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CHRONIC STRESS: NEUROSCIENCE AND PRACTICAL COPING STRATEGIES

The events of this year have led to increasing uncertainty, job insecurity and personal isolation resulting in worsening levels of stress and anxiety. As health professionals, we're aware that increased stress levels lead to increased mental and physical illnesses. Stress also affects our ability to think, remember and to solve problems, all of which are necessary to navigate a crisis. This then becomes a vicious cycle of poor health leading to bad decisions leading to worse health. The aim of this article is to provide practical strategies to cope with stress and to find calm based on neuroscience. I will discuss the impact of stress on the brain and suggest practical lifestyle changes that can reduce this impact.

CHRONIC STRESS AND ANXIETY: THE IMPACT ON THE BRAIN

Studies have shown that chronic stress affects our memory, mood, emotional processing, and our ability to focus. This then has an impact on our performance at work and our interpersonal relationships. The neurobiological changes that occur in the brain with chronic stress include the following:

1. Reduced hippocampal volume. The hippocampus is a critical structure for processing memory and regulating mood.
2. Reduced plasticity. Brain-derived neurotrophic factor (BDNF) is reduced with chronic stress. This leads to reduced plasticity in the hippocampus.
3. Reduced neurogenesis. Highly levels of cortisol associated with chronic

stress and reduced levels of BDNF contribute to reduced neurogenesis.

Given this, studies have shown that chronic stress affects our memory, mood, emotional processing, and our ability to focus. This then has an impact on our performance at work and our interpersonal relationships.

HOW CAN WE REDUCE THIS IMPACT AND FIND CALM?

Exercise

Exercise may be one of the most practical ways to reduce the impact of stress. Several studies have shown the benefits of exercise. In one study on mice, twenty-one days of aerobic activity reversed lab-induced, chronic stress-related memory and learning impairments. This was reported to be, at least in part, due to increased levels of BDNF. Several other studies have shown that exercise has antidepressant effects. Exercise increases plasticity and neurogenesis reducing the impact of chronic stress by:

1. Increasing levels of BDNF
2. Changing levels of cortisol, norepinephrine and serotonin
3. Reducing pro-inflammatory cytokines

Practical suggestions

1. The exact amount of exercise needed is not known and there are probably individual variations however general recommendations are to exercise three to five times a week for twenty to forty minutes a session.
2. Aerobic exercise is important especially for a healthy brain but balance and strength training are required as well.
3. The most important advice is that people need to find an exercise that they enjoy doing, and commit to this given the actual time that they have available.

Diet

There are many conflicting reports on what to eat and what not to eat. The most consistent advice regarding diet focuses on the excessive consumption of saturated fats and refined sugar.

Diets are changing world-wide with increasing consumption of saturated fats, sugar and calories which leads to increased physical and mental illnesses. A healthy diet is associated with a reduced risk of depression and memory problems.

Studies have shown that chronic stress affects our memory, mood, emotional processing, and our ability to focus.

Diets high in refined sugar and saturated fat:

1. Decrease levels of BDNF resulting in reduced plasticity in the hippocampus.
2. Increase hippocampal atrophy. A longitudinal study on 255 people aged 60-64 showed that high-sugar, high-fat diets were associated with hippocampal atrophy. In mice, this diet has been shown to result in brain changes after just seven days of consumption.

Practical suggestions

1. An average person requiring 2000 calories per day should consume less than six teaspoons of sugar a day. This includes the sugar found in syrups, honey, fruit juices and concentrates, sauces, sweets, cakes and biscuits.
2. It is recommended that saturated fat content be less than 11% of total calories consumed. This can be quite confusing to work out and monitor. Advice to make this simpler to adopt includes reducing the daily content of fat by a third and avoiding fast-food.
3. Increase consumption of healthy foods such as fresh fruit and vegetables and whole grains.

Sleep

Illness has an impact on sleep quality and sleep quality has an impact on health. Poor sleep quality may have an impact on mood, memory and learning.

Chronic anxiety and depression have been associated with poor sleep quality but the exact mechanism of this association is not completely understood.

Sleep deprivation has been shown to:

1. Alter gene expression possibly contributing to illness.
2. Lead to hypersensitivity of the amygdala. This results in increased anxiety or fear in response to perceived threats.
3. Affect the ability to process and understand emotions and to express emotions. This includes an inability to distinguish threatening from welcoming facial expressions.

Practical suggestions

Ideal sleep duration is not completely known. The following have been recommended (Joint Consensus Statement of the American Academy of Sleep):

1. 7-9 hours is the recommended sleep duration.
2. Less than 6 hours of sleep is not enough for good health.
3. More than 9 hours of sleep may not be healthy, but this is not yet established.

Features that should raise concern are a change in sleep patterns, waking up repeatedly, persistent day-time tiredness and the use of stimulants to stay up.

Some suggestions to improve sleep quality include:

- Limiting daily intake of caffeine and other stimulants particularly 3-4 hours before bedtime.
- Exercising regularly but not too close to bedtime.
- Trying to maintain a regular schedule for going to bed and waking up.
- Learning effective relaxation techniques. Mindfulness, relaxation and meditation techniques have been shown to improve sleep quality.

I have discussed three lifestyle factors that are practical, relevant and acceptable to most people. There are others such as social interaction, using art or music, and spending time in nature. Finding calm, coping with stress and thriving requires the adoption of seemingly simple habits and yet remains challenging, requiring motivation and discipline. Successful adoption of habits is facilitated if people choose the set of changes themselves, understanding the reasons to do it, and setting achievable goals in a stepwise manner. This supports patients' self-efficacy and interest ultimately promoting behaviour change. As health professionals, we can inspire change and potentially reduce the impact of chronic stress on the health and wellbeing of the people that we care for. MHM

References available upon request