emotional contrasts.

Individuals with GAD have grater negative environmental experiences compared to individuals with other emotional disorders (Nordahl et al., 2010). Adverse childhood experiences are associated with high emotional reactivity (Glaser et al., 2006; Wichers et al., 2009). Emotional reactivity is another factor related to the development of emotional disorders (Glaser et al., 2006) and maybe CA tendencies (Newman et al., 2014). Individuals with GAD experience heightened emotional reactivity in dealing with negative life events (Llera & Newman, 2014) and negative stimuli (Fitzgerald et al., 2017). Worry develops in individuals who experience high levels of emotional reactivity and have maladaptive efforts in dealing with these emotions (Newman et al., 2014; Rothbart & Sheese, 2007). Emotional reactivity could be investigated in light of the EDM.

The EDM suggests that individuals with GAD have heightened emotional intensity, poor emotional understanding, negative cognitive reaction to emotions, and maladaptive emotion regulation strategies (Mennin et al., 2005). The EDM posits that worry develops in individuals with high levels of emotional reactivity who have maladaptive attempts in coping with these emotional experiences (Turk et al., 2005). A study on the children between 7 and 10 years old aimed to combine the EDM with the CAM, revealed that high emotional reactivity and lower levels of attentional and emotional control are related to worry symptoms (Gramszlo & Woodruff-Borden, 2015). This finding implicates that worried children may experience emotion dysregulation problems as well. Besides, the CAM posits that worry is used to avoid negative emotional contrasts, and individuals with higher levels of emotional reactivity would have a greater probability of experiencing these aversive negative emotional shifts (Newman & Llera, 2011). The results of the study indicate that level of excessive and uncontrollable worry in children with emotionally reactive temperament was high (Gramszlo & Woodruff-Borden, 2015). Thus, emotional reactivity could be an essential vulnerability factor in the development of maladaptive emotion regulation mechanisms such as creating and sustaining negative emotions through worry. However, this field needs more research from new perspectives like the CAM.

Barlow's triple vulnerabilities model (Barlow, 2002) suggests that the perceived lack of control over the negative emotions and events is a transdiagnostic vulnerability factor in the development of anxiety disorders. A meta-analysis showed that perceived control has a strong relationship with trait anxiety, and it is mostly associated with GAD, among other anxiety disorders. Also, it was found that individuals with GAD experience many uncontrollable worries, and they have a low level of perceived control (Gallagher et al., 2014).

A study revealed that after controlling the neuroticism and extraversion, perceived lack of control over emotions predicts GAD, but does not predict social anxiety disorder and MDD (Brown & Naragon-Gainey, 2013). Also, the perceived lack of control over emotions is a moderator of the relationship between the severity of GAD symptoms and neuroticism (Bourgeois & Brown, 2015). Individuals with GAD actively recruit worry in order for obtaining control over the emotions and prevention of experiencing negative emotional contrast (LaFreniere & Newman, 2019b; Sandra J. S. J. Llera & Newman, 2014). From the perspective of the CAM, perceived lack of control over negative events and aversive emotional experiences (such as negative emotional contrast) may contribute to the development of GAD through leading individuals with the disorder to use maladaptive strategies like worry. Llera and Newman (2017) developed measures for assessing CA tendencies from two distinct perspectives, one uniquely focusing on worry (Contrast avoidance questionnaire-Worry; CAQ-W) and the other assesses these tendencies more broadly that could measure CA as a transdiagnostic construct (Contrast avoidance questionnaire-General Emotion; CAQ-GE). In the CAQ-W, the first component is about gaining control over the negative events and emotions by worry (Llera & Newman, 2017), so an important research topic for future studies would be investigating the relationship between perceived lack of control and principles of the CAM, as well.

Emotional factors reviewed above indicate that problems in understanding and regulating emotions, emotional sensitivity, emotional intensity, emotional reactivity, and perceived lack of control in the literature have a crucial role in the development of psychopathology. The results show that these emotional vulnerability factors may play a role in the development of CA tendencies. However, few studies in the literature have directly investigated the association between these emotional factors and the CAM. Thus, it is worthwhile to conduct studies to develop the CAM and extend our knowledge about the etiology of emotional disorders.

5. Critiques on the CAM

Although principles of the CAM have been supported in empirical studies, addressing the model from a critical point of view may help to enrich the model. Considering that the CAM is a new model in the literature of anxiety and mood disorders, therefore limited critiques have been made about this model. The main critique has been proposed by the Generalized Unsafety Theory of Stress (GUTS). This theory (Brosschot et al., 2016) combines neurobiological and evolution-theoretical explanations for the occurrence and maintenance of feeling uncertainty in neutral or safe conditions. According to the GUTS, stress, and consequently, the anxiety response is the organism's default response unless safety is perceived. The GUTS suggests that the main question is "what mechanism causes the inhibition of default stress response," not "what causes the chronic stress response."

The inability to detect safety signals in the environment and disinhibition of default stress response is the main cause of chronic stress and anxiety. IU is a transdiagnostic construct and contributes to the development and maintenance of anxiety disorders (Carleton et al., 2012) and is related to the stress response (Greco & Roger, 2003). IU is an intrinsic feature of any living organism. Unlike the previous knowledge about it, IU is not a thing that one obtains during life, but it is learning the safety conditions that a person should obtain instead. Learning models of chronic anxiety that specifically explain worry, generally assert that worry is maintained by certain positive outcomes for the individual such as inhibition of intense physiological responses (Borkovec, 1994) or preventing sudden and negative emotional contrasts (Llera & Newman, 2014).

The theory claims that we are shared with animals in a major part of physiological and affective components of anxiety, and animals experience chronic stress and anxiety as similar to humans (Mastorci et al., 2009). Besides, animal models of the disorders that seem to be unique for humans have been proposed, such as social anxiety disorder (Toth & Neumann, 2013) and GAD (Lissek, 2012; Luyten et al., 2011). The first limitation of existing learning models is that they all related to high-level cognitive processes that are unique for humans. It is clear that high-level cognitive processes play a role in the exacerbation of worry or anxiety and stress, but these cognitive processes fail to explain at least two basic aspects: first, often spontaneous initiation of worry (Gilboa & Revelle, 1994; Killingsworth & Gilbert, 2010; Langlois et al., 2000). Second, they are not able to explain the continuity or chronicity of worry and anxiety responses. "It is, for example, difficult to understand how a profoundly negative experience such as worry can be reinforced by the prevention of, or buffering of relative rare feared situations, let alone why worry is maintained at all in the first place, in the absence of feared situations" (Brosschot et al., 2016, p. 2).

Another critique on both EDM and CAM is that their primary focus is on the prediction of pathological worry, and they do not make strong claims about the applicability of these predictions to normal worry and non-GAD worry (Hallion et al., 2019).

The critiques mentioned above are not primarily for the CAM, and they apply other theoretical models of worry and GAD. According to GUTS, other theoretical models proposed for anxiety disorders such as IUM and EDM have the same deficits. To have sound explanations, these models should consider the processes involved in anxiety responses, which are shared in living organisms, along with high-level cognitive processes. Addressing such processes would help these models to

explain spontaneous initiation of worry and the continuity or chronicity of worry and anxiety responses (Brosschot et al., 2016).

The Extant models of worry and GAD have empirical support and have shown efficacy in the treatment of GAD. However, these models have failed to explain the healthy and pathological level of worry (Hallion et al., 2019). Explaining normal levels of worry may help researchers to find out what mechanisms turn normal worry into a pathological level and what is the difference between people with or without GAD.

6. Treatment based on the CAM

The lower efficiency of the cognitive therapy in GAD treatment in comparison with other disorders (Brown et al., 1994; Hofmann & Smits, 2008), led the researchers to design more effective therapies with emphasizing on the different aspects of the disorder. According to the results of a meta-analysis, fewer studies involved finding an answer to the question that "which treatment for GAD is better than others?" (Cuijpers et al., 2014). Based on pathological, neural and physiological alterations in GAD while reacting to an emotional stimulus (Mochcovitch et al., 2014) and in resting state (Etkin et al., 2009; Roy et al., 2013), a two-pronged approach to the treatment of the disorder have been proposed.

In this treatment method, first by teaching relaxation, acceptance, and mindful awareness of interoceptive states, individuals engage in relaxation, and the parasympathetic system becomes dominant. Then, the sympathetic system is activated through exposures targeted to avoidance from negative emotional contrasts. The combination of these two approaches could be the most effective treatment method for GAD (Fonzo & Etkin, 2016). In other words, this method generates a positive/neutral emotional state. Then exposure to negative emotional contrast takes place via exposure to a feared outcome, which according to the CAM, this process is the main fear of individuals with GAD (Newman & Llera, 2011). As has been suggested in M. G. Newman et al. (2018), the treatment of negative contrast sensitivity could incorporate cognitive and behavioral interventions. Cognitive modal might implement with modification of the patient's fear of negative emotional contrast and positive beliefs about worry/tension. Moreover, by the repeated implementation of exposure to negative emotional contrast (that is, long AR exercises preceding negative imaginal exposure), patients may desensitize to their aversion of sudden negative emotional contrasts.

The treatment method discussed above is primarily proposed for GAD. Investigating CA tendencies in other disorders like MDD, or investigating the CAM as a transdiagnostic model could help researchers to develop treatment methods which apply to a range of emotional disorders. However, to develop a well-established treatment protocol, randomized clinical trials are needed to be conducted to evaluate its efficacy.

7. Discussion

The primary purpose of the present study was to review the most recent empirical studies regarding the CAM and to demonstrate that principles of the CAM, which developed for the GAD, might apply to other emotional disorders. Thus, these principles were reviewed with an emphasis on the transdiagnostic nature of CA tendencies. In some cases, we tried to note the findings that could be explained from the perspective of the CAM. However, we noted that empirical studies are required to support these explanations. One of the essential aspects of our study is that we reviewed studies that critique the CAM. We also discussed the emotional factors that could be related to the development of CA tendencies in a range of emotional disorders. Finally, treatment based on the CAM was discussed. However, there were limited studies on this subject.

We started with an emphasis on the transdiagnostic nature of worry in emotional disorders and burdens of generalized anxiety disorder on the individual. Further, we highlighted the importance of detection, prevention, and treatment of GAD. In recent years, some cognitive-behavioral models of the GAD have been proposed. However, there were some inconsistencies in the literature on the

role of worry in the development and maintenance of GAD. That is, unlike the claim of previous models, worry is related to increased and prolonged negative emotionality. Newman and Llera (2011) attempted to explain these inconsistencies and find an answer to the questions concerning positive beliefs about worry and actively using worry despite its emotional consequences and proposed the CAM. We described the CAM and its theoretical bases and illustrated the pathological process proposed by the CAM. Then, evidence supporting the principles of the CAM was reviewed.

For the first principle (The main fear in people with GAD is a sharp shift in negative emotions), data from experimental studies indicate individuals with GAD have difficulty in experiencing negative emotional contrast (Buff et al., 2016; Crouch et al., 2017; Ranney et al., 2018). These data also provide preliminary evidence for the applicability of the CAM for MDD (Kim & Newman, 2016). Emotion regulation problems in individuals with GAD may lead them to the active recruitment of worry as an emotion regulation strategy to gain control over the emotions (Mennin et al., 2002, 2009).

In line with the second principle of the CAM (Worry creates and sustains negative emotion), data have indicated that in terms of physiological measures like HRV, heart rate, skin conductance and cortisol levels as an indicator of HPA axis activity, worry increases and sustains negative emotionality (Aldao & Mennin, 2012; Arbel et al., 2017; Brosschot et al., 2007; Deschênes et al., 2016; Levine et al., 2016; Seeley et al., 2016; Weise et al., 2013). Also, in self-report measures, the worry was related to heightened negative affect (Newman et al., 2016). However, to provide support for the transdiagnostic applicability of the CAM, we reviewed studies that investigate the activating effects of another form of repetitive negative thinking. Results indicated that rumination like worry leads to heightened negative emotionality and thereby facilitates the avoidance from negative emotional contrasts (Kim & Newman, 2016). Also, lower HRV has been shown in obsessive-compulsive disorder, social anxiety disorder, and panic disorder (Pittig et al., 2013). Results of a study showed that worry is strongly related to the hyperarousal symptoms of PTSD, which contributes to the development and maintenance of PTSD (Bardeen et al., 2012). Future studies will show us whether there are shared underlying mechanisms among emotional disorders that could be explained by the CAM.

In the third principle (People with GAD enjoy transient positive emotional states), our review has supported the notion that positive emotional states make individuals with GAD vulnerable to experiencing negative emotional contrast. Results indicate that negative contrast sensitivity is a mediator of the relationship between RIA and GAD or MDD (Kim & Newman, 2019). It seems that relaxation leads to less control over the emotions and events, and anxiety following relaxation is a way to obtain such control. This phenomenon can be explained by the CAM, which was unclear in the literature of anxiety. In addition, these results implicate that CA tendencies exist in disorders other than GAD, which requires further study to support the contribution of these tendencies in emotional disorders. Another support to the third principle of the CAM comes from neuroimaging studies, which demonstrate reducing worry through worry reappraisal task, paradoxically, increases anxiety (Aldao & Mennin, 2012). Behavioral avoidance, safety behaviors, and reassurance seeking strategies are the ways to reduce the worry and frequently are observed in individuals with GAD (Beesdo-Baum et al., 2012). However, the reason for such strategies might be explained via the CAM. Reduction in worry following these strategies may make them vulnerable to the experience of negative emotional contrast, and then they try to keep a steady emotional state by worry. The process proposed by the CAM could reinforce this vicious cycle. However, no study has studied this subject since yet.

Many vulnerability factors are related to the development of CA tendencies; however, we limited our study to some emotional factors. Results of our study indicated that emotional sensitivity and emotional intensity are high in individuals with GAD and due to these emotional factors, they may experience difficulty in experiencing emotional shifts especially shifts from positive/neutral states to negative one (Mennin, 2004; Newman & Llera, 2011; Rutter et al., 2019). Therefore, they actively use worry as an emotion regulation strategy in order to avoid negative emotional contrast. Also, emotional reactivity and the use of maladaptive copings are vulnerability factors in the development of worry (Glaser et al., 2006). Emotionally reactive individuals with lower levels of attentional and emotional control are prone

to the development of worry, and their preferred emotion regulation strategy may be creating and sustaining negative affect since thereby, they feel more control over the emotions and events.

A line of research supports the claim that the worry is a way to gain control over the emotions, and this could be a transdiagnostic process and cut-across among emotional disorders. Perceived lack of control is a transdiagnostic construct that contributes to the development of anxiety disorders (Bentley et al., 2013). Preliminary evidence indicates that the perceived lack of control is an important construct that could be integrated into the CAM. The items of the first component of CAQ-W (Worry to Avoid Negative Emotional Shifts) implicate the role of perceived lack of control (Llera & Newman, 2017); however, studies are required to investigate the contribution of this transdiagnostic construct in the CAM.

Nevertheless, there were some critiques on the CAM in the literature. The main critique on the high-level cognitive models of worry, including the CAM, is that they fail to explain spontaneous initiation of worry and continuity or chronicity of worry and anxiety responses (Brosschot et al., 2016). Another critique was generally on the failure of both EDM and the CAM in predicting normal worry. That is, these models could not apply to individuals without GAD who experience worry (Hallion et al., 2019).

Based on the assumptions of the CAM, a treatment method was proposed, which consists of two modals. In behavioral modal, individuals with GAD receive relaxation and acceptance and mindful awareness of interoceptive state techniques before exposure to negative emotional contrasts. This process should be implemented repeatedly to patients fully desensitize to aversion of the sudden increase in negative emotions. In the cognitive modal, modification of patient's fear of negative emotional contrasts and positive beliefs about worry take place (Fonzo & Etkin, 2016; Newman & Llera, 2011). However, there is a long way to develop a contrast avoidance-based treatment protocol and confirm its efficacy.

Along with studies that have been reviewed above, some studies were in the literature that directly investigated the CAM, and here, we try to demonstrate the latest findings on the CAM for the motivation of research interest among researchers. In a study, firstly, 125 participants were categorized into three groups of verbal worry, imagery-based worry and distraction. Then the participants encountered social-evaluative stressors. The results supported the CAM, in which verbal worrying about upcoming speech tasks in comparison to distraction leads to a greater increase in negative affect, self-reported symptoms of somatic anxiety, and skin conductance. Another hypothesis of the CAM is that worry compared to distraction, and neutral state or relaxation leads to a lower increase in subsequent negative emotions; however, in this study, the hypothesis only was supported at self-report measures. Also, it was found that there is no difference between verbal worrying and imagery-based worrying in emotional response (Skodzik et al., 2016), which indicates that both types of worry has the same function and may serve to avoid negative emotional contrasts.

LaFreniere and Newman (2018) examined the probabilistic learning by positive and negative reinforcement on 166 individuals with GAD and 105 individuals without GAD. Results indicated that there was no difference in probabilistic learning in negative and positive reinforcement within the GAD group. Though, individuals with GAD learned more slowly and to a lesser degree than those without GAD. Moreover, individuals with GAD had less accuracy at estimating probabilities of desirable outcomes for both types of reinforcement. In short, this study has revealed that one of the important probabilistic learning deficits of individuals with GAD is the underestimation of the probability of desirable outcomes (LaFreniere & Newman, 2018). This finding could be explained from the perspective of the CAM. Making wrong predictions about probabilistic outcomes, serve to maintain worry because of its utility in CA. This means that learning the true probabilities of future events reduces worry, and in turn, it will make individuals with GAD vulnerable to experiencing a sudden increase in negative emotion (Llera & Newman, 2014; LaFreniere & Newman, 2018).

Findings of the other study confirm the ecological validity of underlying assumptions of the CAM (Newman et al., 2019) which showed that longer duration of worry—regardless of GAD status—predicted higher level of negative thoughts valence, an uncontrollable chain of thoughts and more prolonged anxiety and arousal over the next hour. Also, in line with the underlying assumption of the CAM, avoidance of a negative contrast in the thought valence was predicted by worry duration, feeling keyed up, and uncontrollable chain of thoughts. On the other hand, worry duration, concurrent arousal, and uncontrollable chain of thoughts increased the likelihood of experiencing positive emotional contrast within the next hour (Newman et al., 2019).

According to deficit-based cognitive models (Hirsch & Mathews, 2012), pathological worry is mainly maintained by deficits in cognitive control, especially in the context of negative emotional information. Unlike the predictions of the deficit-based models, a study revealed that GAD is associated with better cognitive control in the context of emotional distraction (Hallion et al., 2019). Emotion regulation models of pathological worry predict that worry is recruited at least semi-voluntary and usually as a means to decrease more aversive cognitive content (for example, mental imagery; Borkovec et al., 2004) or prevention of more aversive emotional experiences such as negative emotional contrasts (Mennin, 2004; Newman & Llera, 2011). The finding that worry is related to better cognitive control may confirm the assertion of the CAM that individuals with GAD use worry actively as an emotion regulation mechanism.

Limitations of the present study should be considered. The first and major limitation of our study was that due to the limited studies on the CAM, we were not able to conduct a systematic review. Other limitation concerns the underlying factors related to the principles of the CAM and the development of CA tendencies. We mainly focused on the emotional factors, and in limited cases, we reviewed physiological findings related to the CAM. Future studies could extend the CAM by reviewing the contribution of other factors such as genetics, neurobiology, attachment styles, parenting, environmental influences interpersonal problems.

Despite the mentioned limitations, our study demonstrated that CAM is an increasingly developing model. Also, we reviewed studies that indicate CAM could apply to emotional disorders other than GAD. Besides, we pointed to the studies supporting and criticizing the CAM, which might encourage the researchers to investigate the model from different aspects.

8. Conclusion

Since the presentation of the CAM by Newman and Llera (2011), studies have been conducted to test the validity of this model both in the laboratory and in the natural environment. Although these studies generally support the CAM, they are limited. Over recent years, studies tend to focus on the underlying transdiagnostic factors which are shared in a range of psychological disorders, especially emotional disorders. Some of the theoretical models, such as the metacognitive model (Wells, 2010) and IUM (Dugas et al., 2004), initially were proposed for GAD, and later studies revealed that these models could apply to other emotional disorders. It seems that the CAM will follow the same path. However, much more empirical supports for the transdiagnostic nature of the model are needed to draw such inferences. For example, longitudinal studies on different age groups will show us the developmental pathway of CA tendencies. Moreover, tracking CA in the early life regarding the temperament, attachment, parenting, and environmental influences is another crucial subject in this field. It could provide a more coherent framework for understanding the occurrence and maintenance of GAD syndrome.

On the other hand, to validate this model, it is necessary to conduct studies in healthy, sub-clinical (at-risk) and clinical samples diagnosed with emotional disorders (with or without comorbid GAD) to demonstrate that CA tendencies present in a range of emotional disorders. Moreover, comparing CA tendencies among these three groups (by controlling the primary and secondary diagnosis), may help us to draw inferences about the developmental course of emotional vulnerability related to the CAM

and to show that these tendencies occur in a continuum as well. Such studies can be promising to formulate a comprehensive theory of psychopathology underlying emotional disorders.

Also, two measures developed for investigating the CA tendencies (CAQ-W and CAQ-GE), have excellent psychometric properties (Llera & Newman, 2017). However, no study has been conducted to validate these measures in non-American cultures or to use these measures to investigate the CAM. Since the measures of a model play an important role in accurately measuring its underlying constructs, investigating the psychometric properties of these measures in different healthy and clinical populations as well as in non-American cultures can provide evidence of model validation. Maybe shortly, attempts to fill this research gap would make the model stronger.

Another essential issue in approving the pathology model is the development of protocols and therapeutic manuals that can be used to change the pathological components of the model. If the model proves that it can modify disorder symptoms through manipulating the main components involved in the model, it has provided evidence to approve itself. Competitive models of the CAM in the field of clinical and therapeutic evidence have had significant success. Therefore, another research gap in this area that future research can focus on is to validate the model through designing and developing treatment protocols focused on modifying the claimed components. In addition, investigating the moderators, mediators, predictors, and mechanisms of change in the CAM is another research suggestion for future studies.

All in all, we reviewed critiques that are proposed for the CAM and some of the other models of worry and GAD. Nevertheless, critiques that are unique to the CAM and its components would be more useful in improving the model. However, future studies, along with the criticizing principles of the CAM, should consider the proposed critiques and try to find an answer to them.

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ReferencesReferencesReferencesReferences

Aldao, A., & Mennin, D. S. (2012). Paradoxical cardiovascular effects of implementing adaptive emotion regulation strategies in generalized anxiety disorder. *Behaviour Research and Therapy*, *50*(2), 122–130. https://doi.org/10.1016/j.brat.2011.12.004

Alonso, J., Petukhova, M., Vilagut, G., Chatterji, S., Heeringa, S., Ustun, T. B., Alhamzawi, A. O., Viana, M. C., Angermeyer, M., Bromet, E., Bruffaerts, R., de Girolamo, G., Florescu, S., Gureje, O., Haro, J. M., Hinkov, H., Hu, C.-Y., Karam, E. G., Kovess, V., Medina-Mora, M. E., … Kessler, R. C. (2011). Days out of role due to common physical and mental conditions: Results from the WHO World Mental Health surveys. *Molecular Psychiatry*, *16*(12), 1234–1246. https://doi.org/10.1038/mp.2010.101

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*. American Psychiatric Association.

Andreescu, C., Sheu, L. K., Tudorascu, D., Gross, J. J., Walker, S., Banihashemi, L., & Aizenstein, H. (2015). Emotion reactivity and regulation in late-life generalized anxiety disorder: Functional connectivity at baseline and post-treatment. *The American Journal of Geriatric Psychiatry*, *23*(2), 200–214. https://doi.org/10.1016/j.jagp.2014.05.003

Arbel, R., Shapiro, L. S., Timmons, A. C., Moss, I. K., & Margolin, G. (2017). Adolescents' daily worry, morning cortisol, and health symptoms. *Journal of Adolescent Health*, *60*(6), 667–673. https://doi.org/10.1016/j.jadohealth.2017.01.007

Bacon, M. M., Rood, E. A., & Washburn, M. F. (1914). A study of affective contrast. (Minor Stud. fr. Psychol. Lab. of Vassar Col., XXV.). *The American Journal of Psychology*, *25*(2), 290–293. https://doi.org/10.2307/1413417

Bandelow, B., Boerner, J. R., Kasper, S., Linden, M., Wittchen, H. U., & Moller, H. J. (2013). The diagnosis and treatment of generalized anxiety disorder. *Deutsches Arzteblatt International*, *110*(17), 300–309. https://doi.org/10.3238/arztebl.2013.0300 quiz 310

Bardeen, J., Fergus, T., & Wu, K. (2012). The interactive effect of worry and intolerance of uncertainty on posttraumatic stress symptoms. Cognitive Therapy and Research, *37*(4),742–751. doi:doi.https://doi.org/10.1007/s10608-012-9512-1

Barger, S. D., & Sydeman, S. J. (2005). Does generalized anxiety disorder predict coronary heart disease risk factors independently of major depressive disorder? *Journal of Affective Disorders*, *88*(1), 87–91. https://doi.org/10.1016/j.jad.2005.05.012

Barlow, D. H. (2002). *Anxiety and its disorders: The nature and treatment of anxiety and panic* (*2nd* ed.). Guilford Press.

Barlow, D. H., Rapee, R. M., & Brown, T. A. (1992). Behavioral treatment of generalized anxiety disorder. *Behavior Therapy*, *23*(4), 551–570. https://doi.org/10.1016/S0005-7894(05)80221-7

Beesdo-Baum, K., Jenjahn, E., Hofler, M., Lueken, U., Becker, E. S., & Hoyer, J. (2012). Avoidance, safety behavior, and reassurance seeking in generalized anxiety disorder. *Depression and Anxiety*, *29*(11), 948–957. https://doi.org/10.1002/da.21955

Behar, E., DiMarco, I. D., Hekler, E. B., Mohlman, J., & Staples, A. M. (2009). Current theoretical models of generalized anxiety disorder (GAD): Conceptual review and treatment implications. *Journal of Anxiety Disorders*, *23*(8), 1011–1023. https://doi.org/10.1016/j.janxdis.2009.07.006

Bentley, K. H., Gallagher, M. W., Boswell, J. F., Gorman, J. M., Shear, M. K., Woods, S. W., & Barlow, D. H. (2013). The interactive contributions of perceived control and anxiety sensitivity in panic disorder: A triple vulnerabilities perspective. *Journal of Psychopathology and Behavioral Assessment*, *35*(1), 57–64. https://doi.org/10.1007/s10862-012-9311-8

Bolognesi, F., Baldwin, D. S., & Ruini, C. (2014). Psychological interventions in the treatment of generalized anxiety disorder: A structured review. Journal of Psychopathology, 20(2),111–126. https://www.jpsychopathol.it/article/psychological-interventions-in-the-treatment-of-generalized-anxiety-disorder-a-structured-review/

Borkovec, T. D. (1994). The nature, functions, and origins of worry. In G. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory, assessment and treatment* (pp. 5–33). John Wiley & Sons.

Borkovec, T. D., Alcaine, O. M., & Behar, E. (2004). Avoidance theory of worry and generalized anxiety disorder.

Borkovec, T. D., & Costello, E. (1993). Efficacy of applied relaxation and cognitive-behavioral therapy in the treatment of generalized anxiety disorder. *Journal of Consulting and Clinical Psychology*, *61*(4), 611–619. https://doi.org/10.1037/0022-006x.61.4.611

Borkovec, T. D., Hazlett-Stevens, H., & Diaz, M. L. (1999). The role of positive beliefs about worry in generalized anxiety disorder and its treatment. *Clinical Psychology & Psychotherapy*, *6*(2), 126–138. https://doi.org/10.1002/(SICI)1099-0879(199905)6:2<126::AID-CPP193>3.0.CO;2-M

Bourgeois, M. L., & Brown, T. A. (2015). Perceived emotion control moderates the relationship between neuroticism and generalized anxiety disorder. *Cognitive Therapy and Research*, *39*(4), 531–541. https://doi.org/10.1007/s10608-015-9677-5

Brosschot, J. F., Van Dijk, E., & Thayer, J. F. (2007). Daily worry is related to low heart rate variability during waking and the subsequent nocturnal sleep period. *International Journal of Psychophysiology*, *63*(1), 39–47. https://doi.org/10.1016/j.ijpsycho.2006.07.016

Brosschot, J. F., Verkuil, B., & Thayer, J. F. (2016). The default response to uncertainty and the importance of perceived safety in anxiety and stress: An evolution-theoretical perspective. *Journal of Anxiety Disorders*, *41*, 22–34. https://doi.org/10.1016/j.janxdis.2016.04.012

Brown, T. A., Barlow, D. H., & Liebowitz, M. R. (1994). The empirical basis of generalized anxiety disorder. *Am J Psychiatry*, *151*(9), 1272–1280. https://doi.org/10.1176/ajp.151.9.1272

Brown, T. A., & Naragon-Gainey, K. (2013). Evaluation of the unique and specific contributions of dimensions of the triple vulnerability model to the prediction of DSM-IV anxiety and mood disorder constructs. *Behavior Therapy*, *44*(2), 277–292. https://doi.org/10.1016/j.beth.2012.11.002

Buff, C., Brinkmann, L., Neumeister, P., Feldker, K., Heitmann, C., Gathmann, B., Andor, T., & Straube, T. (2016). Specifically altered brain responses to threat in generalized anxiety disorder relative to social anxiety disorder and panic disorder. *NeuroImage: Clinical*, *12*, 698–706. https://doi.org/10.1016/j.nicl.2016.09.023

Bui, E., Anderson, E., Goetter, E. M., The Campbell, A. A., Fischer, L. E., Barrett, L. F., & Simon, N. M. (2017). Heightened sensitivity to emotional expressions in generalised anxiety disorder, compared to social anxiety disorder, and controls. *Cognition and Emotion*, *31*(1), 119–126. https://doi.org/10.1080/02699931.2015.1087973

Carleton, R. N., Mulvogue, M. K., Thibodeau, M. A., McCabe, R. E., Antony, M. M., & Asmundson, G. J. (2012). Increasingly certain about uncertainty: Intolerance of uncertainty across anxiety and depression. *Journal of Anxiety Disorders*, *26*(3), 468–479. https://doi.org/10.1016/j.janxdis.2012.01.011

Chambless, D., & Ollendick, T. (2001). Empirically supported psychological interventions: Controversies and evidence. *Annual Review of Psychology*, *52*(1), 685–716. https://doi.org/10.1146/annurev.psych.52.1.685

Cohen, A. S., Barlow, D. H., & Blanchard, E. B. (1985). Psychophysiology of relaxation-associated panic attacks. *Journal of Abnormal Psychology*, *94*(1), 96–101. https://doi.org/10.1037//0021-843x.94.1.96

Craig, A. D. (2003). Interoception: The sense of the physiological condition of the body. *Current Opinion in Neurobiology*, *13*(4), 500–505. https://doi.org/10.1016/s0959-4388(03)00090-4

Critchley, H., Wiens, S., Rotshtein, P., Ohman, A., & Dolan, R. (2004). Neural systems supporting interoceptive awareness. *Nature Neuroscience*, *7*, 189–195. https://doi.org/10.1038/nn1176

Crouch, T. A., Lewis, J. A., Erickson, T. M., & Newman, M. G. (2017). Prospective investigation of the contrast avoidance model of generalized anxiety and worry. *Behavior Therapy*, *48*(4), 544–556. https://doi.org/10.1016/j.beth.2016.10.001

Cuijpers, P., Sijbrandij, M., Koole, S., Huibers, M., Berking, M., & Andersson, G. (2014). Psychological treatment of generalized anxiety disorder: A meta-analysis. *Clinical Psychology Review*, *34*(2), 130–140. https://doi.org/10.1016/j.cpr.2014.01.002

Damasio, A., Grabowski, T., Bechara, A., Damasio, H., Ponto, L., Parvizi, J., & Hichwa, R. (2000). Subcortical and cortical brain activity during the feeling of self-generated emotions. *Nature Neuroscience*, *3*(10), 1049–1056. https://doi.org/10.1038/79871

Davidson, R. J., Pizzagalli, D., Nitschke, J. B., & Putnam, K. (2002). Depression: Perspectives from affective neuroscience. *Annual Review of Psychology*, *53*(1), 545–574. https://doi.org/10.1146/annurev.psych.53.100901.135148

Deschênes, S. S., Dugas, M. J., & Gouin, J.-P. (2016). Intolerance of uncertainty, worry catastrophizing, and heart rate variability during worry-inducing tasks. *Personality and Individual Differences*, *90*, 199–204. https://doi.org/10.1016/j.paid.2015.11.015

Drost, J., Van Der Does, W., van Hemert, A., Penninx, B. W., & Spinhoven, P. (2014). Repetitive negative thinking as a transdiagnostic factor in depression and anxiety: A conceptual replication. *Behaviour Research and Therapy*, *63*, 177–183. https://doi.org/10.1016/j.brat.2014.06.004

Dugas, M. J., Buhr, K., & Ladouceur, R. (2004). The Role of Intolerance of Uncertainty in Etiology and Maintenance. In R. G. Heimberg, C. L. Turk, & D. S.

Mennin (Eds.), Generalized anxiety disorder: Advances in research and practice (p. 143–163). The Guilford Press.

Dugas, M. J., & Robichaud, M. (2007). *Cognitive-behavioral treatment for generalized anxiety disorder: From science to practice*. Routledge/Taylor & Francis Group.

Etkin, A., Prater, K. E., Schatzberg, A. F., Menon, V., & Greicius, M. D. (2009). Disrupted amygdalar subregion functional connectivity and evidence of a compensatory network in generalized anxiety disorder. *Archives of General Psychiatry*, *66*(12), 1361–1372. https://doi.org/10.1001/archgenpsychiatry.2009.104

Fisher, P. L. (2006). The efficacy of psychological treatments for generalised anxiety disorder. Worry and Its Psychological Disorders: Theory, Assessment and Treatment, 359–377. https://doi.org/10.1002/9780470713143.ch20

Fitzgerald, J. M., Phan, K. L., Kennedy, A. E., Shankman, S. A., Langenecker, S. A., & Klumpp, H. (2017). Prefrontal and amygdala engagement during emotional reactivity and regulation in generalized anxiety disorder. *Journal of Affective Disorders*, *218*, 398–406. https://doi.org/10.1016/j.jad.2017.05.013

Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin*, *99*(1), 20–35. https://doi.org/10.1037/0033-2909.99.1.20

Fonzo, G. A., & Etkin, A. (2016). Brain connectivity reflects mental and physical states in generalized anxiety disorder. *Biological Psychiatry*, *80*(10), 733–735. https://doi.org/10.1016/j.biopsych.2016.08.026

Freeman, D., Stahl, D., McManus, S., Meltzer, H., Brugha, T., Wiles, N., & Bebbington, P. (2011). Insomnia, worry, anxiety and depression as predictors of the occurrence and persistence of paranoid thinking. *Social Psychiatry and Psychiatric Epidemiology*, *47*(8), 1195–1203. https://doi.org/10.1007/s00127-011-0433-1

Gallagher, M., Bentley, K., & David, B. (2014). Perceived control and vulnerability to anxiety disorders: A meta-analytic review. *Cognitive Therapy and Research*, *38*(6), 571–584. https://doi.org/10.1007/s10608-014-9624-x

Gilboa, E., & Revelle, W. (1994). *Personality and the structure of affective responses*. In S. H. M. van Goozen, N. E. Van de Poll, & J. A. Sergeant (Eds.), *Emotions: Essays on emotion theory* (p. 135–159). Lawrence Erlbaum Associates, Inc.

Glaser, J. P., van Os, J., Portegijs, P. J., & Myin-Germeys, I. (2006). Childhood trauma and emotional reactivity to daily life stress in adult frequent attenders of general practitioners. *Journal of Psychosomatic Research*, *61*(2), 229–236. https://doi.org/10.1016/j.jpsychores.2006.04.014

Gramszlo, C., & Woodruff-Borden, J. (2015). Emotional reactivity and executive control: A pathway of risk for the development of childhood worry. *Journal of Anxiety Disorders*, *35*, 35–41. https://doi.org/10.1016/j.janxdis.2015.07.005

Greco, V., & Roger, D. (2003). Uncertainty, stress, and health. *Personality and Individual Differences*, *34*(6), 1057–1068. https://doi.org/10.1016/S0191-8869(02)00091-0

Hallion, L. S., Tolin, D. F., & Diefenbach, G. J. (2019). Enhanced cognitive control over task-irrelevant emotional distractors in generalized anxiety disorder versus obsessive-compulsive disorder. *Journal of Anxiety Disorders*, *64*, 71–78. https://doi.org/10.1016/j.janxdis.2019.02.004

Heide, F. J., & Borkovec, T. D. (1983). Relaxation-induced anxiety: Paradoxical anxiety enhancement due to relaxation training. *Journal of Consulting and Clinical Psychology*, *51*(2), 171–182. https://doi.org/10.1037/0022-006X.51.2.171

Hirsch, C., & Mathews, A. (2012). A cognitive model of pathological worry. *Behaviour Research and Therapy*, *50*(10), 636–646. https://doi.org/10.1016/j.brat.2012.06.007

Hofmann, S. G., & Smits, J. A. (2008). Cognitive-behavioral therapy for adult anxiety disorders: A meta-analysis of randomized placebo-controlled trials. *The Journal of Clinical Psychiatry*, *69*(4), 621–632. https://doi.org/10.4088/jcp.v69n0415

Hunot, V., Churchill, R., Teixeira, V., Silva de Lima, M. (2007). Psychological therapies for generalised anxiety disorder. Cochrane Database of Systematic Reviews, (1). Art. No.: CD001848. DOI: 10.1002/14651858.CD001848.pub4.

Just, N., & Alloy, L. B. (1997). The response styles theory of depression: Tests and an extension of the theory. *Journal of Abnormal Psychology*, *106*(2), 221–229. https://doi.org/10.1037//0021-843x.106.2.221

Kerns, C. E., Mennin, D. S., Farach, F. J., & Nocera, C. C. (2014). Utilizing an ability-based measure to detect emotion regulation deficits in generalized anxiety disorder. *Journal of Psychopathology and Behavioral Assessment*, *36*(1), 115–123. https://doi.org/10.1007/s10862-013-9372-3

Kessler, R. C., Chiu, W. T., Demler, O., Merikangas, K. R., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, *62*(6), 617–627. https://doi.org/10.1001/archpsyc.62.6.617

Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy mind. *Science*, *330*(6006), 932. https://doi.org/10.1126/science.1192439

Kim, H., & Newman, M. (2016). *Emotional contrast avoidance in generalized anxiety disorder and major depressive disorder: A comparison between the perseveration processes of worry and rumination* [Paper presentation]. The 50th Annual Meeting of the Association for Behavioral and Cognitive Therapies, New York, NY.

Kim, H., & Newman, M. G. (2019). The paradox of relaxation training: Relaxation induced anxiety and mediation effects of negative contrast sensitivity in generalized anxiety disorder and major depressive disorder. *Journal of Affective Disorders*, *259*, 271–278. https://doi.org/10.1016/j.jad.2019.08.045

LaFreniere, L. S., & Newman, M. G. (2018). Probabilistic learning by positive and negative reinforcement in generalized anxiety disorder. *7*(3), 502–515. https://doi.org/10.1177/2167702618809366

LaFreniere, L. S., & Newman, M. G. (2019a). Exposing worry's deceit: Percentage of untrue worries in generalized anxiety disorder treatment. *Behavior Therapy*. *51*(3), 413-423. https://doi.org/10.1016/j.beth.2019.07.003

LaFreniere, L. S., & Newman, M. G. (2019b). The impact of uncontrollability beliefs and thought-related distress on ecological momentary interventions for generalized anxiety disorder: A moderated mediation model. *Journal of Anxiety Disorders*, *66*, 102–113. https://doi.org/10.1016/j.janxdis.2019.102113

Langlois, F., Freeston, M. H., & Ladouceur, R. (2000). Differences and similarities between obsessive intrusive thoughts and worry in a non-clinical population: Study 1. *Behaviour Research and Therapy*, *38*(2), 157–173. https://doi.org/10.1016/S0005-7967(99)00027-3

Levine, J. C., Fleming, R., Piedmont, J. I., Cain, S. M., & Chen, W. J. (2016). Heart rate variability and generalized anxiety disorder during laboratory-induced worry and aversive imagery. *Journal of Affective*

Disorders, *205*, 207–215. https://doi.org/10.1016/j.jad.2016.07.019

Ley, R. (1988). Panic attacks during relaxation and relaxation-induced anxiety: A hyperventilation interpretation. *Journal of Behavior Therapy and Experimental Psychiatry*, *19*(4), 253–259. https://doi.org/10.1016/0005-7916(88)90054-7

Lissek, S. (2012). Toward an account of clinical anxiety predicated on basic, neurally mapped mechanisms of Pavlovian fear-learning: The case for conditioned overgeneralization. *Depression and Anxiety*, *29*(4), 257–263. https://doi.org/10.1002/da.21922

Llera, S. J., & Newman, M. G. (2010). Effects of worry on physiological and subjective reactivity to emotional stimuli in generalized anxiety disorder and nonanxious control participants. *Emotion*, *10*(5), 640–650. https://doi.org/10.1037/a0019351

Llera, S. J., & Newman, M. G. (2014). Rethinking the role of worry in generalized anxiety disorder: Evidence supporting a model of emotional contrast avoidance. *Behavior Therapy*, *45*(3), 283–299. https://doi.org/10.1016/j.beth.2013.12.011

Llera, S. J., & Newman, M. G. (2017). Development and validation of two measures of emotional contrast avoidance: The contrast avoidance questionnaires. *Journal of Anxiety Disorders*, *49*, 114–127. https://doi.org/10.1016/j.janxdis.2017.04.008

Luyten, L., Vansteenwegen, D., van Kuyck, K., Gabriels, L., & Nuttin, B. (2011). Contextual conditioning in rats as an animal model for generalized anxiety disorder. *Cognitive, Affective, & Behavioral Neuroscience*, *11*(2), 228–244. https://doi.org/10.3758/s13415-011-0021-6

Martin, L. L., & Tesser, A. (1996). Some ruminative thoughts. In R. S. Wyer, Jr. (Ed.), *Advances in social cognition, Vol. 9. Ruminative thoughts* (pp. 1–47). Lawrence Erlbaum Associates, Inc.

Mastorci, F., Vicentini, M., Viltart, O., Manghi, M., Graiani, G., Quaini, F., Meerlo, P., Nalivaiko, E., Maccari, S., & Sgoifo, A. (2009). Long-term effects of prenatal stress: Changes in adult cardiovascular regulation and sensitivity to stress. *Neuroscience & Biobehavioral Reviews*, *33*(2), 191–203. https://doi.org/10.1016/j.neubiorev.2008.08.001

McEvoy, P. M., Watson, H., Watkins, E. R., & Nathan, P. (2013). The relationship between worry, rumination, and comorbidity: Evidence for repetitive negative thinking as a transdiagnostic construct. *Journal of Affective Disorders*, *151*(1), 313–320. https://doi.org/10.1016/j.jad.2013.06.014

McLaughlin, K. A., Borkovec, T. D., & Sibrava, N. J. (2007). The effects of worry and rumination on affect states and cognitive activity. *Behavior Therapy*, *38*(1), 23–38. https://doi.org/10.1016/j.beth.2006.03.003

McLaughlin, K. A., & Nolen-Hoeksema, S. (2011). Rumination as a transdiagnostic factor in depression and anxiety. *Behaviour Research and Therapy*, *49*(3), 186–193. https://doi.org/10.1016/j.brat.2010.12.006

Mennin, D. S. (2004). Emotion regulation therapy for generalized anxiety disorder. *Clinical Psychology & Psychotherapy*, *11*(1), 17–29. https://doi.org/10.1002/cpp.389

Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2002). Applying an emotion regulation framework to integrative approaches to generalized anxiety disorder. *Clinical Psychology: Science and Practice*, *9*(1), 85–90. https://doi.org/10.1093/clipsy/9.1.85

Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2005). Preliminary evidence for an emotion dysregulation model of generalized anxiety disorder. *Behaviour Research and Therapy*, *43*(10), 1281–1310. https://doi.org/10.1016/j.brat.2004.08.008

Mennin, D. S., Holaway, R. M., Fresco, D. M., Moore, M. T., & Heimberg, R. G. (2007). Delineating components of emotion and its dysregulation in anxiety and mood psychopathology. *Behavior Therapy*, *38*(3), 284–302. https://doi.org/10.1016/j.beth.2006.09.001

Mennin, D. S., McLaughlin, K. A., & Flanagan, T. J. (2009). Emotion regulation deficits in generalized anxiety disorder, social anxiety disorder, and their co-occurrence. *Journal of Anxiety Disorders*, *23*(7), 866–871. https://doi.org/10.1016/j.janxdis.2009.04.006

Moberly, N. J., & Watkins, E. R. (2008). Ruminative self-focus, negative life events, and negative affect. *Behaviour Research and Therapy*, *46*(9), 1034–1039. https://doi.org/10.1016/j.brat.2008.06.004

Mochcovitch, M. D., da Rocha Freire, R. C., Garcia, R. F., & Nardi, A. E. (2014). A systematic review of fMRI studies in generalized anxiety disorder: Evaluating its neural and cognitive basis. *Journal of Affective Disorders*, *167*, 336–342. https://doi.org/10.1016/j.jad.2014.06.041

Mowrer, O. H. (1947). On the dual nature of learning—a re-interpretation of "conditioning" and "problem-solving.". *Harvard Educational Review*, *17*, 102–148.

Muris, P., Roelofs, J., Rassin, E., Franken, I., & Mayer, B. (2005). Mediating effects of rumination and worry on the links between neuroticism, anxiety and depression. *Personality and Individual Differences*, *39*(6), 1105–1111. https://doi.org/10.1016/j.paid.2005.04.005

Newman, M. G., Jacobson, N. C., Szkodny, L. E., & Sliwinski, M. J. (2016). Contrast avoidance in daily life. In T. M. Erickson (Ed.), *The contrast avoidance model: Reconceptualizing worry in GAD and as a transdiagnostic process*. Paper presented at the 50th Annual Meeting of the Association for Behavioral and Cognitive Therapies.

Newman, M. G., Jacobson, N. C., Zainal, N. H., Shin, K. E., Szkodny, L. E., & Sliwinski, M. J. (2019). The effects of worry in daily life: An ecological momentary assessment study supporting the tenets of the contrast avoidance model. *Clinical Psychological Science*, *7*(4), 794–810. https://doi.org/10.1177/2167702619827019

Newman, M. G., Lafreniere, L. S., & Jacobson, N. C. (2018). Relaxation-induced anxiety: Effects of peak and trajectories of change on treatment outcome for generalized anxiety disorder. *Psychotherapy Research: Journal of the Society for Psychotherapy Research*, *28*(4), 616–629. https://doi.org/10.1080/10503307.2016.1253891

Newman, M. G., & Llera, S. J. (2011). A novel theory of experiential avoidance in generalized anxiety disorder: A review and synthesis of research supporting a contrast avoidance model of worry. *Clinical Psychology Review*, *31*(3), 371–382. https://doi.org/10.1016/j.cpr.2011.01.008

Newman, M. G., Llera, S. J., Erickson, T. M., & Przeworski, A. (2014). Basic science and clinical application of the Contrast Avoidance model in generalized anxiety disorder. *Journal of Psychotherapy Integration*, *24*(3), 155–167. https://doi.org/10.1037/a0037510

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, *100*(4), 569–582. https://doi.org/10.1037/0021-843x.100.4.569

Nolen-hoeksema, S., & Morrow, J. (1993). Effects of rumination and distraction on naturally occurring depressed mood. *Cognition and Emotion*, *7*(6), 561–570. https://doi.org/10.1080/02699939308409206

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking Rumination. *Perspectives on*

Psychological Science, *3*(5), 400–424. https://doi.org/10.1111/j.1745-6924.2008.00088.x

Nordahl, H. M., Wells, A., Olsson, C. A., & Bjerkeset, O. (2010). Association between abnormal psychosocial situations in childhood, generalized anxiety disorder and oppositional defiant disorder. *Australian & New Zealand Journal of Psychiatry*, *44*(9), 852–858. https://doi.org/10.3109/00048674.2010.489504

Ost, L. G. (1987). Applied relaxation: Description of a coping technique and review of controlled studies. *Behaviour Research and Therapy*, *25*(5), 397–409. https://doi.org/10.1016/0005-7967(87)90017-9

Ost, L. G., & Breitholtz, E. (2000). Applied relaxation vs. cognitive therapy in the treatment of generalized anxiety disorder. *Behaviour Research and Therapy*, *38*(8), 777–790. https://doi.org/10.1016/s0005-7967(99)00095-9

Ottaviani, C., Shapiro, D., & Fitzgerald, L. (2011). Rumination in the laboratory: What happens when you go back to everyday life? *Psychophysiology*, *48*(4), 453–461. https://doi.org/10.1111/j.1469-8986.2010.01122.x

Ottaviani, C., Watson, D. R., Meeten, F., Makovac, E., Garfinkel, S. N., & Critchley, H. D. (2016). Neurobiological substrates of cognitive rigidity and autonomic inflexibility in generalized anxiety disorder. *Biological Psychology*, *119*, 31–41. https://doi.org/10.1016/j.biopsycho.2016.06.009

Papageorgiou, C., & Wells, A. (2003). An empirical test of a clinical metacognitive model of rumination and depression. *Cognitive Therapy and Research*, *27*(3), 261–273. https://doi.org/10.1023/A:1023962332399

Pittig, A., Arch, J. J., Lam, C. W. R., & Craske, M. G. (2013). Heart rate and heart rate variability in panic, social anxiety, obsessive–compulsive, and generalized anxiety disorders at baseline and in response to relaxation and hyperventilation. *International Journal of Psychophysiology*, *87*(1), 19–27. https://doi.org/10.1016/j.ijpsycho.2012.10.012

Ranney, R., Behar, E., & Bartoszek, G. (2018). Individuals intolerant of uncertainty: The maintenance of worry and distress despite reduced uncertainty. *Behavior Therapy*, *50*(3), 489-503. https://doi.org/10.1016/j.beth.2018.08.006

Roemer, L., & Borkovec, T. D. (1993). Worry: Unwanted cognitive activity that controls unwanted somatic experience. In D. M. Wegner & J. W. Pennebaker (Eds.), *Century psychology series. Handbook of mental control* (pp. 220–238). Prentice-Hall, Inc.

Rothbart, M. K., & Sheese, B. E. (2007). *Temperament and Emotion Regulation*. In J. J. Gross (Ed.), *Handbook of emotion regulation* (p. 331–350). The Guilford Press.

Roy, A. K., Fudge, J. L., Kelly, C., Perry, J. S., Daniele, T., Carlisi, C., Benson, B., Xavier Castellanos, F., Milham, M. P., Pine, D. S., & Ernst, M. (2013). Intrinsic functional connectivity of amygdala-based networks in adolescent generalized anxiety disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, *52*(3), 290–299.e292. https://doi.org/10.1016/j.jaac.2012.12.010

Ruscio, A. M., Chiu, W. T., Roy-Byrne, P., Stang, P. E., Stein, D. J., Wittchen, H. U., & Kessler, R. C. (2007). Broadening the definition of generalized anxiety disorder: Effects on prevalence and associations with other disorders in the National Comorbidity Survey Replication. *Journal of Anxiety Disorders*, *21*(5), 662–676. https://doi.org/10.1016/j.janxdis.2006.10.004

Rutter, L. A., Scheuer, L., Vahia, I. V., Forester, B. P., Smoller, J. W., & Germine, L. (2019). Emotion sensitivity and self-reported symptoms of generalized anxiety disorder across the lifespan: A population-based sample approach. *Brain and Behavior*, *9*(6), e01282. https://doi.org/10.1002/brb3.1282

Sassaroli, S., Bertelli, S., Decoppi, M., Crosina, M., Milos, G., & Ruggiero, G. (2006). Worry and eating disorders: A psychopathological association. *Eating Behaviors*, *6*(4), 301–307. https://doi.org/10.1016/j.eatbeh.2005.05.001

Seeley, S. H., Mennin, D. S., Aldao, A., McLaughlin, K. A., Rottenberg, J., & Fresco, D. M. (2016). Impact of comorbid depressive disorders on subjective and physiological responses to emotion in generalized anxiety disorder. *Cognitive Therapy and Research*, *40*(30), 290–303. https://doi.org/10.1007/s10608-015-9744-y

Siev, J., & Chambless, D. L. (2007). Specificity of treatment effects: Cognitive therapy and relaxation for generalized anxiety and panic disorders. *Journal of Consulting and Clinical Psychology*, *75*(4), 513–522. https://doi.org/10.1037/0022-006x.75.4.513

Skodzik, T., Zettler, T., Topper, M., Blechert, J., & Ehring, T. (2016). The effect of verbal and imagery-based worry versus distraction on the emotional response to a stressful in-vivo situation. *Journal of Behavior Therapy and Experimental Psychiatry*, *52*, 51–58. https://doi.org/10.1016/j.jbtep.2016.03.003

Steinfurth, E. C., Alius, M. G., Wendt, J., & Hamm, A. O. (2017). Physiological and neural correlates of worry and rumination: Support for the contrast avoidance model of worry. *Psychophysiology*, *54*(2), 161–171. https://doi.org/10.1111/psyp.12767

Toth, I., & Neumann, I. D. (2013). Animal models of social avoidance and social fear. *Cell and Tissue Research*, *354*(1), 107–118. https://doi.org/10.1007/s00441-013-1636-4

Turk, C. L., Heimberg, R. G., Luterek, J. A., Mennin, D. S., & Fresco, D. M. (2005). Emotion dysregulation in generalized anxiety disorder: A comparison with social anxiety disorder. *Cognitive Therapy and Research*, *29*(1), 89–106. https://doi.org/10.1007/s10608-005-1651-1

Watkins, E., & Moulds, M. (2005). Distinct modes of ruminative self-focus: Impact of abstract versus concrete rumination on problem solving in depression. *Emotion*, *5*(3), 319–328. https://doi.org/10.1037/1528-3542.5.3.319

Watkins, E., Moulds, M., & Mackintosh, B. (2005). Comparisons between rumination and worry in a non-clinical population. *Behaviour Research and Therapy*, *43*(12), 1577–1585. https://doi.org/10.1016/j.brat.2004.11.008

Weise, S., Ong, J., Tesler, N. A., Kim, S., & Roth, W. T. (2013). Worried sleep: 24-h monitoring in high and low worriers. *Biological Psychology*, *94*(1), 61–70. https://doi.org/10.1016/j.biopsycho.2013.04.009

Wells, A. (1990). Panic disorder in association with relaxation induced anxiety: An attentional training approach to treatment. *Behavior Therapy*, *21*(3), 273–280. https://doi.org/10.1016/S0005-7894(05)80330-2

Wells, A. (2006). The metacognitive model of worry and generalised anxiety disorder. *Worry and Its Psychological Disorders: Theory, Assessment and Treatment*, 179–199. https://doi.org/10.1002/9780470713143.ch11

Wells, A. (2010). Metacognitive Theory and Therapy for Worry and Generalized Anxiety Disorder: Review and Status. *Journal of Experimental Psychopathology, 1*(1), 133–145. https://doi.org/10.5127/jep.007910

Wichers, M., Schrijvers, D., Geschwind, N., Jacobs, N., Myin-Germeys, I., Thiery, E., Derom, C., Sabbe, B., Peeters, F., Delespaul, P., & van Os, J. (2009). Mechanisms of gene-environment interactions in depression: Evidence that genes potentiate multiple sources of adversity. *Psychological Medicine*, *39*(7), 1077–1086. https://doi.org/10.1017/s0033291708004388

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