

FOCUS: NURSING

## Chronic Physical Illness: A Psychophysiological Approach for Chronic Physical Illness

Jana Purdy, PMHNP

*Psychiatric ARNP, Greater Lakes Mental Health Care, Lakewood, Washington*

Growing evidence demonstrates that psychological risk variables can contribute to physical disease. In an effort to thoroughly investigate potential etiological origins and optimal interventions, this broad review is divided into five sections: the stress response, chronic diseases, mind-body theoretical models, psychophysiological interventions, and integrated health care solutions. The stress response and its correlation to chronic disorders such as cardiovascular, gastrointestinal, autoimmune, metabolic syndrome, and chronic pain are comprehensively explored. Current mind-body theoretical models, including peripheral nerve pathway, neurophysiological, and integrative theories, are reviewed to elucidate the biological mechanisms behind psychophysiological interventions. Specific interventions included are psychotherapy, mindfulness meditation, yoga, and psychopharmacology. Finally, the author advocates for an integrated care approach as a means by which to blur the sharp distinction between physical and psychological health. Integrated care approaches can utilize psychiatric nurse practitioners for behavioral assessment, intervention, research, advocacy, consultation, and education to optimize health outcomes.

---

To whom all correspondence should be addressed: Jana Purdy, PMHNP, Greater Lakes Mental Healthcare, 9330 59th Ave. SW, Lakewood, WA 98499; Tele: 253-581-7020; Email: paulandjana@q.com.

†Abbreviations: CDC, Centers for Disease Control; HPA axis; hypothalamic-pituitary-adrenal axis; SNS, sympathetic nervous system; CRF, corticotropin releasing factor; ACTH, adrenocorticotropic hormone; CHD, coronary heart disease; HRV, heart rate variability; WHI, Women's Health Initiative; RA, rheumatoid arthritis; DMARDs, disease modifying anti-rheumatic drugs; TNF, tumor necrosis factor; IBS, irritable bowel disease; PFC, prefrontal cortex; IC, insular cortex; ACC, anterior cingulate cortex; EHN, executive homeostatic network; CBT, cognitive behavioral therapy; DBT, dialectical behavior therapy; ACT, acceptance and commitment therapy; SAMHSA-HRSA, Substance Abuse and Mental Health Services—Health Resources and Services Administration; DSM, Diagnostic Statistical Manual; PMHNP, psychiatric mental health nurse practitioner.

Keywords: stress, hypothalamic-pituitary axis, sympathetic nervous system, depression, anger, Type D personality, cynicism, vitality, optimism, cardiovascular disease, gastrointestinal disease, autoimmune disease, metabolic syndrome, chronic pain, psychodynamic psychiatry, cognitive behavioral therapy, dialectical behavioral therapy, acceptance and commitment therapy, positive psychotherapy, mindfulness meditation, yoga, integrative medicine, psychiatric mental health nurse practitioner

## INTRODUCTION

According to the Centers for Disease Control (CDC†), chronic diseases such as heart disease, cancer, and diabetes are among the leading causes of death and disability in the United States, and nearly 1 out of 10 Americans suffer significant functional limitations as a result [1]. An expanding evidence base implicates psychosocial etiologies in the pathophysiology of several disease states [2-4]. Chronic stress exceeding an individual's capacity to cope affects the brain, endocrine system, and the immune system [4,5]. Integrative medicine practices with the understanding that the mind is inherently inseparable from endocrine, immune, and central/peripheral nervous systems, and thus, psychophysiological interventions seek not only to eradicate disease symptomatology but also to enhance health by facilitating the mind's capacity to optimize physical function [2].

Taylor et al. defines the mind as follows: "conscious and unconscious thought patterns, including images, perceptions and intentions, generated by a functional network of distributed neural centers in the brain and body, including homeostatic representations that provide the context for human self awareness and emotional experience" [6]. By concentrating on how health can be affected by emotional, mental, social, spiritual, and behavioral variables, mind-body medicine can examine interactions as they occur between the brain, mind, body, and behavior [6]. It is paramount that we continue to research the potential consequences of anger, hostility, fear, guilt, and helplessness on the physical body while simultaneously examining the beneficial effects of joy, love, creativity, optimism, passion, curiosity, flexibility, perseverance, and altruism. Research exploring interventions that focus on the mind's capacity to affect health are essential now and in the future.

This comprehensive review is divided into five sections: (a) the stress response, (b) chronic disease, (c) mind-body theoretical models, (d) psychophysiological interventions, and (e) the urgent need for integrated

health care solutions. In the following pages, I will explore the potential for physical disease to arise from chronic psychological stress through the stress response and its correlation with cardiovascular, gastrointestinal, and autoimmune disease along with metabolic syndrome and chronic pain. Current mind-body theoretical models will be reviewed to include peripheral nerve pathway, neurophysiological, and integrative theories. Adjunctive psychophysiological interventions will be explored, specifically psychotherapy (psychodynamic, cognitive behavioral, acceptance and commitment, positive and dialectical behavioral), as well as mindfulness meditation, yoga, and psychopharmacology. These interventions have the potential to empower the patient, address underlying etiological mechanisms, and ultimately improve physical symptomatology. I will advocate for an integrated care approach in order to blur the sharp division between physical and psychological health. Finally, I will discuss the potential for psychiatric mental health nurse practitioners (PMHNPs) to significantly contribute to an integrated care approach through behavioral assessment, intervention, research, advocacy, liaison, consultation, and education.

## THE STRESS RESPONSE

Chronic autonomic nervous system activation causes a greater allostatic load (stress burden on the body) that can result in hypertension, tachycardia, hyperglycemia, and muscle tension [3,4]. Over time, this can result in a constant state of hypervigilance from repeated firing of the hypothalamic-pituitary-adrenal (HPA) axis and sympathetic nervous system (SNS). This dysregulation can contribute to chronic physical diseases such as cardiovascular disease, obesity, diabetes, and autoimmune disorders [4,5]. Stress can be defined as a real (physical) or perceived (psychological) threat to the homeostasis of an organism that induces adaptive responses striving to protect the stability of the internal environment [7]. While this response assures survival of the organism, the presence of severe, prolonged,

or chronic stressors can result in maladaptive physiological responses that increase vulnerability to new diseases or exacerbate existing disease [7].

The physiological effects of stress are mediated by central, autonomic, endocrine, and immune systems [4,8]. Chronic stress results in the activation of the sympathoadrenal system and the HPA axis that involves catecholamine release, vagal withdrawal, cortisol secretion, and upregulation of the renin-angiotension system [8]. The neuroendocrine immune system, including the HPA axis, can be over-stimulated by the limbic system in unremitting stress [4,9]. The HPA axis involves two main hormones, corticotropin-releasing factor (CRF) and adrenocorticotropin hormone (ACTH), and is a complex set of direct influences and feedback loops between the hypothalamus, the pituitary gland, and the adrenal glands [8]. Stress can result in a chronically activated hypothalamus that stimulates the SNS and the secretion of corticotrophin-releasing hormone (CRH), and in response, the pituitary gland secretes adrenocorticotropin hormone [9]. In an effort to maintain homeostasis, cortisol is released from the adrenal cortex, which, if prolonged, can cause damage along with a disruption in the HPA axis function [9]. In addition, stress hormones and over-activation of the HPA axis may facilitate inflammation through the induction of pro-inflammatory cytokine production [4,9].

## CHRONIC DISEASE

### *Cardiovascular Disease*

Heart disease has been the leading cause of death in the United States for the past 80 years and has the potential to result in significant disability, expenditure, and societal burden [10]. In 2010, the total costs of cardiovascular diseases in the United States were estimated to be an astonishing \$444 billion [10]. Remarkably, of all the Americans who died of cardiovascular diseases in the year 2007, 150,000 were younger than the age of 65 [10]. Although the complex rela-

tionship between the mind and the heart is poorly understood, current research is beginning to explore correlative mechanisms [4,11,12,13,14,15,17]. Prospective risk factor studies demonstrate that emotional distress measures are at least as strong as well-accepted risk factors in predicting cardiovascular mortality [4,12].

Depression, in particular, has been found repeatedly to predict early onset coronary heart disease (CHD) [12]. According to Ketterer et al. in *Psychosomatic Medicine*, epidemiology research has revealed that major depression criteria are met in 18 to 20 percent of CHD cohorts, which represents a five-fold increase over the general population [12]. Depression is co-morbid with anxiety and anger, both of which have been found to be positive predictors of cardiac disease and mortality [12]. A 2009 study (n = 682) revealed a markedly strong relationship between depressive symptoms and the incidence of elevated inflammatory markers and decreased heart rate variability (HRV), even after controlling for age, sex, previous MI, left ventricular ejection fraction, recent coronary artery bypass surgery, diabetes, smoking, BMI, fasting cholesterol, fasting glucose, systolic blood pressure, and cardiac medications [13].

There is also expanding interest in the role of personality factors and optimism in cardiovascular diseases. Type D personality is described as the combined tendency to experience negative emotions while inhibiting self expression [14]. In a quantitative analysis of prospective studies that included 6,121 patients, Type D personality was found to be associated with a more than three-fold increased risk of poor long-term prognosis (95 percent confidence interval; pooled odds ratio 2.7-5.1) [11]. Conversely, optimism was studied in the 2009 Women's Health Initiative (WHI), in which 97,253 women were studied over an 8-year period. Results revealed that optimists were less likely to develop CHD and had a lower total mortality rate [15]. Age-adjusted incident CHD rates measured from 43 events per 10,000 women among optimists to 60 events per 10,000 women among pessimists [15].

Acute emotional arousal has been shown to result in widespread vasoconstriction and, at times, vasospasm, which can create mechanical strain, endothelial tearing, or plaque rupture [12]. In acute or chronic emotional distress, thrombogenesis may also cause enhanced platelet aggregability [12]. Emotional inhibition has been correlated with higher cardiovascular reactivity, poor recovery, decreased heart rate variability, and incidence of CHD [16]. In chronically depressed persons, elevated inflammatory markers such as C-reactive protein and interleukin-6 are seen, which may correlate with plaque instability [12]. In light of these potentially important clinical implications, interventions targeting autonomic balance may serve to additionally constrain inflammation in the CHD population [13].

Compelling work by Kubzansky and Thurston explores the relationship between vitality and cardiovascular health [17]. Emotional vitality (typified by a sense of energy and well being) and effective emotional regulation were measured in a large prospective population-based cohort study ( $n = 6,025$ ) in which men and women aged 25 to 74 years (without CHD at baseline) were followed for a mean period of 15 years [17]. Compared to individuals with low levels of vitality, those reporting high levels of emotional vitality had multivariate adjusted relative risks of 0.81 (95 percent confidence interval, 0.69-0.94) [17].

### *Metabolic Syndrome*

In the last 50 years, we have seen an alarming increase in metabolic disorders, including obesity and type II diabetes [8]. Metabolic syndrome, now affecting nearly 40 percent of the U.S. population, has been shown to contribute to the pathogenesis and progression of type II diabetes, cardiovascular disease, hypercoagulation, chronic inflammation, endothelial dysfunction, and oxidative stress [8]. This syndrome is complex and multifaceted, leading to glucose intolerance, insulin resistance, dyslipidemia, and hypertension [8]. There is now compelling evidence revealing that chronic psychological stress and negative mood states

correlate bidirectionally with metabolic syndrome [8,18-20]. Cross-sectional and prospective studies have demonstrated that low socioeconomic status and job stress (two measurable indicators of chronic stress) are associated with greater abdominal adiposity [21]. Chronic psychological stress, therefore, is a potentially modifiable risk factor for abdominal adiposity that can be explained through specific physiological pathways [21].

Visceral obesity (excessive fat deposition in the abdominal viscera and omentum), in particular, produces inflammatory molecules that promote insulin resistance and metabolic syndrome [21]. Abdominal adiposity increases through the repeated activation of the HPA axis, which results in cortisol hypersecretion [21]. This occurs because cortisol binds to glucocorticoid receptors on fat cells that activate lipoprotein lipase, an enzyme that converts circulating triglycerides into free fatty acids in adipocytes [21]. In the presence of elevated cortisol, fat stores are specifically redistributed to the intra-abdominal region because there is greater density of glucocorticoid receptors found on visceral fat cells [21]. Elevations in cortisol and insulin serve to mobilize amino acids and fatty acids from the periphery to the abdomen for immediate use by the liver for gluconeogenesis [21]. Cytokines in the liver, the endothelium, and fat cell depots are released, along with C-reactive protein, and this process stimulates an inflammatory response that can lead to insulin resistance, non-insulin dependent diabetes, and metabolic syndrome [22].

Current clinical practice guidelines are limited to lifestyle modification, but mind-body therapies can address etiological mechanisms and affect cardiometabolic systems, which may be promising for the prevention and treatment of this pervasive syndrome [8,20]. Until providers recognize psychopathology as a potential variable risk factor for metabolic syndrome, critical opportunities for early detection and intervention may be missed [20]. Objective physiological outcomes that could evaluate the effect of psychophysiological interventions in-

clude lipoprotein profiles, circulating levels of glucose and insulin and anthropometric measures [8].

### *Autoimmune Disease*

Rheumatoid arthritis (RA) is one of the most common chronic autoimmune diseases, affecting approximately 1.3 million Americans, and, at present, there is no cure for this debilitating inflammatory disease [2]. While it is clear that the etiology behind autoimmune disease is multifactorial, stress is now recognized as key risk factor in the pathogenesis of autoimmune rheumatic diseases [22,23]. As noted above, the stimulation of the stress response system affects multidirectional relationships between the HPA axis, the SNS, and the immune system [22]. Currently, it is presumed that immune dysregulation is triggered by psychological stress through cytokine amplification by way of these complex and inter-related pathways. [22].

Current interventions for this debilitating disease involve the use of immunosuppressant agents such as methotrexate and corticosteroids to decelerate the process of RA along with non-steroidal, anti-inflammatory drugs to manage pain [2,23]. These drugs increase the risk for infection, myelosuppression, hepatotoxicity, gastrointestinal bleeding, and renal impairment. New advancements in RA therapy also include disease modifying anti-rheumatic drugs (DMARDs) to block tumor necrosis factor (TNF)-alpha, but adverse effects such as infection, malignancy, immune responses, demyelinating syndromes, and heart failure are risks that must be seriously considered [2]. Due to the progressive and incapacitating nature of this disease along with the side effect profiles of available treatments, psychophysiological interventions hold considerable promise for these individuals [23].

In a large randomized controlled study (n = 1,001) by Lin et al., researchers sought to determine whether enhancing care for depression improves pain and functional outcomes in older adults with both depression and arthritis [24]. The intervention consisted of antidepressant medications and/or six to

eight sessions of psychotherapy. In addition to a reduction in depressive symptoms, the intervention group (compared with the usual care group at 12 months) had lower mean scores for pain intensity and decreased interference with daily activities as a result of suboptimal functionality and/or pain [24]. The intervention group also experienced overall health and quality of life enhancement relative to control patients at 12 months [24]. Researchers concluded that benefits of improved psychological care extended beyond reduced depressive symptoms to include improved functional status, quality of life, and decreased pain [24].

### *Gastrointestinal Disease*

This is a very broad topic to explore within the confines of this paper, and therefore, this review is limited to two of the most prevalent disorders, irritable bowel syndrome (IBS) and peptic ulcer disease, although, clearly, there are more gastrointestinal disorders that could be examined in this context. While epidemiological evidence demonstrates a causal link between stress and intestinal inflammation, the pathomechanical basis is unclear at this time [7,9,25]. The inception of IBS symptoms occurs through brain-gut interactions attributed to the overstimulation of the neuroendocrine immune system (including the HPA axis) by the limbic system [7,9]. Depressive traits, chronic psychological stress, and alexithymia are correlative with inflammatory bowel disease and can increase gastrointestinal permeability, thereby triggering intestinal inflammation exacerbation [25].

In a 2003 study (n = 257), the cost effectiveness of utilizing psychotherapy and paroxetine for patients with severe irritable bowel syndrome was examined [26]. Both psychotherapy and paroxetine were noted to improve physical symptoms (compared with a treatment-as-usual control group), and both interventions actually netted a total cost savings when compared to the control group [26]. Authors concluded that treatment of patients with severe IBS should incorporate psychotherapy and/or a suitable antidepressant therapy, given both their success and

cost effectiveness [26]. An analysis of this study population ( $n = 257$ ) at the 15-month follow-up revealed an association between reported history of sexual abuse and baseline scores for physical pain, and these subjects experienced a marked improvement in somatic symptoms following eight sessions of individual psychotherapy [27].

Peptic ulcers are among the most common ulcerations of the gastrointestinal tract [28]. Although stress causes dyspeptic symptoms, there are no definitive studies (largely due to methodological limitations) demonstrating a firm causal relationship between the development of peptic ulcer disease and psychological stress [28]. Of considerable interest, however, is a large 2005 Canadian regional community health survey that included 13,069 respondents. Those reporting childhood physical abuse had more than twice the prevalence of peptic ulcers (6.6 percent vs. 2.7 percent), even when controlling for age, race, sex, socioeconomic status, current health behaviors, current stress, marital status, and history of mood/anxiety disorders, which calculated to a fully adjusted odds ratio of 1.68 (95 percent CI = 1.22, 2.32) [29]. This survey reveals the critical need for more research exploring psychosocial risk factors in peptic ulcer disease.

### *Chronic Pain*

Chronic pain is an extremely challenging problem for individuals, their families, and society at large, often necessitating astounding expenditures of health care dollars and lost productivity [30]. Within the traditional biomedical model, pain results from a specific injury (or pathological disease process) and can be relieved by identifying and treating the underlying problem [31]. However, there are many common pain disorders (migraines, back pain, fibromyalgia) for which no clear etiological pathology can be established [31]. Biomedical interventions (predominantly medications) have had limited success in ameliorating symptomatology long term and have concerning side effect profiles [30]. Epidemiological research has demonstrated that chronic pain

conditions are frequently coincident with depressive and anxiety [31,32,33]. This highlights the urgent need for integrative care that optimizes assessment and treatment of psychological risk variables while simultaneously seeking to palliate real and persistent pain.

An expanding evidence base reveals that the limbic system (in particular, the amygdale) has the capacity to up- or down-regulate pain's emotional response [31]. Strong communication from an experience is transmitted to the hippocampus for memory integration and storage so the subjective experience of pain, in fact, can be modulated by a wide range of environmental and internal stimuli via the nociceptive amygdale [31]. In animal studies, hippocampal sensitization to pain has actually been reversed through the use of positive environmental interventions [31]. Life enhancing treatment alternatives may therefore include body movement and mindfulness practices as well as psychotherapy. On a fundamental level, all psychologically oriented interventions for chronic pain focus on the impact that pain has on one's life, rather than on pain intensity, as a way of directly addressing adaptive change [30]. There now is well-established data pointing to the efficacy of cognitive-behavioral interventions [30,33], along with emerging data supportive of combining this methodology with acceptance-oriented treatments [30,34,35]. These interventions could potentially address underlying etiological mechanisms, improve self efficacy, and decrease hippocampal sensitization.

### **MIND-BODY THEORETICAL MODELS**

It is paramount that providers conceptualize current mind-body research and theoretical models in order to positively impact patients suffering from chronic physical illness. Integration of mind-body therapies into conventional medicine can be achieved by elucidating the biological mechanisms that occur when these interventions are appropriately applied [6]. Through the modulation of the sympathoadrenal system and the HPA axis, mind-body therapies may stimulate positive downstream effects on

neuroendocrine status, metabolic function, and related inflammatory responses [8]. They may also serve to augment parasympathetic output through vagus nerve activation, creating a visceral shift from sympathetic to parasympathetic, thereby stimulating positive changes in cardiac-vagal, inflammatory, metabolic, and neuroendocrine functions [8]. As research expands, outcome assessment markers could include pain, physiological disease symptomatology, psychological status, coping, self efficacy, heart rate variability (HRV), inflammatory markers (ESR, C-reactive protein), cortisol levels, and neuroimaging findings [2]. The following models can be viewed as complementary in nature and serve to further explore the potential mechanisms involved in the complex relationship between the mind, the brain, and the body.

#### *Peripheral Nerve Pathway Models*

The relaxation response model by Benson and colleagues in 2000 postulates that mind-body therapies decrease sympathetic and brain cortical activation, thereby eliciting an intrinsic relaxation and anti-stress response [6]. Porges (2001) developed the polyvagal theory that involves the inhibition of the stress response in the myelinated branches of the vagus nerve and specific medullary parasympathetic source nuclei [6]. As such, cardio-vagal activity is proposed as the primary objective physiological marker of stress and homeostasis in this model [6]. Zagon (2001) hypothesizes that inhibition of sympathetic activation occurs within the brainstem along with tonic transmission of peripheral visceral signals to the forebrain via sensory vagal activity [6]. Finally, Sternberg et al. (2001) explores the signaling role of pro-inflammatory cytokines through afferent components of the vagus nerve, which has been attributed to psychophysiological regulation [6].

#### *Neurophysiological Models*

In the neurovisceral integration model by Thaler and Lane (2000), the central autonomic network of brain nuclei is responsible for the regulation of emotions and

stress-related responses. The neurophysiological model of hypnosis and imagery by Crawford and colleagues (1996) postulates that the fronto-limbic attentional system regulates inhibitory shifts in neural activity during hypnotic/imaginal experiences in responsive individuals [6]. The somatic marker hypothesis by Damasio and Craig (2002) points to a hierarchical control of visceral states encoded in the prefrontal cortex (PFC) and the insular cortex (IC) with related physiological responses and thought patterns occurring within the ACC (anterior cingulate cortex) [6]. These cortical structures involve cognitive and physiological self-regulation [6].

#### *Integrative Model*

The integrative model by Taylor et al. theorizes that the principal neurophysiological substrate for mind-body therapies lies within a functional cortical network of frontotemporal structures referred to as the executive homeostatic network (EHN), which includes the PFC, IC, and ACC [6]. Symptoms of stress are evident in functional disturbances within the structures of the EHN, and these central disturbances are expressed at the periphery as reduced heart rate variability (HRV) and increased expression of pro-inflammatory cytokines [6]. Within this framework, mind-body therapies operate within multiple levels of the EHN that interact reciprocally with sub-cortical structures to modulate disease patterns [6]. Thus, this model emphasizes the use of mind-body therapies to alter the expression of affective, hormonal, and immune responses occurring bi-directionally through autonomic and neuroendocrine pathways [6].

## **PSYCHOPHYSIOLOGICAL INTERVENTIONS**

### *Psychotherapy*

The routine application of adjunctive psychological interventions for the management of chronic disease has the potential to markedly improve health outcomes. According to Gabbard [36], circuits are formed

within neural connections between the cortex, limbic system, and autonomic system in response to developmental experiences. I further hypothesize that adverse developmental experiences can result in the brain circuitry formulation that has the potential to contribute to physical disease, and thus it stands to reason that effective psychotherapy could intervene and positively affect physical outcomes. The following sections outline specific psychotherapeutic techniques that may be useful in chronic physical disease management.

### *Psychodynamic Psychotherapy*

An integral element of psychodynamic psychotherapy is the attainment of insight into one's problems, and its basic model describes mental phenomena arising from conflict [36]. Dynamic psychiatry focuses on the patient's internal world to include fears, hopes, fantasies, dreams, impulses, wishes, self image, perceptions, and psychological reactions to symptoms in order to identify unconscious conflicts [36]. A specific intervention as it relates to chronic disease is the creation of a "psychodynamic life narrative," which involves the creation of a global statement about the meaning of an illness in the context of the patient's entire life [37]. Through the utilization of psychological factors and relationships from the past and present, a life narrative can be constructed to gain perspective, meaning, and affirmation [37]. Unconscious conflicts, coping styles, and personality traits can surface through this intervention and be explored within the context of physical disease [37].

### *Cognitive Behavioral Therapy*

The following quote by Anais Nin (1903-1977) powerfully describes the basis behind cognitive behavioral therapy (CBT): "We don't see things as they are, we see things how we are" [38]. Cognitive behavioral interventions are constructed from three fundamental assumptions. First, cognition mediates an individual's response to the environment or, in other words, our habitual thoughts motivate our behavior toward the environment [39]. Secondly, change can be

affected through an exploration of habitually dysfunctional thinking. Lastly, utilizing these exploratory findings, a combination of cognitive and behavioral strategies are applied to stimulate change [39]. In the treatment of chronic disease, these principles can be employed by discovering potential contributive factors, fostering adaptation and improving emotional responsiveness [39]. Thus, CBT methodology would focus on the patient's cognitive schema of his or her illness with the intent to teach new strategies and techniques for health promotion [39].

### *Acceptance and Commitment Therapy*

Acceptance and commitment therapy (ACT) is a unique, empirically based psychological intervention that uses acceptance and mindfulness strategies together with commitment and behavior change strategies to increase psychological flexibility [40]. This process-oriented approach utilizes interventions that seek to increase behavioral effectiveness regardless of suffering in the present moment, which contrasts sharply with traditional interventions that place primary emphasis on decreasing the intensity and frequency of aversive experiences [40]. Psychological flexibility refers to the ability to engage with the present moment fully and tolerate distress that occurs in the process of pursuing a meaningful, purposeful, and vital life [40]. This therapy also focuses on the potential for avoidance behaviors themselves to cause harm in the form of lifestyle choices, addiction, procrastination, and evasion of conflict [40].

### *Dialectical Behavior Therapy*

Originally designed for the treatment of borderline personality disorder, dialectical behavior therapy (DBT) is widely expanding as a result of its empirical efficacy. This approach combines CBT techniques with methodology from Eastern psychological and spiritual practices such as mindfulness and acceptance [41]. Other DBT treatment components consist of instruction in skills such as distress tolerance, emotion regulation, and interpersonal effectiveness [41]. The dialectical process is also a central and

empowering component that involves working within the tension inherent in polarity or paradox [41]. From a chronic illness perspective, the patient has the potential to make transformative change through a dialectic progression of “holding on” to former self representatives while learning to manage the disease [42]. The ultimate goal is thus to differentiate one’s self from the illness while simultaneously surrendering control in order to assimilate the chronic illness into a reconciled self [42].

### *Positive Clinical Psychology*

Although empirical evidence reveals that negative affect plays a pivotal role in the manifestations of chronic disease, it is paramount that research and interventions be expanded toward the promotion of positive affect and vitality [43]. The science of psychology has concentrated largely on the palliation of negative symptomatology while reserving a dearth of attention on positive characteristics such as authenticity, love, courage, psychological flexibility, optimism, gratitude, and positive affect that have the potential to promote wellness and buffer the impact of negative life events [44]. Salutogenesis is defined as the application of interventions that strive to improve quality of life and, thus, induce healing [45]. Quality of life interventions can promote subjective well being, life satisfaction, happiness, meaning, a sense of coherence, and realization of potential functioning [45]. An integrative approach should consider negative and positive functioning equally in order to more deeply understand disease and thereby intervene effectively [44]. Ideally, this process would be integrated into traditional allopathic medicine, both in outpatient and inpatient settings.

The search for pathways that mediate biologically and behaviorally with positive psychological states is stimulated by discoveries that reveal delayed onset of disability and reduced risk of death in individuals with positive affective states [46]. The capacity to experience positive emotion may allow individuals to persevere, recover, and sustain quality of life even in

the presence of chronic stressors [43]. One of the most widely publicized studies revealing the impact of positive emotions is known as the Nun Study ( $n = 678$ ), in which emotional expressions (recorded when the nuns were young adults) predicted mortality six decades later [43]. Sixty years after autobiographical essays were written, nuns who composed essays in the highest positive emotion quartile had 2.5 times lower mortality than those in the lowest quartile [43]. In another large research endeavor, known as the Whitehall II Study, daily salivary cortisol levels were tested on 2,873 healthy subjects over a 2-year period, and results indicated that cortisol levels were inversely associated with positive affect even after controlling for age, gender, income, ethnicity, body mass, waist/hip ratio, smoking, depression, and paid employment [46]. Researchers hypothesize that direct biological links with neuroendocrine, inflammatory, and immune processes may be present in individuals with positive affective states [43]. Given the favorable effects of positive emotions, the question emerges of whether clinical techniques can foster their development in order to affect chronic disease.

### *Mindfulness Meditation*

This psychotherapeutic intervention can be differentiated into distinct but interrelated components to include attentional regulation, body awareness, emotion regulation, and self-perceptual changes [47]. The practice of mindfulness meditation involves focusing one’s attention on the experience of one’s thoughts, emotions, and bodily sensations, accepting them, and allowing them to arise and dissipate without judgment [47]. Attention to internal and external experiences are maintained through the use of openness, acceptance, and curiosity. This attention heightens emotional and physical awareness, which stimulates emotional regulation processes, thereby reducing habitual reactivity or avoidance [47].

The use of mindfulness meditation to affect both physical and psychological disorders is gaining considerable attention. Evidence from extensive neuroimaging re-

search demonstrates that neuroplastic changes occur synergistically in the anterior cingulate cortex, insula, temporo-parietal junction, and fronto-limbic network, which can enhance self regulation [45-49]. It is unclear how exactly these intentional mind interventions result in neuroplastic changes; however, preliminary research documents the efficacy of this approach for stress-related symptoms through a reduction in cortisol levels, decreased blood pressure, enhanced immune function [47,50,51], and increased telomerase activity [47,52].

### *Yoga*

Yoga is an ancient practice that can foster physical, mental, emotional, and spiritual health through the practice of specific postures, breath control, concentration, and meditation [5]. Mindful yoga can increase awareness of the mind's patterns along with the ability to discriminate between bodily sensations and thoughts [53]. This intervention is not prescriptive but is, rather, an inquiry into the connection between thoughts and the physical body [53]. Accordingly, one learns to understand and care for his or her suffering (rather than trying to abolish it) through a process intended to unite all aspects of oneself, including frailty and afflictions [53].

Burgeoning research supports the reasoning that certain yoga techniques down-regulate the HPA axis and the SNS, which, as outlined above, respond to stress with a cascading release of cortisol and catecholamines [5]. By reducing the reactivity of the sympathoadrenal system and the HPA axis along with the direct stimulation of the vagus nerve, balance can be shifted from primarily sympathetic to parasympathetic, which can result in positive changes to cardiac-vagal function and related neuroendocrine, metabolic, and inflammatory responses [18]. Yoga has been shown to significantly decrease blood glucose, cholesterol, and blood pressure [5,18,54] along with salivary cortisol [5,55] and heart rate [5,56]. Studies also suggest that yoga can reverse the negative impact of stress on the immune system by increasing levels of im-

munoglobulin A and natural killer cells while decreasing markers such as C-reactive protein and inflammatory cytokines [5,57].

### *Psychopharmacological Treatment*

In the context of chronic disease management, it is imperative that pre-existing or concurrent psychiatric disease be identified and treated appropriately [58]. Of equal import is the recognition that the medical condition may itself precipitate psychiatric sequelae [58]. Correlated with increased inflammation, mental health impairments can result in both vascular and autoimmune disease through bidirectional interactions between the brain and peripheral tissues [6]. Mental illness affects disease and can negatively impact quality of life, morbidity, and mortality. Consequently, if Diagnostic Statistical Manual (DSM) criteria is met for psychiatric disease in the course of chronic disease management, appropriate psychopharmacological interventions should be considered for adjunctive treatment [58].

## **INTEGRATED HEALTH CARE**

Integrated health care is distinguished by a high degree of collaboration among health professionals in order to establish comprehensive treatment plans that meet the biological, psychological, and social needs of the patient [59]. Novel practice models are emerging that recognize the need for behavioral health services in primary care settings and are thereby beginning the process of diminishing the formerly rigid physical, policy, and cultural barriers between primary and behavioral health care [59]. The Substance Abuse and Mental Health Services-Health Resources and Services Administration (SAMHSA-HRSA) directs the Center for Integrated Health Solutions, whose function is to promote the development of integrated primary and behavioral health services, regardless of the health care setting, in order to better serve the needs of individuals with mental health and substance use conditions [59]. This author advocates for use of this approach in order to accurately identify and effectively address psychological risk variables in the course of chronic disease management.

## THE ROLE OF THE PSYCHIATRIC NURSE PRACTITIONER

The current focus on health care reform offers the opportunity for psychiatric nurse practitioners to play a role in the provision of integrated care for the treatment of chronic physical illness. The psychiatric mental health nurse practitioner (PMHNP) is an advanced nursing role requiring 6 to 10 years of post-secondary education and involves extensive instruction in physical and mental health assessment, psychiatric diagnosis, psychopharmacology, psychotherapy, integration and implementation of care, outcome evaluation, consultation, and liaison [60]. Advanced master's and doctoral degrees allow the PMHNP nurse to work in various roles, such as that of psychiatric primary care provider, psychotherapist, consultant, and university educator [60]. Primary care and inpatient settings can benefit from this expertise because psychosocial difficulties and psychiatric co-morbidities are often overlooked in favor of isolating the underlying physical disease [61].

Currently, psychiatrists and PMHNPs are utilized in large inpatient medical settings to serve as a resource, liaison, and consultant for patients presenting with severe psychiatric presentation occurring concurrently with a medical illness. However, this author advocates the expansion of this role in order to accurately assess and intervene in the management of subtler psychiatric risk variables that may contribute to chronic disease. It is paramount that PMHNPs' educational curriculum includes a thorough review of psychological risk factors in chronic physical disease, mind-body theoretical models, and psychophysiological interventions in the context of physical disease management. Increased visibility through interdisciplinary publications, interactions, presentations, and research is essential. Consultation into chronic disease management could expand on multiple levels to include psychological risk variable assessment, intervention, advocacy, education, and research. It is imperative that psychoeducation is provided to individuals, families, and groups in order to promote knowledge, un-

derstanding, and effective management of mental health problems that may co-occur with physical symptomatology. Advocacy work should enhance community health and policy initiatives that focus on the integration of psychiatric services into health care settings.

## CONCLUSION

Sir William Osler (1849-1919) said, "It is much more important to know what sort of a patient has a disease than what sort of a disease a patient has" [62]. As health care providers, we must broaden our perspective of disease management and seek not only to reduce psychological distress but also to promote positive emotion. In this paper, I have presented compelling evidence demonstrating that chronic psychological stress can contribute to physical disease through the stress response. Cardiovascular, gastrointestinal, and autoimmune disease along with metabolic syndrome and chronic pain can result in devastating loss, disability, and expenditures. Given the mind's ability to influence health, psychophysiological interventions can be used in conjunction with chronic disease management in order to optimize care provision. There is an urgent need for more research that advances the understanding of psychological risk variables and provides an evidence-based data for both assessment and management. While a considerable body of published literature exists establishing the effectiveness of mind-body interventions, relatively few large and rigorously controlled studies have been conducted [2,5,8,18,21,23]. As interventional research continues to progress, outcome assessment markers could include pain, physiological disease symptomatology, psychological status, coping, self efficacy, heart rate variability (HRV), inflammatory markers (ESR, C-reactive protein), cortisol levels, and neuroimaging findings [2]. Integrative medicine is expanding and models exist that are striving to effectively incorporate primary and behavioral health care as a means to improve overall health outcomes [59]. Psychiatric nurse practitioners can offer a great deal to the provision of integrated care by optimally identi-

fyng and treating psychological risk variables and applying psychophysiological knowledge to palliate negative symptoms while simultaneously promoting emotional health.

**Acknowledgments:** I gratefully acknowledge the Association of Advanced Practice Psychiatric Nurses (AAPPN) for their research scholarship support, advocacy and ongoing promotion of excellence in advanced practice psychiatric nursing.

## REFERENCES

1. CDC (Fact Sheet). Chronic Disease Prevention and Health Promotion [Internet]. 2012. Available from: <http://www.cdc.gov/chronicdisease/index.htm>.
2. Leverone D, Epstein B. Nonpharmacologic interventions for the treatment of rheumatoid arthritis: a focus on mind-body medicine. *J Pharm Pract.* 2010;23(2): 101-9.
3. Weiss S, Haber J, Horowitz J, Stuart G, Wolfe B. The inextricable nature of mental and physical health: implications for integrative care. *J Am Psychiatr Nurses Assoc.* 2009;15(6): 371-82.
4. Kendall K. The psychoneuroimmunology of chronic disease : exploring the links between inflammation, stress, and illness. Washington, DC: American Psychological Association; 2009.
5. Ross A, Thompson S. The health benefits of yoga and exercise; a review of comparison studies. *J Altern Complement Med.* 2010;16(1): 3-12.
6. Taylor A, Goehler L, Galper D, Innes K, Bourguignon C. Top-down and bottom-up mechanisms in mind-body medicine: development of an integrative framework for psychophysiological research. *Explore (NY).* 2010;6(1):29-41.
7. Jarcho J, Mayer E. Stress and irritable bowel syndrome. *Primary Psychiatry.* 2007;14(4):74-8.
8. Anderson J, Taylor A. The metabolic syndrome and mind-body therapies: A systematic review. *J Nutr Metab.* 2011;2011:276419.
9. Kuroki T, Ohta A, Sherriff-Tadano R, Matsuura E, Takashima T, Iwakiri R, et al. Imbalance with the stress-adaptation system in patients with inflammatory bowel disease. *Biol Res Nurs.* 2011;13(4):391-8.
10. CDC. Heart Disease and Stroke: The Nation's Leading Killers (Fact Sheet) [Internet]. 2010. Available from: <http://www.cdc.gov/chronicdisease/resources/publications/AAG/dhdsp.htm>.
11. Denollet J, Schiffer A, Spek V. A general propensity to psychological distress affects cardiovascular outcomes. *Circulation.* 2010;3:546-57.
12. Ketterer M, Knysk W, Khanal S, Hudson M. Cardiovascular disease. In: Blumenfeld M, Strain J, editors. *Psychosomatic Medicine.* Philadelphia: Lippincott Williams & Wilkins; 2006. pp. 109-19.
13. Frasure-Smith N, Lesperance F, Irwin M, Talajic M, Pollock B. The relationships among heart rate variability, inflammatory markers and depression in coronary heart disease patients. *Brain Behav Immun.* 2009;23:1140-7.
14. Pelle A, Pederson S, Szabo B, Denollet J. Beyond type D personality; reduced positive affect (anhedonia) predicts impaired health status in chronic heart failure. *Qual Life Res.* 2009;18:689-98.
15. Tindle H, Chang Y, Kuller L, Manson J, Robinson J, Rosal M, et al. Optimism, cynical hostility and incident coronary heart disease and mortality in the women's health initiative. *Circulation.* 2009;120:656-62.
16. Sher L. Type D personality: the heart, stress, and cortisol. *QJM.* 2005;98(5):323-9.
17. Kubzansky L, Thurston R. Emotional vitality and incident coronary heart disease. *Arch Gen Psychiatry.* 2007;64(12):1393-401.
18. Innes K, Bourguignon C, Taylor A. Risk Indices Associated with the Insulin Resistance Syndrome, Cardiovascular Disease, and Possible Protection with Yoga: A Systematic Review. *J Am Board Fam Pract.* 2005;18(6):491-519.
19. Mettola J, Niskanen L, Viinamaki H, Kumpusalo E. Metabolic syndrome is associated with self-perceived depression. *Scand J Prim Health Care.* 2008;26:203-10.
20. Terre L. Psychological Risks for Metabolic Syndrome. *American Journal of Lifestyle Medicine.* 2008;2(2):126-9.
21. Daubenmier J, Kristeller J, Hecht F, Maninger N, Kuwata M, Jhavan K, et al. Mindfulness intervention for stress eating to reduce cortisol and abdominal fat among overweight and obese women: an exploratory randomized controlled study. *J Obes.* 2011;2011:651936.
22. Stojanovich L, Marisavljevic D. Stress as a trigger of autoimmune disease. *Autoimmun Rev.* 2008;7(3):209-13.
23. Broderick J. Mind-body medicine in rheumatological disease. *Rheum Dis Clin North Am.* 2000;26(1):161-76.
24. Lin E, Katon W, Von Korff M, Tang L, Williams J, Kroenke K, et al. Effect of improving depression care on pain and functional outcomes among older adults with arthritis. *JAMA.* 2003;290(18), 2428-9.
25. Stasi C, Orlandelli E. Role of the brain-gut axis in the pathophysiology of Crohn's disease. *Dig Dis.* 2008;26(2):156-66.
26. Creed F, Fernandes L, Elspeth G, Palmer S, Ratcliffe J, Read N, et al. The cost-effectiveness of psychotherapy and paroxetine for severe irritable bowel syndrome. *Gastroenterology.* 2003;124(2):303-17.
27. Creed F, Guthrie E, Ratcliffe J, Fernandes L, Tomenson B, Read N, et al. Reported sexual abuse predicts impaired functioning but a good response to psychological treatments in patients with severe irritable bowel syndrome. *Psychosom Med.* 2005;67(3):490-9.

28. Jones M. The role of psychosocial factors in peptic ulcer disease: beyond *Helicobacter pylori* and NSAIDs. *J Psychosom Med.* 2006;60(4):407-12.
29. Thompson E, Bottoms J, Brennenstuhl S, Hurd M. Is childhood physical abuse associated with peptic ulcer disease? *J Interpers Violence.* 2011;26(16):3225-47.
30. Vowles K, Mcneil D, Gross R, Mcdaniel M, Mouse A, Gallimore B. Effects of Pain Acceptance and Pain Control Strategies on Physical Impairment in Individuals With Chronic Low Back Pain. *Behav Ther.* 2007;38(4):412-5.
31. Gallagher R, Wiedemer N. Pain and Palliative Care. In: Blumenfield M, Strain J, editors. *Psychosomatic Medicine.* Philadelphia, PA: Lippincott Williams & Wilkins; 2006. pp. 695-723.
32. Miller L, Cano A. Comorbid Chronic Pain and Depression: Who Is at Risk? *J Pain.* 2009;10(6):619-27.
33. Hoffman B, Chatoff D, Papas R, Kerns R. Meta-Analysis of Psychological Interventions for Chronic Low Back Pain. *Health Psychol.* 2007;26(1):1-9.
34. McCracken L, Vowles K, Eccleston C. Acceptance-based treatment for persons with complex, long standing chronic pain: a preliminary analysis of treatment outcome in comparison to a waiting phase. *Behav Res Ther.* 2005;43(10):1335-46.
35. Vowles K, McCracken L. Acceptance and Values-Based Action in Chronic Pain: A Study of Treatment Effectiveness and Process. *J Consult Clin Psychol.* 2008;76(3):397-407.
36. Gabbard G. Basic Principles of Dynamic Psychiatry. In: *Psychodynamic Psychiatry.* Fourth edition. Arlington, VA: American Psychiatric Publishing, Inc.; 2005. pp. 3-30.
37. Blumenfield M, Strain J, Grossman S. Psychodynamic Approach. In: Blumenfield M, Strain J, editors. *Psychosomatic Medicine.* Philadelphia, PA: Lippincott Williams & Wilkins; 2006. pp. 817-828.
38. Anais Nin. The Quotations Page [Internet]. Available from: <https://www.quotations-page.com/quote/27655.html>.
39. Lau M, Segal Z, Zaretzky A. Cognitive-behavioral therapies for the medical clinic. In: Moss D, McGrady A, Davies T, Wickramasekera I, editors. *Handbook of Mind-Body Medicine for Primary Care.* Thousand Oaks, CA: Sage Publications, Inc.; 2002. pp. 167-80.
40. Flaxman P, Blackledge J, Bond F. *Acceptance and Commitment Therapy: Distinctive Features.* Hove: Routledge; 2011.
41. Linehan M. *Skills Training Manual for Treating Borderline Personality Disorder.* New York: Guilford Publications; 1993.
42. Lubkin I, Larsen P. *Chronic Illness: Impact and Intervention.* Eighth edition. Burlington, MA: Jones and Bartlett Learning; 2013.
43. Davis M. Building emotional resilience to promote health. *Am J Lifestyle Med.* 2009;3(1 Suppl):60S-63S.
44. Wood A, Tarrier N. Positive clinical psychology: A new vision and strategy for integrated research and practice. *Clin Psychol Rev.* 2010;30(7):819-29.
45. Venterodt S, Omar H, Merrick J. Quality of life as medicine; interventions that induce salutogenesis. A review of the literature. *Soc Indic Res.* 2011;100:415-33.
46. Steptoe A, O'Donnell K, Badrick E, Kumari M, Marmot M. Neuroendocrine and inflammatory factors associated with positive affect in healthy men and women. *Am J Epidemiol.* 2007;167(1):96-102.
47. Holzel B, Lazar S, Gard T, Schuman-Oliver Z, Vago D, Ott U. How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science.* 2011;6(6):537-59.
48. Cahn B, Polich J. Meditation states and traits: EEG, ERP and neuroimaging studies. *Psychol Bull.* 2006;132(2):180-211.
49. Holzel B, Ott U, Hempel H, Hackl A, Wolf K, Stark R, et al. Differential engagement of anterior cingulate and adjacent medial frontal cortex in adept meditators and non-meditators. *Neurosci Lett.* 2007;421(1):16-21.
50. Sridharan D, Levitin D, Menon V. A critical role for the right fronto-insular cortex in switching between central-executive and default-mode networks. *Proc Natl Acad Sci USA.* 2008;105(34):12569-74.
51. Carlson L, Speca M, Faris P, Patel K. One year pre-post intervention follow-up of psychological, immune, endocrine and blood pressure outcomes of mindfulness-based stress reduction (MBSR) in breast and prostate cancer outpatients. *Brain Behav Immun.* 2007;21(8):1038-49.
52. Jacobs T, Epel E, Lin J, Blackburn E, Wolkowitz OM, Saron CD. Intensive meditation training, immune cell telomerase activity, and psychological mediators. *Psychoneuroendocrinology.* 2010;36(5):664-81.
53. Douglass L. Thinking through the body: the conceptualization of yoga as therapy for individuals with eating disorders. *Eat Disord.* 2011;19(1):83-96.
54. Khatri D, Mathur KC, Gahlot S. Effects of yoga and meditation on clinical and biochemical parameters of metabolic syndrome. *Diabetes Res Clin Pract.* 2007;78(3):e9-10.
55. Michalsen A, Grossman P, Acil A. Rapid stress reduction and anxiolysis among distressed women as a consequence of a three month intensive yoga program. *Med Sci Monit.* 2005;11(12):CR555-61.
56. McCaffrey R, Ruknui P, Hatthakit U, Kasetsoomboon P. The Effects of Yoga on Hyper-tensive Persons in Thailand. *Holist Nurs Pract.* 2005;19(4):173-80.
57. Kiecolt-Glaser J, Christian L, Preston H, Houts C, Malarkey W, Emery C, et al. Stress, inflammation and yoga practice. *Psychosom Med.* 2010;72(2):113-21.

58. Mui D, Labbate L. Psychotropic Drugs in the Medically Ill. In: Blumenfield M, Strain J, editors. *Psychosomatic Medicine*. Philadelphia, PA: Lippincott Williams & Wilkins; 2006. pp. 739-66.
59. Behavioral Health in Primary Care. Integrating Behavioral Health into Primary Care. Substance Abuse and Mental Health Services-Health Resources and Services Administration (SAMHSA-HRSA) Center for Integrated Health Solutions [Internet]. Available from : <http://www.integration.samhsa.gov/integrated-care-models/behavioral-health-in-primary-care>.
60. About Psychiatric-Mental Health Nurses (PMHNs). American Psychiatric Nurses Association (APNA) [Internet]. Available from: <http://www.apna.org/i4a/pages/index.cfm?pageid=3292>.
61. McGrady A. Psychophysiological foundations of mind-body therapies. In: Moss D, McGrady A, Davies T, Wickramasekera I, editors. *Handbook of Mind- Body Medicine for Primary Care*. Thousand Oaks, CA: Sage Publications, Inc.; 2003. pp. 43-68.
62. William Osler — the founder of modern medicine. *Radical Loving Care — The Journal of Sacred Work*. [Internet]. 2007. Available from [http://thinkexist.com/quotation/it\\_is\\_much\\_more\\_important\\_to\\_know\\_what\\_sort\\_of\\_a/331707.html](http://thinkexist.com/quotation/it_is_much_more_important_to_know_what_sort_of_a/331707.html).