HELPING YOUTH WITH ANXIETY

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Introduction

Today, whether consciously or unconsciously, many people feel a persistent sense that they are in some or many ways unprepared for what is coming their way, overwhelmed by the real or perceived demands placed upon them, and insecure in their general sense of safety and belonging. Psychologically, this is experienced as ruminating worry, avoidance, and difficulty concentrating or being hyper-focused, with feelings of dread, fear, and apprehension. These descriptions illuminate a potentially debilitating condition labelled as anxiety. Anxiety is a common condition in first world countries and is experienced as intense, excessive, and persistent worry and fear about everyday situations (Stewart et al., 2019). Moreover, this condition is associated with a higher incidence of depression, suicide, and substance abuse (Stewart et al., 2019).

Though anxiety can be experienced by anyone at any point during their lifespan, those in adolescence and young adulthood are having a particularly challenging time managing this disorder. In Canada young people aged 15 to 24 are more likely to experience mental illness and/or substance use disorders than any other age group (Pearson, Janz, & Ali, 2013). A meta-analysis conducted by Chang, Ji, Li, Pan, and Su (2022) looking at the prevalence of anxiety (and depression) symptoms for college aged students during the COVID-19 pandemic showed that globally 31% of that population had experienced symptoms of anxiety; with students from China having the lowest incidence rates (15%) and America having the highest (52%). A recent report conducted by the Centre for Addiction and Mental Health (CAMH) showed that 25.1% of Canadians 18 years of age and older reported feeling moderate to severe anxiety; the rate for individuals aged 18-39 was 33.5% (CAMH, 2022). Both males and females are affected by anxiety; globally the prevalence rate for college aged males is 36% and females is 30% (for depression, the female prevalence rate is 56%, and males is 34%) (Chang et al., 2022). In Canada, 28.8% of females experienced moderate to severe anxiety compared to 20.9% of males (CAMH, 2022). A meta-analysis investigating global child and adolescent anxiety (and depression) levels found that 1 in 5 youth (20.5%) experienced anxiety because of the global pandemic (Racine et al., 2021).

What is clear from the research is anxiety is pervasive and has the power to devastate a person's life; sadly, youth particularly are facing situations in life that seem insurmountable. Even worse, many are enduring it in a state of lonely hopelessness. Additionally, the effects of anxiety can manifest in any individual regardless of their religious or spiritual orientation or worldview. At this time, there

is a paucity of research available regarding prevalence rates of anxiety among people of faith; however, one study conducted by Lifeway Research on American Views on Emotions and Adversity in 2020 noted 46% of people surveyed stated the thing they most want to remove from their lives is anxiety. Many faith-based organizations are disseminating information about anxiety to anyone in need of support, indicating the growing awareness that this is an issue for many people of faith.

Considering the ubiquity of the challenges that anxiety brings to young people of faith, the purpose of this article is to enhance understanding of anxiety. Part one will discuss the multifaceted complexities of this disorder, equipping the reader with descriptions to recognize various forms and experiences of anxiety. Part two will provide research-based strategies to help youth navigate the presence of anxiety in their lives and increase their experience of peace. Specifically, the first part of this article will discuss some important distinctions when discussing anxiety, the relationship between anxiety and stress, various ways anxiety interacts with overall health, and neurobiological foundations of anxiety. Part two will offer research-based self-help and professional techniques and treatments for managing anxiety, and then focus on the relationship between religion and spirituality and anxiety, and specific religious and spiritual practices to reduce it.

Types of Anxiety

The reasons for, and sources of, anxiety are complex and are being purposely investigated at this time to increase knowledge and insight into this concept. To think of the challenges that come with anxiety in simplistic black-or-white, right-or-wrong terms, or with easy step-by-step, or you-just-need-to-do-this solutions would be naïve and erroneous. Anxiety is multifaceted and all aspects of a person's constitution - biological, psychological, social, developmental, and spiritual - need to be taken into consideration in formulating an understanding of an individual's experience with anxiety. Each of these areas will be addressed at different points in this article, starting with a defining anxiety, distinguishing between four sub-types of anxiety, and describing clinically significant diagnosable forms of anxiety.

Anxiety can be broadly defined as the anticipation of a future danger or threat that can turn into a disorder when characterized by excessive fear, worry, and behavioral disturbances (American Psychiatric Association [APA], 2013). Trait anxiety is anxiety that is experienced in everyday life and state anxiety is anxiety that is experienced in the moment (Roberts, Hart, & Eastwood, 2016). Put differently, trait anxiety relates to an individual's personality composition and predisposition to respond to perceived threats or challenges in an anxious manner. State anxiety is focused on present, point in time assumptions that elicit anxiety induced emotions and are resolved in time. Cognitive anxiety is characterized by intrusive thoughts,

difficulty concentrating, worry, catastrophizing, indecisiveness, feeling judged, and memory problems (Roberts, Hart, & Eastwood, 2016). Somatic anxiety is defined by the bodily sensations of sweating, weakness, dizziness, shaking/trembling, muscle tension, restlessness, and increased heart rate (Roberts, Hart, & Eastwood, 2016).

Being knowledgeable about which sub-type(s) of anxiety a person is experiencing helps guide questions that address areas of concern more accurately. Additionally, having the vocabulary to use precise language also facilitates properly diagnosing clinically significant forms of anxiety like generalized anxiety disorder, social anxiety, panic attacks and specific phobias. The following definitions are from the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013). Generalized anxiety disorder is characterized by excessive and uncontrollable worry about a range of things that may or may not happen or have happened. Social anxiety disorder (formerly social phobia) is anxiety in everyday social situations and social interactions due to a fear of negative evaluation by others. Panic disorder involves recurrent panic attacks, which are feelings of terror that occur suddenly and without warning, accompanied by physical symptoms such as chest pain, palpitations, sweating and feeling of choking. Lastly, specific phobias are when a person has intense fear of a particular object or situation. Extending beyond the different sub-types of anxiety and clinically diagnosable forms of anxiety, the focus will shift to the relationship between anxiety and stress for youth.

Anxiety and Stress for Youth

A survey by the American College Health Association (ACHA) showed that 51.2% of college aged students reported experiencing moderate general psychological distress regularly and 21.2% of students experiencing serious psychological distress regularly (2023). This survey also found that in the last 30 days 48.9% of students experienced moderate overall stress and 28.4% experienced high rates of overall stress (ACHA, 2023). Interestingly, of the 33,199 students included in the survey, 32.9% of them had also at some point in their life been diagnosed with an anxiety disorder (for example: generalized anxiety, social anxiety, panic disorder, specific phobia) (ACHA, 2023). These statistics highlight the vicious cycle young people with anxiety experience due to the interaction anxiety has with stress.

Stress is a response of the brain and body to any pressures or demands placed upon it. Lazarus and Folkman (1984) proposed a cognitive appraisal theory of stress whereby an individual will first assess a situation that appears to have a threat (*primary appraisal*) and then, if there is a threat, the person will determine if there are adequate resources available to manage the situation (*secondary appraisal*). If there is a perceived scarcity of resources, the person will experience elevated levels

of stress. Though, it is not clear at this time whether anxiety leads to stress response or vice versa, Cohen-Louck and Levy found that anxiety increases stress reactions to life stressors (2022). To clarify, stress is not in and of itself a negative factor. However, when a person struggles with anxiety, the factors that are associated with stress are more likely to be interpreted unfavourably, resulting in increased anxiety, which then perpetuates the negative experience with stress. This has an overall negative effect on a person's ability to function well and flourish in day-to-day activities in both general (referring to persistent feelings of doom and gloom, chronic headaches, persistent stomach pains, constant sense of fatigue, and nail biting) and specific ways (unique combinations of symptoms). Consequently, anxiety profoundly impacts one's health, relationships, and overall well-being.

Youth Health and Anxiety

From a health perspective, anxiety impacts many if not all aspects of a person's life. Particularly concerning is the way that anxiety alters a person's attention processes, self-esteem, sleep, and increases the likelihood of using substances for coping; each of which will be elaborated on in the following paragraphs. With the effect of anxiety on attention it can be assumed that anxiety impairs or modifies efficient functioning of goal-directed thoughts and behaviours in that it shifts attention away from growth-oriented plans to survival-based interests. When this occurs, the individual may not be aware that their cognitive resources have been commandeered to avoid a perceived threat or danger and the person(s) observing their behaviours may not be able to make sense of that individual's actions or thought processes.

Attentional control theory (ACT) offers valuable insight into this re-direct of mental resources. ACT investigates disruptions in attention for people suffering from anxiety with the assumption that anxiety negatively influences processing efficiency and performance effectiveness differently (Eysenck et al., 2007). Specifically, anxiety has an adverse effect on a person's ability to inhibit irrelevant information and to shift back and forth between multiple demands or operations (Eysenck et al., 2007). Interestingly, anxiety may not initially impair a person's performance if they are able to use compensatory strategies (i.e., enhanced effort; increased use of processing resources) (Eysenck et al., 2007). However, the additional effort needed over time to accomplish goals and complete tasks eventually results in decreased performance effectiveness. Practically speaking, when cognitive load remains consistent, an individual with anxiety will have less and less resources to accomplish the tasks associated with the cognitive load.

In addition, people with anxiety find it difficult to think there is a future hope of having more positive experiences. Accordingly, a recent systematic review and

meta-analysis found that people struggling with anxiety picture future events with greater negative vividness and a less clear view of positive future experiences (Du, Hallford, & Grant, 2022). For example, use of cues that instinctively generate negative emotions (negatively-valenced cues) are associated with a significant positive correlation between anxiety scores and images of the future (Du, Hallford, & Grant, 2022). Consequently, with the accumulation of things becoming more difficult to accomplish and no clear picture of a brighter future, it is understandable how anxiety can lead to a host of self-perception challenges that includes the diminishing of one's self esteem.

Research indicates that positive self-esteem can lead to better health and social behaviour, whereas poor self-esteem is associated with a broad range of mental disorders and social problems, including anxiety (Mann et al., 2004). Self-esteem has been shown to serve as a protective mechanism against stress, fear, and uncertainty (Mann et al., 2004), all of which play a role in increasing anxiety for an individual. This is troubling considering the COVID-19 pandemic increased uncertainty and instability in diverse areas of daily life (Germani et al., 2020). For those in emerging adulthood the effect has been especially difficult emotionally as uncertainty and instability already characterize this developmental period. Moreover, the pandemic had a central effect on anxiety exacerbating worries about the present and future, negatively impacting personal and interpersonal functioning (Germani et al., 2020).

The overall quality of the emerging adulthood phase has serious implications for one's general health status, perception of one's value, sense of personal competence, and security or insecurity in relationships. Enhanced self-esteem serves as a predictor of healthy development and low self-esteem is a predictor of poorer mental and physical health outcomes, and lower relationship quality (Germani et al., 2020). Since anxiety is a factor that diminishes self-esteem, struggling with it leads to an alarming deterioration in physical and mental well-being. As was seen with difficulty managing cognitive load, negative self-esteem ultimately diminishes trust in oneself, resulting in an inability to handle daily problems and decreases the likelihood of achieving maximum potential (Mann et al., 2004). Thus considering the overarching consequences self-esteem has on myriad aspects of a young person's life, evaluating the effect of anxiety on self-esteem is of paramount importance. Another important consideration is the presence of chronic health conditions, as physical factors also have a strong relationship with anxiety.

Hill, Waite, and Creswell (2016) note that anxiety disorders are particularly prevalent in youth with chronic physical health conditions and young people with autism spectrum disorders (ASD). Young people have up to four times the rate of psychiatric disorder when suffering from chronic physical illness compared to those who do not, and anxiety disorders are one of the most common psychiatric conditions in youth with ASD. Rates for anxiety disorders are quite similar. For

example, anxiety disorder is present in around a third of young people with asthma, 39% of young people with Crohn's disease, nearly 50% of adolescents with cystic fibrosis, and 40% of youth with ASD meet criteria for at least one anxiety disorder (Hill, Waite, & Creswell, 2016). Youth who experience the compounding of comorbid anxiety and physical health conditions have greater functional impairment than would be observed with either disorder alone (Hill, Waite, & Creswell, 2016). Progressing from a focus on psychological and physical factors associated with anxiety, next is a discussion of the effect of anxiety on sleep quality.

Sleep Quality and Anxiety

Most people know from personal experience poor sleep quality results in greater difficulty with managing every other aspect of one's life. Sleep disturbance is particularly detrimental for youth as they are navigating numerous developmental challenges (i.e., identity elaboration, social dynamics, intimate relationships, academic and work-related demands). Poor sleep also shares a reciprocal relationship with emotion regulation and is one of the causal factors linked to many psychiatric disorders, including anxiety (Harvey et al., 2011). This is important for adolescents as quality sleep is essential to all areas of youth functioning, and sleep difficulty during this period has been shown to exacerbate vulnerability for psychiatric illnesses (Lang et al., 2016). Since anxiety shares a complex relationship with sleeping problems, it is necessary to evaluate the cognitive, affective, and biological factors that contribute to the relationship between sleep challenges and anxiety. Increased understanding regarding sleep dysregulation and anxiety reveals how sleep deprivation worsens the effects of anxiety on youth which then negatively affects falling and staying asleep, resulting in a negative cycle involving insomnia and anxiety disorders.

Having already discussed self-esteem, another cognitive factor for consideration is perfectionism. Perfectionism is the self-critical maladaptive habit of judging oneself against unreasonably high self-imposed standards. Perfectionism, along with low self-esteem and an external locus of control, are linked to both anxiety and insomnia, and insomnia symptoms are strong predictors of symptoms of anxiety (and depression) (Lindsay et al., 2022). Insomnia is often precipitated by a period of stress and is perpetuated by chronic factors like poor sleep habits, a bedroom environment that impedes proper sleep hygiene, or dysfunctional beliefs or expectations concerning sleep (Lindsay et al., 2022). If an individual has perfectionistic tendencies, stress may lead to an increase in worry and rumination which is a risk factor for insomnia. Ultimately, perfectionism leads to poor sleep and an increase in anxiety symptoms (Lindsay et al., 2022). Additionally, poor sleep results in daytime fatigue, mood disturbance, hyper-arousal at bedtime, greater sleep

effort, and an increase in perceived stress. The mounting self-evaluative concerns lead to even higher levels of self-scrutiny, regret, and cognitive arousal when preparing to sleep, predisposing oneself to insomnia. Lindsay and her colleagues found the effect to be so profound that for university aged students insomnia symptoms were one of the strongest predictors of anxious (and depressive) symptoms at the end of an academic year (2022).

Sleep Disturbance and Neurophysiology

The complex relationship between sleep disruption and the maintenance or worsening of anxiety also negatively affects neurobiological structures and systems. This section will briefly explain some of the connections between sleep disturbance and neurophysiology.

It is important to note that a plethora of structural and neurochemical (neurotransmitter and neuromodulator) systems orchestrate sleep and emotional regulation. Regarding brain areas, neuroimaging studies indicate that sleep disturbance/loss amplifies activity within the "fear network", which includes a set of structures important in emotion regulation called the limbic system (Chellappa & Aeschbach, 2022), along with a set of brain structures that help with thought regulation that form the salience network (SN) (Peters, Dunlop, & Downar, 2016). The SN plays a central role in cognitive control by integrating sensory input to guide attention, attend to motivationally salient stimuli, and recruit appropriate functional brain networks to modulate behaviour. When that system is disturbed, it significantly contributes to pathological conditions like anxiety (Peters, Dunlop, & Downar, 2016). Additionally, the anxiety inducing impact of total sleep loss relates to impaired brain functioning and great challenges controlling thoughts and emotions (Chellappa & Aeschbach, 2022). This results in a distorted elevation of the perceived importance for each choice that a person is considering. Evidence indicates a lack of sleep inappropriately modulates those emotional responses to disproportionally focus on negative stimuli contributing to compromised decision-making skills and potentially inappropriate behaviour (Yoo et al., 2007).

Another brain area to consider is the hippocampus. The hippocampus is a structure within the limbic system vital for memory storage and retrieval. Through its mediation of fear responses and processing of contextual information, the hippocampus plays a central role in the onset and continuance of anxiety disorders (Baksh et al., 2021). For example, activity between the hippocampus and other brain structures are known to be central in the fight-or-flight response experienced during threat or challenge and the aforementioned "fear network" (Baksh et al., 2021). Huo and colleagues suggest that trait anxiety also affects risk-taking (which could lead to positive experiences) via episodic future thinking mechanisms furthered by the

hippocampus (2020). More succinctly, individuals with trait anxiety are more likely to interpret internal and external stimuli pessimistically and consequently avoid making decisions that perceivably involve risk and thus maintain (or worsen) their thought processes, mood, and behaviour.

Furthermore, inherent to anxiety is conflict between approach-related drives (e.g., to seek positive social interactions; to leave the house) and avoidance-related drives (e.g., to prevent being humiliated or having a panic attack) (Aupperle & Paulus, 2010). The coupling of incorrectly predicting negative outcomes and the underlying conflict between approach and avoidance are powerful mechanisms that maintain anxiety. For more information regarding the relationship brain structures and neurochemical systems play in anxiety see Appendix A. Attention will now shift towards the effect of social anxiety on social functioning.

Social Anxiety Considerations for Youth

Social anxiety (SA) is defined as marked and persistent fear of one or more social situations (American Psychiatric Association, 2013). SA is increasing and overly affects young people (Jeffries & Ungar, 2020). The global prevalence of social anxiety for young adults is more than 1 in 3 (36%). Moreover, 1 in 6 (18%) perceive themselves as not having social anxiety, yet still meet or exceed the threshold for social anxiety disorder; overall, whether they know it or not, many young people are experiencing substantial disruptions in functioning and well-being because of SA (Jeffries & Ungar, 2020). Some precipitating cognitive factors for SA include a fear of negative valuation by others and a tendency toward perfectionism along with feelings of guilt and shame (Levinson, Byrne, & Rodebaugh, 2016). Individuals with high levels of SA report difficulty controlling their beliefs and behaviors (Zabag, Gilboa-Schechtman, & Levi-Gigi, 2022), and are susceptible to social comparison (Zafar & Arshad, 2020), social networking sites addiction (Chen et al., 2020), and alcohol use disorders (Zimmerman et al., 2003). Youth with SA not only see themselves negatively, but also have negative perceptions of others and poor outlook resulting in distorted cognitive processes. These cognitive distortions lead to avoidance of intimacy and non-realistic relationship expectations shaped by a tendency toward perfectionism and need for approval (Ünübol, Hizli Sayar, & Gül, 2018). These non-functional attitudes contribute to false assumptions about oneself and misinterpretations concerning their situation. The exacerbation of SA increases intolerance against uncertainty and perfectionistic attitudes and impairs problem solving skills, which has implications for young peoples' present and future life (Ünübol, Hizli Sayar, & Gül, 2018).

SA also makes it difficult for people to update their social and self-evaluations. Updating images of oneself and others is essential for adjusting to ever-changing

environmental demands. Doing so enables a person to identify internal or external stresses and select appropriate response from a repertoire of options (Zabag, Gilboa-Schechtman, & Levi-Gigi, 2022). Those with SA have significant challenges updating positive information from social settings but not negative updating, leading to positive change resistance in intrapersonal and interpersonal contexts. For example, interpersonally there may be a failure to notice someone from a social context (i.e., a peer, colleague, or acquaintance) who initially seemed unpleasant, becoming friendlier and signaling an interest in a closer relationship. Consequently, SA provides an ease of transition to negative views of social reality, enhances negative social updating, and leads to heightened social reactivity (Zabag, Gilboa-Schechtman, & Levi-Gigi, 2022). Individuals with SA also have problems with social comparison, paranoid social cognitions, and submissive behaviours.

Social comparison is when a person competes with others on standards of wealth, education, and social status, and ultimately bases their mood, emotional state, and cognitions on how well they are doing compared to others. Young adults with SA undervalue their performance, develop evaluation fears, and form paranoid social thoughts that result in suspicious and doubtful thinking patterns. This thought pattern increases submissive social behaviours (i.e., reduced eye contact, denying one's own relational needs, and staying away from social situations) and avoidance of interpersonal contact to evade conflict with others. Ultimately, the thought patterns form social comparisons that bias an individual to believe they are receiving negative attention, which distorts their self-perception and leads to paranoid thoughts, resulting in passive social behaviours (Zafar & Arshad, 2020). The poor self-perception and negative bias toward social situations make avoiding in-person social gatherings desirable. Unfortunately, experiential avoidance only serves to maintain psychological distress, and disruption of pleasant, engaging, and spontaneous activity (Kashdan et al., 2006). Plausibly, experiential avoidance seems like an effective short term self-protective strategy; however, it is a toxic process that increases stress and illness and yields impairment in functioning (Kashdan et al., 2006). The exhaustion arising from the energy expenditure needed to control the unwanted thoughts, feelings and sensations leaves an individual vulnerable to even greater unhealthy coping strategies.

For young adults, experiential avoidance leads to interpersonal problems that predictably mediates the relationship between SA and social networking site/service (SNS) addiction proneness. To elaborate, people with SA have low emotional and social intimacy with others and perpetual fear of rejection and negative social evaluation, thus SNS becomes a viable option for social connection. A person with SA can use SNS as a compensatory activity to fulfill the basic human desire for belonging and connectivity (Kim & Bae, 2022). Understandably, to escape from real social situations and gratify the connection desire, individuals with SA spend much

more time on SNS (Chen et al., 2020). However, they cannot get what they expected from SNS and fail to compensate for social inadequacies in real situations. The risk of addiction increases at the same time, as social interaction activities are ever present in the real social world (Chen et al., 2020). Though initially the level of social control an individual can exert on SNS seems rewarding, the gratification diminishes over time and users tend to find it more difficult to live in accordance with core values. What initially started as goal congruent behaviour for connecting with others in a way that reduces social anxiety, ultimately results in an addiction where users engage with SNS more than they want to while trying to manage the possibility of being denied or derided by others on a virtual medium (Seo & Ray, 2019). This loss of control has negative ramifications for the user (like a decrease in self-esteem and an increase in depression), and impacts organizations and society (Chen et al., 2020; Seo & Ray, 2019). Ultimately, individuals trapped in SNS addiction suffer from a series of emotional, relational, and health-related problems (Chen et al., 2020).

Potentially even more concerning than SNS site addiction is that young people who struggle with social anxiety are significantly more likely to have problems with alcohol use and develop alcohol use disorders (Villarosa et al., 2016; Zimmerman et al., 2003). For college aged students, the inability to resist peer influence is predictive of drinking behaviour, alcohol-related negative consequences (i.e., death, assault, rape), and less use of protective behavioural strategies (i.e., monitoring where one's drink is, alternating between alcoholic and non-alcoholic beverages, or abstaining from alcohol use) (Villarosa et al., 2016). Students with high levels of SA seem to be more susceptible to the harmful effects of drinking due to their lack of safety considerations while engaging in heavy drinking due to conformity motives to feel more socially accepted (Villarosa et al., 2016).

Another factor linking SA to young person alcohol use is alcohol outcome expectancies from drinking alcohol. Alcohol outcome expectancies are acquired either through one's own alcohol use or through observation of others' drinking experiences which form either positive expectancies (i.e., drinking alcohol will lead to a desirable experience) or negative expectancies (i.e., drinking alcohol will lead to unpleasant consequences) (Papachristou et al., 2018). Negative expectancies are often linked with avoidance of alcohol consumption due to the fear that if one becomes intoxicated, they will behave in ways that will result in embarrassment and negative social evaluation; SA also leads to a greater likelihood of avoiding social gatherings altogether (Gagné, Radomsky, & O' Connor, 2021; Papachristou et al., 2018). However, positive outcome expectations such as social facilitation and fun strongly predict alcohol use to manage anticipatory and in-situation anxiety.

Alcohol consumption also leads to spending significantly more time thinking, usually negatively, about social events (Gagné, Radomsky, & O' Connor, 2021). Individuals lower in experiential avoidance who use protective behavioural strategies

enact more mindful, non-judgmental perspectives toward private events, whereas individuals high in coping through experiential avoidance and alcohol use are imprisoned by their inflexible negative self-evaluations and over or under emotional expressions (Kashdan et al., 2006; Villarosa et al., 2016). Overall, studies indicate that SA is strongly connected, possibly causally, to alcohol use in both clinical samples and from the general population, and that using alcohol to manage social fears can result in alcohol being used as a coping strategy for decades (Papachristou et al., 2018).

Over time, SA has widespread effects on various domains of a young person's life. For instance, developmentally speaking individuals who experience SA are more likely to be victims of bullying, leave school early with poorer qualifications, have fewer friends, are less likely to marry, more likely to divorce, less likely to have children, and have poorer performance and more absences at work (Jeffries & Ungar, 2020). Shifting to the second part of the article, attention will now focus on health promotion strategies. More general strategies and treatments will be discussed first followed by religious and spiritual approaches that address anxiety.

Health Promotion and Therapeutic Options

Youth living with anxiety suffer deeply from a fractured sense of self tend to be self-critical, have little compassion for themselves and yet, carry a profound sense of responsibility for others. Despite these circumstances, and the fear of stigmatization, young people still want to share their difficulties with others who are safe, and desire to grow through self-discovery, awareness, and reflection (Woodgate et al., 2020). Health promotion is a process whereby a person is enabled to increase control over and improve their own health to increase their sense of competence, self-esteem, and well-being (Mann et al., 2004). Anyone in contact with someone experiencing anxiety can be helpful by being open, engaging, and non-judgmental in conversation, allowing the individual to explore their worry in a safe, respectful, private environment (National Institute for Health and Clinical Excellence, 2011). Some tangible solutions to mitigate the effects of anxiety include implementing consistent and predictable routines around academic/work related pursuits, screen use, physical activity, sleep, and use of experimental disclosure (Racine et al., 2021; Frattaroli, 2006).

Concerning young person screen use, limiting social media use to approximately 30 minutes per day can significantly reduce anxiety and lead to improvement in well-being (Hunt et al., 2018). Also, physical activity is known to help mental health via improvements in self-perceptions (i.e., self-concept and self-esteem), distractions from everyday stressors, and through promotion of beneficial changes in brain regions implicated in manifestations of anxiety or stress-related

conditions (Felez-Nobrega et al., 2021). Moreover, mobile technologies such as acitgraphy devices (a wrist-worn device that measures physical movement in a person's living environment) and smartphones allow individuals to track real time effects of physical activity levels on mood. Examining the effects of physical activity levels on the individual level is important as not everyone experiences the benefits of activity on mood; however, physical activity can elicit short- and long-term benefits for individuals with anxiety. Research has shown that higher physical activity enhances subsequent positive affect and improves mood while decreasing negative affect; thus, physical activity is a viable strategy for mood improvement and regulation for people struggling with anxiety (Difrancesco et al., 2022).

Another readily accessible technique for managing anxiety is experimental disclosure. Experimental disclosure is a psychotherapeutic activity whereby an individual spends approximately 20 minutes a day for three days writing (or talking) about current thoughts and feelings about personal and meaningful topics, at home or in a private setting (Frattaroli, 2006). It is used to unpack and process psychologically (or physically) painful/stressful experiences, yet positive experiences can be recorded, too. Encouragingly, though not as effective as receiving psychotherapy, experimental disclosure not only has a positive effect on reducing anxiety, but also has shown beneficial effects on a number of psychological health subcategories such as distress, depression, anger, and overall subjective well-being (Frattaroli, 2006). These self-help strategies can be helpful for ameliorating the effects of anxiety, however, for many receiving services from a mental health professional will be a more suitable additional option.

Professional Mental Health Options

In terms of receiving help from a mental health professional (psychiatrist, psychologist, or a master's degree level trained counsellor) two evidence-based therapeutic techniques effective for treatment of anxiety are Cognitive-Behavior Therapy (CBT) and Emotion-Focused Therapy (EFT) (Timulak et al., 2022). CBT is a class of scientifically informed interventions that seek to directly manipulate dysfunctional ways of thinking and patterns of behaviour to reduce psychological suffering (Carpenter et al., 2018). Concerning anxiety, CBT focuses on changing maladaptive beliefs about the likelihood and true cost of anticipated harms by using various cognitive (i.e., cognitive restructuring) and behavioural (i.e., exposure) techniques (Carpenter et al., 2018). Specifically, CBT therapists will provide psychoeducation, and help with worry monitoring and reevaluation, problem-solving, and both imaginal and in vivo (real life) exposure (Timulak et al., 2022). In addition to CBT, Internet-based Cognitive Behavior Therapy (ICBT) has been proven efficacious for people suffering from social anxiety (Niles et al., 2021). The

effectiveness of ICBT is like face-to-face CBT with the additional benefits of being more accessible (i.e., across geographical locations and time availability) and more palatable for those with greater avoidance-based challenges (Niles et al., 2021).

Another valuable target for CBT connected to anxiety is insomnia. As previously mentioned, sleep disruption has been shown to worsen mood vulnerability and exacerbate anxiety-related symptoms; Cognitive-Behavior Therapy for Insomnia (CBT-I) uses multiple evidence-based strategies including good sleep hygiene, stimulus control, sleep restriction and relaxation therapy to reduce insomnia and improve sleep quality (Chellappa & Aeschbach, 2022). CBT-I treats insomnia by focusing on cognitive restructuring by addressing negative cognitive patterns and behaviours that initiate and perpetuate insomnia and reinforce worry and rumination. Many professionals see CBT-I as a first line treatment for insomnia (Chellappa & Aeschbach, 2022).

EFT is a research-informed therapy that focuses on transforming maladaptive emotions through generation of adaptive emotions (Greenberg, 2015). Change is facilitated by helping people make sense of their emotions through awareness, expression, regulation, reflection, transformation, and corrective experience of emotion in the context of an empathetically attuned relationship (Greenberg, 2010). EFT is effective at helping clients stay with vulnerable emotions (e.g., chronic loneliness/sadness, shame, and fear) to overcome avoidance, making it possible to generate adaptive experiences of compassion and protective anger in response to the emotional needs during emotional vulnerability (Timulak et al., 2022). Having presented many viable self-help strategies and professional mental health resources, it is now time to consider religious and spiritual approaches to managing anxiety.

Religion, Spirituality, and Anxiety

Anxiety is ubiquitous, but training in how to properly treat those suffering from anxiety is not. Thus, it is important to recognize where one's knowledge and training may not be sufficient or adequate for the level of psychological difficulty encountered and to be comfortable expressing those limitations to people who may seek counsel from people of faith (i.e., church leaders, members, or religious educators). At the same time, the church as a body would benefit from considering the cognitive challenges, lowered self-esteem, fatigue, brain functioning changes and social struggles that individuals who suffer from anxiety experience. From a Judeo-Christian perspective, for people of faith to help others know God better – His healing and the fullness of His plans for their life – it is imperative to understand that negative relational experiences only add to diminishment of a person's self-esteem. As a result, they will limit or remove their participation in the community, which will deepen their psychopathology (Longworth et al., 2018).

Youth of today face increased uncertainties in an environment of fear, stress, fake news, and conspiracy theories. Youth also experience more psychological problems overall while having less religious/spiritual commitment and life satisfaction (Koçak, 2021). Fortunately, there is a wealth of research that addresses how religion and spirituality can better a person's mental health. The use of religious and/or spiritual resources to connect with the divine in times of crisis, trauma, and/or transition is termed religious coping. Religious coping is defined as a person's efforts to understand and deal with life stressors in ways related to the sacred (the term "sacred" refers not only to traditional notions of God, divinity, or higher powers, but also to other aspects of life that are associated with the divine or are imbued with divine-like qualities) (Pargament, Feuille, & Burdzy, 2011).

Religious coping happens when events, goals, and the means used to reach them are actively interpreted in relation to the sacred and serves five main functions: finding meaning, gaining control, gaining comfort from and closeness to God, finding intimacy with others, and life transformation (Dein, 2013). It involves relationships, behaviors, emotions, and cognitions and, in line with the purposes of this article, anxiety-reduction (Pargament et al., 2011). Religious coping can be positive or negative. Positive religious coping methods reflect a secure relationship with a transcendent force, a sense of spiritual connectedness with others, and a benevolent worldview, whereas negative religious coping methods reflect underlying spiritual tensions and struggles within oneself, with others, and with the divine (Pargament et al., 2011). Predictably, research indicates that negative religious coping and spiritual struggles are significantly associated with anxiety (and depression) (McConnell et al., 2006). Additionally, individuals with anxiety (and depression) that hold to negative religious coping often have unrealistic expectations regarding various religious practices. Thus, it is important to emphasize setting realistic targets for activities such as Bible reading or prayer, as excessive expectations may evoke a sense of failure, enhance guilt, and worsen mood (Dein, 2013).

Studies also suggest negative experiences with organized religion may be related to higher levels of anxiety (Rowell et al., 2020). In the end, for those who adhere to negative religious coping practices, spiritual reframing will be necessary to address rigid, inflexible, idiosyncratic religious beliefs, tensions with others, and belief in a punitive, uncaring, vengeful God. Spiritual reframing can transform religious and spiritual resources into sources capable of improving mental health. One strategy for spiritual reframing, if the individual consents, is to attempt to place negative life events in a larger, more meaningful, and benevolent context to reformulate the event/situation/experience as one of spiritual growth or increasing faith, by drawing on specific religious teachings and texts. For those who hold an excessively punitive image of God, religious reframing can help them adopt an image that is more benevolent and compassionate (Dein, 2013). Alternatively, positive

religious beliefs and practices can comfort people who are fearful or anxious, increase sense of control, enhance feelings of security, and boost self-confidence (Koenig, 2009). Building on this, the following research-based benefits of positive religious coping that will be explored are the embodied practices of forgiveness, gratitude, Christian mindfulness meditation, and prayer.

Forgiveness

Forgiveness is an essential and necessary component of healthy physical, psychological, and social development. It is a vital virtue of many spiritual and religious belief systems, and this holds especially true within Christianity (cf. Matt 6:12, Luke 11:4; Matt 6:14-15; Matt 18: 21, Luke 17:4). Forgiveness is associated with numerous benefits for physical and mental health and relationships, primarily through the reduction of stress (Davis et al., 2013). Forgiveness is a process of decreasing inter-related negative resentment-based emotions, motivations, and cognition (Worthington, 2005). It is not downplaying or excusing the negative effects of an experience; rather, it is an activity that increases empathy, compassion, and understanding toward oneself and others. It is a decisional (controlling one's behaviour) and affective (changing thoughts, emotions, and motivations) process beginning with addressing thoughts and feelings associated with unforgiveness, often including negative emotions such as fear, anger, resentment, hatred, and hostility. The procedure of forgiveness releases oneself from ruminating on retribution by replacing negative emotions of unforgiveness with neutral or even positive emotions. This emotional replacement can happen in one transformative corrective experience or gradually over time (Worthington, 2003). Studies show spirituality significantly predicts forgiveness of others beyond personality traits, and aspects of spirituality like a disposition to forgive and one's concept of the Divine influences one's experience of anxiety (Davis, Worthington, Hook, & Hill, 2013; Rowell et al., 2020). To partake in this work, Worthington's REACH model is an empirically validated framework for practicing forgiveness; this resource can be found at: http://www.evworthington-forgiveness.com/

Previous research significantly connects the effects of forgiveness on anxiety; specifically, interpersonal forgiveness is inversely related to anxiety and the willingness to forgive significantly correlates with lower levels of anxiety (Rowell et al., 2020). This holds for self-unforgiveness, too, as anxiety is positively related to self-unforgiveness among college students (Rowell et al., 2020). Extending these findings, Davis and his team found self-forgiveness is positively related to psychological well-being, life satisfaction, meaning, and general quality of mental health and is negatively related to anxiety, traumatic symptoms, depression, suicide symptoms, and alcohol symptoms (2015).

Overall, it is clear forgiveness of self and others is an important component of addressing anxiety. Studies confirm forgiveness is effective in reducing negative feelings associated with unforgiveness, helps in the treatment of various forms of anxiety (i.e., generalized anxiety disorder, social anxiety, and panic disorder), and increases one's sense of hope and self-esteem (Enright & Fitzgibbons, 2015).

Gratitude

Gratitude can be seen as feelings anchored in two essential pieces of information processed by an individual: (a) an affirming of goodness or "good things" in one's life and (b) the recognition that the sources of this goodness lie at least partially outside the self (Emmons & Stern, 2013). Purportedly, gratitude can lower blood pressure, improve immune function, promote happiness and well-being, spur acts of helpfulness, generosity, and cooperation, and potentially reduce lifetime risk for anxiety, depression, and substance abuse disorders (Emmons & Stern, 2013). In many religious traditions, gratitude is integral to health and well-being. One study among undergraduate students found those who kept gratitude journals on a weekly basis exercised more regularly, reported fewer physical symptoms, felt better about their lives, and were more optimistic about the upcoming week compared with those who recorded hassles or neutral life events (Emmons & McCullough, 2003).

A qualifier to using gratitude as a strategy for decreasing anxiety is that the duration of time one spends being grateful matters. Meta-analytical studies investigating the efficacy of gratitude in reducing anxiety found weak efficacy (Davis et al., 2016; Cregg & Cheavens, 2020); however, these analyses only account for studies that utilized short, self-help-oriented gratitude interventions (i.e., doing self-guided brief periods of gratitude journaling). Conversely, a study using a computer and app-based hybrid version of the GET.ON gratitude intervention, with many different exercises that targeted various aspects of gratitude and offered ecoaches for support, found this approach not only decreased repetitive negative thinking, but also demonstrated a medium to large effect on reducing anxiety (and depression) (Heckendorf et al., 2019). For gratitude practices to substantially reduce anxiety, they need to be a sustained daily exercise, with options for additional support.

Prayer

Prayer is a complex, multidimensional resource that takes many different forms and a variety of meanings. Underlying the action of prayer is the belief that it does, or will do, something helpful. Several studies show that prayer practices predict enhanced mental health and well-being through various mechanisms including closeness to God and feeling like God is in control, disclosure as a means of

communicating with God, trust-based beliefs, cognitive reappraisal (i.e., reframing the source of pain), and as a coping resource for reducing existing distress, pain, and stress (Lowe, Wang, & Chin, 2022; Zarzycka & Krok, 2021). In relation to the effects of prayer on anxiety, Tloczynski & Fritzsch (2002) studied a sample of US undergraduate students. Some received prayer for up to 7 weeks and some were not prayed for. They discovered that others' prayers lowered anxiety scores and that the reduced anxiety scores somewhat matched the timing for which they received prayer. In contrast, those not receiving prayer did not have decreased anxiety scores (Tloczynski & Fritzsch, 2002). Along those lines, it was found that over a 1-year time interval, subjects receiving direct person-to-person prayer reported significantly less depression and anxiety, more optimism, and greater levels of spiritual experience than did the baseline (pre-prayer) measures in all cases (Boelens et al., 2012). This finding supports the belief that direct person-to-person prayer is useful as an adjunct to other interventions for people with anxiety (and depression) (Boelens et al., 2012).

Notably, different types of prayer can account for different outcomes. A study on 564 graduate seminary students from 17 different institutions found significant negative relationships between colloquial (talking to God in one's own authentic words), liturgical (prayers that are read, memorized, and recited), and meditative prayer (prayer that includes components of intimacy and personal relationship to God such as adoring, reflecting, and communicating with the divine) with anxiety, depression, and burnout (Lowe et al., 2022). Each of these forms of prayer decreased anxiety, depression, and burnout by addressing experiential avoidance. Gámez and colleagues (2011) found experiential avoidance has often been shown to only create or exacerbate problems or, ironically, increase interaction with the situation being avoided. Colloquial, liturgical, and meditative prayer increases psychological flexibility and a causal sequence of greater engagement with prayer leads to a decrease in experiential avoidance, which in turn, can reduce anxiety (and depression, and burnout) symptoms (Lowe et al., 2022).

It is important to mention that petitionary prayer (prayers making requests for specific material needs of self and others) is consistently associated with negative mental health outcomes (Lowe et al., 2022). As this form of prayer lacks an interpersonal focus, is aimed at getting something from God and requires the person praying to focus on what they are lacking or on their unfulfilled needs it may be that petitionary prayer practiced selfishly or inconsiderately has the tendency to draw out pathology in ways other prayer types avoid (Zarzycka & Krok, 2021; Lowe et al., 2022). The next section extends attention to prayer rooted in meditation.

Christian Mindfulness Meditation

The purpose of Christian mindfulness meditation – whether conducted for an extended period or briefly, with long recitations or use of a single word or phrase – is to increase one's sense of connection and closeness with God. Mindful meditation is the process of attending to present-moment sensations, thoughts, emotions, and experiences in a non-judgmental manner, which exerts beneficial effects on health and well-being, both in non-clinical and clinical populations (Parmentier et al., 2021). Worry and rumination are consistently implicated as core features in the development and maintenance of anxiety and decreased overall well-being (Parmentier et al., 2021).

Spiritually meditative prayer emphasizes two-way communication and interpersonal interaction that promote closeness to God (Jeppsen et al., 2022). Meditative prayer provides a sense of agency or direction for the person praying and a sense that "I can make a difference" in tangible kinds of ways in moving forward (Jankowski & Sandage, 2011). One study had participants meditate for 20 minutes per day for 30 days and found that God-centered spiritual meditation (i.e., "God is peace," "God is joy," "God is good," and "God is love.") had a large effect on reducing anxiety and other negative feelings while also significantly decreasing the frequency of migraine headaches compared to a secular based meditation (i.e., "I am content," "I am joyful," "I am good," "I am happy.") (Wachholtz & Pargament, 2008). This study indicates the spiritual component of meditation has a unique additive effect to decrease anxiety and frequency of migraine headaches (which are known to negatively impact mood, quality of life, self-identity, relationships, and ability to work) (Wachholtz & Pargament, 2008). Another study found one specific way Christians can practice mindfulness meditation is by surrendering to God's active presence within (Frederick & White, 2022). For Christians, surrendering to God's active presence helps cope with worry and is a potential mechanism that allows individuals to experience less anxiety (Frederick & White, 2022). Timbers & Hollenberger (2022) state for Christians the doctrine of the Trinity and Jesus' incarnation brings overwhelming physical and emotional experiences with God through mindfulness techniques. For example, using mindfulness techniques like body scans, breathing exercises, and self-soothing, one intentionally becomes aware of a specific embodied experience, and can combine this self-awareness with attention to God, who cares for and ministers to each unique person (Timbers & Hollenberger, 2022). Therefore, use of mindfulness techniques in Christian worship, surrendering to God, and attending to one's mental health needs, can further spiritual growth by freeing up energy that was previously used to manage emotional or physical suffering (Timbers & Hollenberger, 2022).

Timbers & Hollenberger (2022) also note, despite the benefits of mindfulness, Christian theology would not assert that self-awareness and emotional regulation are the end goal. Rather, these practices are tools for deepening religious

meaning and commitment that augment religious coping and worship. In this way, the mind (the knowledge of Christian tenets and God's character) is integrated with the physical experience (the bio-psycho-social realities) allowing for faith to be a holistic experience (Timbers & Hollenberger, 2022). Lastly, Jeppsen and colleagues (2022) found for Christians, closeness to God mediated the relationship between mental health and meditative (and colloquial) prayers, which supports the theory that one's relationship to God may be a source of social support related to improved mental health for Christians. Encouragingly, use of meditation can improve one's overall health across the lifespan (Wachholtz & Austin, 2013).

Importantly, though there is a clear link between mental health and religion and spirituality, the relationship is complex and bi-directional. For some, their spiritual beliefs, practices, and experiences may be a source of peace, the antidote to anxiety. For others, however, beliefs may occasion shame, guilt, or fear, which may increase anxiety (Rowell et al., 2020). All spiritual activities are approached through the lens of how a person perceives God. There is evidence that one's beliefs concerning God (or God concept) are related to anxiety. Specifically, perceiving God as either passive or negative is associated with greater psychological distress while supportive or positive perceptions of God are associated with lower levels of distress (Eurelings-Bontekoe, Steeg, & Verschuur, 2005). Another study found that persons who viewed God as engaged had lower anxiety while people who viewed God as judgmental had higher levels of social anxiety (Morrow & Froese, 2011). The accumulating findings suggest that one's concept of God may be an important consideration for predicting anxiety and the treatment of anxiety (Dein, 2013).

Conclusion

Anxiety is a universal emotion that can distort cognition, overwhelm emotions, and incite maladaptive behaviours. However, at times it would be maladaptive not to experience anxiety as it is a necessary part of a person's response to a stressor (i. e., a threat to the psychological or the physiological integrity of an individual). Anxiety can take on many forms and be experienced in a variety of ways. It can be divided between state anxiety and trait anxiety having cognitive and somatic features. Anxiety may reach clinically significant levels likely reflecting a lifetime of maladaptive responses to stress due to individual differences in biogenetic background, developmental influences, and early life experiences (Staner, 2003). There isn't a clear distinction between normal anxiety and pathological anxiety; however, in normal anxiety there is a clearer perception of the immediacy and source of challenge or threat, whereas in pathological anxiety the nature of the stress is not always clear or discernible. Whether normal or pathological, the symptoms of anxiety always involve increased arousal or alertness leading to attention/thought

problems, self-esteem issues, and sleep–wake alterations that increase the likelihood of using unhealthy coping tools. Sadly, some may depend on, or become addicted to, a variety of escape/avoidance behaviours that only serve to worsen their condition.

Experiencing anxiety can create tremendous challenges for persons of any age; but it has become an increasingly debilitating experience for those in the adolescent/early adulthood stages of development. It is of utmost importance to equip the youth of today, and those in a supportive role around them, with tools and resources to successfully mitigate and manage their experience with anxiety symptoms. Beneficially, there are empirically validated self-help and professional options that help reduce anxiety symptoms. Additionally, for both healthy individuals and clinical populations, religion in general, religious training, spirituality, faith, prayer, religious community, and worship are associated with a reduction in anxiety and stress (Stewart et al., 2019). Lastly, genuine spirituality allows an individual to fully experience, express, and address anxiety rather than avoiding psychological and emotional discomfort (Rowell et al., 2020).

In summary, this paper has described differences between various types of anxiety, discussed the effects of anxiety on one's thoughts, self-esteem, and sleep quality, considered the neurobiological underpinnings of anxiety, proposed self-help, and professional treatment options, and presented religious and spiritual resources aimed at increasing an overall sense of peace, hope, optimism, and meaning in a young person's life.

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Appendix A

Before discussing specific brain structures and neurochemical systems it is important to note a plethora of structural and neurochemical (neurotransmitter and neuromodulator) systems orchestrate sleep and emotional regulation. Regarding brain structures, neuroimaging studies using functional magnetic resonance imaging (fMRI) indicate sleep disturbance/loss amplifies activity within the "fear network", which includes the limbic system (a collection of brain structures like the amygdala, hippocampus, and hypothalamus that are involved in processing emotion) (Chellappa & Aeschbach, 2022) and the salience network (SN) involved in cognitive control (dorsal anterior cingulate cortex and anterior insula) (Peters, Dunlop, & Downar, 2016). The SN plays a central role in cognitive control by integrating sensory input to guide attention, attend to motivationally salient stimuli, and recruit appropriate functional brain-behaviour networks to modulate behavior, and when that system is disturbed, it can be a significant contributor to pathological conditions like anxiety (Peters, Dunlop, & Downar, 2016). Additionally, the anxiety inducing impact of total sleep loss relates to impaired medial prefrontal cortex activity and associated connectivity with extended limbic regions (Chellappa & Aeschbach, 2022). Structurally, it can be helpful to highlight the functions, and interconnections, of the amygdala, medial prefrontal cortex, hippocampus, hypothalamus, anterior cingulate cortex, insula, and locus coeruleus to appreciate the brain networks that contribute to the experience of anxiety and how sleep deprivation can exacerbate one's overall relationship with anxiety.

The amygdala is known to play a role in the processing of emotionally salient information, particularly to aversive or negative stimuli (Yoo et al., 2007). Additionally, the amygdala may play a role in increasing urges to obtain rewards, leading to a "higher stakes" experience where individuals have a lot to gain and a lot to lose (Aupperle & Paulus, 2010). This will distort and elevate the perceived importance of each choice a person is considering. The amount of amygdala involvement is particularly influenced by the medial prefrontal cortex (MPFC). The MPFC is critical for decision-making and emotional control and appears to exert

inhibitory top-down control of the amygdala, resulting in contextually appropriate emotional responses. Evidence indicates a lack of sleep inappropriately modulates those emotional responses to disproportionally focus on negative stimuli contributing to compromised decision-making skills and potentially inappropriate behaviour (Yoo et al., 2007). The hippocampus is a vital structure for memory storage and retrieval and has a multifactorial relationship with the experience of anxiety. Through its mediation of fear responses and processing of contextual information, the hippocampus plays a central role in the onset and continuance of anxiety disorders (Baksh et al., 2021). For example, input from the hippocampus to the amygdala is known to be central in fight-or-flight responses experienced during threat or challenge and the aforementioned "fear network" in the amygdala is controlled by MPFC areas via the hippocampus (Baksh et al., 2021). Also, the functional connectivity between the (right) hippocampus and the (left) insula has a positive relationship with trait anxiety and negative relationship with risk-taking (Huo et al., 2020). Huo and colleagues go on to suggest that trait anxiety can affect risk-taking (which could lead to positive experiences) via episodic future thinking mechanisms furthered by the hippocampus in concert with emotional and motivational control mechanisms promoted by the insula (2020). More succinctly, individuals with trait anxiety are more likely to interpret internal and external stimuli pessimistically and consequently avoid making decisions that perceivably involve risk and thus maintain (or worsen) their thought processes, mood, and behaviour.

Elaborating on this effect on decision making, we'll look more closely at the role of the insula. The insula seems to play an important role in monitoring internal states (interoception), predicting future internal states in response to environmental changes, and in seeking to maintain homeostasis, especially in situations that involve risk or uncertainty (Aupperle & Paulus, 2010). There is also evidence that the insula plays a role in integrating information concerning current bodily state with cognitive information to make change predictions. Along with the orbital frontal cortex (OFC – which plays a primary role in reward processing), the insula is important for integrating individuals preconceived beliefs with the current bodily state to make change predictions related to various choices. This means insula (and OFC) dysfunction evident in anxiety disorders could lead to imbalances in calculating differences regarding current and future internal states, which can influence risk estimations and approach-avoidance decision making (Aupperle & Paulus, 2010). Adding to this, the anterior cingulate cortex (ACC) (located at the front of the cingulate cortex) involved in emotion and social cognition, when functioning abnormally, is also associated with emotional, social, and behavioural disturbances (Hadland et al., 2003). Specifically, the ACC plays a critical role in forming associations between rewards and actions linking motivational outcomes to behaviour (Hayden & Platt, 2010). Consequently, when the ACC is functioning

abnormally it leads to an increase in harm avoidant behaviours, meaning one's sensitivity to incorrect predictions leads to aversive responses based on incorrectly predicted circumstances (Paulus et al., 2004). Furthermore, inherent to anxiety is conflict between approach-related drives (e.g., to seek positive social interactions; to leave the house) and avoidance-related drives (e.g., to prevent being humiliated or having a panic attack) (Aupperle & Paulus, 2010). Thus, the coupling of incorrectly predicting negative outcomes and the underlying conflict between approach and avoidance are powerful mechanisms that maintain anxiety. Moving from the complex relationship that brain structures play in the development, maintenance, and progression of anxiety, we'll now look briefly at the influence of neurochemical (neurotransmitter and neuromodulator) systems.

Neurochemical Involvement

When considering the biological factors involved in the experience of anxiety, a discussion of neurochemical action is appropriate as they are responsible for the activity of brain structures and are used to form, maintain, strengthen, and weaken neuronal networks. Some of the neurotransmitter and neuromodulator systems involved in experiencing anxiety include norepinephrine, acetylcholine, GABA, glutamate, dopamine, serotonin, and adenosine.

Norepinephrine (aka, noradrenaline) is produced in an area of the brainstem named the locus coeruleus and is an arousal neurotransmitter. Norepinephrine levels are elevated in individuals with anxiety which leads to hyperactive alerting/orienting networks in the brain (Chellappa & Aeschbach, 2022). This hyper-arousal causes elevated heart rate, blood pressure, sweating, shaking, and an over responsive fight-or-flight response. Acetylcholine is an arousal neurotransmitter that is synthesized in many areas of the central nervous system (CNS). It influences functions including memory, cognition, attention, arousal, and muscle contractions all throughout the body. Specifically, in the brain, acetylcholine alters neuronal excitability, influences synaptic transmission, induces synaptic plasticity, and coordinates firing of groups of neurons. As a result, it changes the state of neuronal networks throughout the brain and modifies their response to internal and external inputs (Picciotto, Higley, & Mineur, 2012). It plays a central role in sleep regulation and in triggering anxiety (Chellappa & Aeschbach, 2022). GABA (□-aminobutyric acid) is found throughout the human body and is the primary inhibitory (in that it sends a "stop" message) neurotransmitter in the CNS. It has a complex role in anxiety as GABA activity can both produce anxiety enhancing (anxiogenic) and anxiety reducing (anxiolytic) effects in the brain. Glutamate is the most abundant excitatory (in that it sends a "go" message) neurotransmitter in the CNS. Dysfunction of the glutamate system has been associated with trauma and stress psychopathology

(Chellappa & Aeschbach, 2022). People struggling with anxiety have high levels of glutamate activity in many different regions of the brain. Dopamine is a neurotransmitter produced in the substantia nigra, ventral tegmental area, and hypothalamus, and is intimately involved in reward neuro-circuitry, addiction, and processing of aversive stimuli (Chellappa & Aeschbach, 2022). Reduced dopamine release is associated with several different forms of anxiety, including higher trait anxiety (Chellappa & Aeschbach, 2022). Serotonin is a neurotransmitter that plays an essential role in both sleep-wake and mood regulation systems. Fear and reward related-brain regions are particularly sensitive to elevated serotonin levels, which contribute to anxiety related behaviours, especially in the experience of social anxiety and sleep dysregulation (Chellappa & Aeschbach, 2022). Adenosine is a neuromodulator that can be found all over the CNS. It plays a prominent role in both sleep and anxiety in that its intended function is to promote sleep as it accumulates in one's brain, and with continued lowered sleep quality, plays a role in activating the brain's fear network. Research findings indicate the systems affected by adenosine play a central role in arousal-related disorders (Chellappa & Aeschbach, 2022). Accumulating molecular imaging evidence suggests the adenosinergic system (systems that produce or respond to the neurotransmitter adenosine), is one of the neurotransmitter mechanisms underlying sleep-wake regulation and is also involved in anxiety.

In summary, it is clear sleep disturbances worsen mood vulnerability and exacerbates anxiety-related symptoms and there is now substantial evidence indicating overlapping brain networks underlie sleep and emotion regulation (Chellappa & Aeschbach, 2022). Thus, the information from this section delineates the neuropsychological ways that disrupted sleep magnifies anxiety and impairs regulatory control over emotion processing and decision-making.