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Research Paper

Psychological Stress, Function and its Effects on Human Health

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ABSTRACT: *Stress is a widely used construct to mean various feelings by various people. Notwithstanding the divergence of emotions embodying this construct, it all comes down to changes in individual's emotional and physiological states. We are more likely to experience hurtful symptoms of stress if we perceive an event to have the potential for aversive outcomes in our lives and that we don't have what is required to surmount it. In this state, our internal organs get activated for fight or flight response meant to enhance physical or mental defenses. This biological activation elicits hyperarousal especially upswing in blood pressure, upsurge in heart rate, boosted energy release, but also to temporarily turning-off non-essential functions such as digestion, growth, tissue repair and reproduction. Prolonged biological activation and hyperarousal as happens under chronic stress causes wear and tear on the body and hence stress is implicated in the cause of heart disease, decreased immune system functioning and damage to neurons in the hippocampus leading to mental deficiencies, intellectual and cognitive difficulties. Models to cope with stress primarily target to either manage the underlying circumstances causing stress or arm the sufferer with a new psychological perception about the problem at hand thereby make it less stressful. Despite its predisposing power to cause poor health, stress, like other mental health conditions, has remained peripheral in policy, medical training and practice in many government jurisdictions in Africa perhaps because of failure to recognize this power. This paper aims to enrich our understanding of how psychological stress contributes to the development of ill-health.*

KEYWORDS: *Psychological Stress, function, effects on human health*

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I. INTRODUCTION

As a way of contextualizing and introducing the concept of stress and its immediate impacts, picture the scene in the passage inserted below from Robin Cook's novel **Crisis.**

'…Few people knew his middle initial…Craig turned expecting to see a patient or perhaps a colleague or an old schoolmate. The man was a handsome African American, quick moving, intelligent-appearing, and approximately Craig's age…
"Doctor Craig M. Bowman?" the man questioned again as he stepped directly up to Craig.
"Yes?" Craig said with questioning nod. He was still trying to place the individual…The man responded by placing a large envelope in Craig's hands. Craig looked at it … Before Craig could respond … The man was gone.
…He looked back down the envelope and he got his first inkling of trouble. Printed in the upper corner was Superior Court, Suffolk County, Massachusetts.
…A number (of people) were curiously looking at him after having witnessed the encounter.
…Craig worked his thumb under the envelope's flap and tore it open. He could feel his purse quicken as he pulled out the contents.

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...Craig's eyes lifted and looked ... They reflected an intensity not seen before ... it was clearly shock. For a few beats, Craig seem paralyzed. He didn't even breathe.
..."I've been sued", Craig croaked a whisper. "The bastard is suing me"...."
Robin Cook (2007): Crisis. New York, Berkley (pp. 50 – 52).

The above story clearly depicts a fictitious Dr. Craig Bowman in a state of stress. Picture the bolded sections of the story:

"Craig worked his thumb under the envelope's flap and tore it open. ***He could feel his purse quicken*** as he pulled out the contents.
Craig's ***eyes lifted and looked … They reflected an intensity not seen before*** *…* ***it was clearly shock.*** *For a few beats,* ***Craig seem paralyzed. He didn't even breathe****."*
He is not in a good mental health; he is terrified; in a state of shock. He seems to have lost control *(Paralyzed!*). His body functions are disoriented – "*He didn't even breathe*!"

So this would be a typical case of stress. Although, stress is a widely used construct, it means various feelings to different people [1] [2]. In many cases, stress has a connotation of anxiety, as in the case of Dr. Bowman in the story. In such cases we talk of distress. Distress is primarily stress that presents painful psychological arousal ([1]). In other words, distress causes painful arousal in the individual. Most of what we refer to as stressful is actually distress: painful, upsetting, disconcerting, frightening etc. Failing to meet your boss' set deadline at work, facing an impending difficult exam, awaiting a court appearance as in the case of Dr. Craig Bowman and many other such instances are typical examples of distress.

However, we shall discover that not all forms of stress are negative. One notices that some people present arousal symptoms similar to those of anxious persons when excited. In the days of widespread unemployment, receiving an offer for a well-paying job can be overwhelming. In the days approaching one's wedding day, for instance, the bride and groom might present states of hyperarousal synonymous to those produced by environmentally distressful events. Thus, exhilarating events may also present emotions and physiological manifestations similar to distress. The name given to such type of stress is eustress: the type of stress that arises out of positive and beneficial incidents [1]. This also happens when participating in events such as parachute jump, bungee jump, being on the first date, reporting for a new job and so on. You might temporarily experience sweating, loss of appetite and your purse would probably go up – somewhat similar physiological responses to what Dr. Craig Bowman (in the story above) is reported to have experienced. But the difference is that, in the case of eustress, we actually cherish the feeling and look forward to similar events in the future [3].

II. STRUCTURE OF STRESS

According to Durand and Barlow [2], whether one feels excitement or (*dis*)stress depends on their *sense of control* or how well they think they can cope with the challenge they are facing. It is actually posited that distress and excitement are on a continuum of feelings: from excitement to stress to anxiety to depression (p. 267). It becomes an exciting moment if one is prepared for the challenge and confident in one's abilities to deal with it [2].

Figure 1: Emotional continuum of Stress

Notwithstanding the divergence of emotions embodying this stress construct, it all comes down to changes in individual's emotional and physiological states. According to Lazarus and Launier (1978), the nature of the emotion a person is under is as a result of changes in the environment affecting them – whether these changes are true or imaginary. Lazarus and Launier further hypothesized that stress is "a transaction between people and the environment, meaning that a situation is stressful only when the individual appraises it as stressful and perhaps because they feel that they lack the resources to overcome it [1]. By Lazarus' theory, a situation will cause stress if the individual's answer to the question '*Is it stressful?*' is '*yes*' and if the answer to the question '*Can I cope?*' is '*no*'. Because not everyone individual will perceive the same situation in the same way, an event can be stressful to one person and be perfectly normal to another. In either way, whether one perceives a situation as distressful or an exciting challenge depends on psychological factors, i.e., sense of control and confidence that one is able to cope with the challenge – referred to as **self-efficacy** (Bandura, 1986 in [2]).

In a nutshell, we are more likely to experience hurtful symptoms of distress when we are convinced that the event will have stressful outcomes in our lives and that we don't have what is required to prevail over

the challenge. If, on the other hand, we face a challenge upon which we think we can prevail, then we are likely to experience eustress and might even look forward to experiencing it in future.

III. STRESSORS

External environmental changes that we appraise as stressful are referred to as stressors [4]; [1]. The use of the phrase '*we appraise as stressful*' is significant in understanding stress because, as Lazarus and Launier (1978) argued, an event is no stressor until it is perceived as such. Upon encountering an event, for it to be a stressor, the person should be sufficiently burdened so as to require digging deeper than usual into their personal resources – emotions, finances, performances *etc*. In a nutshell, according to Ogden [1], a stressor is any event that disrupts one's emotional functioning which arises in the family, job or social domains that matter to them. Additionally, an event will be more distressful if so many distressing incidents than one are concurrently at play (e.g., concurrently facing divorce but also facing a disciplinary case at work). Also, ambiguous and/or uncontrollable events are perceived as more distressful than those that are clear-cut and predictable. For example, in an experiment, Glass and Singer (1972) demonstrated "that unpredicted loud bursts of noise are more stressful than predictable ones" ([1: p.296].

IV. IMPORTANT CATEGORIES OF STRESS

Stress is categorized depending on the length of time the feeling remains in force within a person. The American Psychological Association (APA) [5] describes various types of stress based upon its duration. Among the principle ones are, and also in fitting with our current discussion, *acute stress* and *chronic stress*.

Acute stress is usually brief but a widely frequent occurrence. Freshwater [5] describes acute stress as negative thoughts about occurrences, past, current or upcoming, which then affect our emotions. Take the example of one being involved in an embarrassing incident which keeps playing out in his/her mind. It might distract one's concentration, lower their self-worth and may generally affect their social interactions. Acute stress is at play, for example, when one is required to make a public presentation to a large gathering of people. It is typical of acute stress that no sooner does the external stressor pass than the emotional distress itself clears off one's shoulders.

Acute stress is the most adaptive (or worthwhile) type of stress. As Sapolsky [3] would put it, when one is faced with a life threatening emergency, the role of acute stress is to marshal bodily energy resources to survive the emergency. UNHCR [6] presents acute stress as a basic life protecting mechanism that enhances physical and mental defenses and preparedness that focuses attention and mobilizes the energy and resources within us to undertake an appropriate and exceptional action. In that vein, acute stress allows us to remain productive even in the face of changing and challenging situations [6].

Once the emergency situation is over, typically acute stress subsides within a short period of time. That is not the case with chronic stress. Chronic stress is long term - grinding at its victim day in and day out. Long term unemployment and poverty, nursing a close relative who is chronically and terminally ill, death of a bread winner or such very often lead to chronic stress. According to APA, chronic stress can occur because of stressful situations that are ignored or poorly managed [7]. The sufferer vegetates under the weight of these lingering negative thoughts to the extent that s/he doesn't live a normal life for an extended period of time [8]. Persons under chronic stress experience strong emotions which in turn provoke their bodies into an accompanying hormonal uproar linked to mere thoughts [8]. As a consequence, they feel fatigued, unable to concentrate on important activities and are irritable for no clear reason. Chronic stress causes wear and tear on the body. At a basic level, there is a very close link between chronic stress and ill-health, especially mental health.

Figure 2: Threat of animal attack elicits stress response –
Source: Thinkingobserver.com

V. THE BIOLOGICAL BASES OF STRESS

So what really happens to us internally when we perceive an event as stressful? What does a stressor elicit inside the organism? For a start, the organism responds to a stressor in a biological fashion. According to

neural biologists such as Sapolsky [3], environmental demands, some of them life threatening, require exceptional biological responses to surmount them. An attack on one's life will generate exceptional biological responses aimed at increasing blood sugar to fuel exceptional physical and psychological responses to survive the attack. This is generally interpreted as biological adaptation essential for fight or flight response. These responses aid the animal to marshal extraordinary amount of energy to fight back or flee the attack. This is a frequent occurrence in the animal world where predators survive by killing and eating other animals. The animals of prey have to either fight or flee to survive the vicious attack by a predator.

Physiologically, stress response happens at two levels: first, secretion of stress hormones by adrenal glands which in turn induces the second level response: changes in physiology - what is known as stress reactivity [1]. The hormones arouse the body and give it energy to respond in a fight-or-flight fashion [1] [2]. Due to the secretion of stress hormones, one can run faster and for longer distances than would normally be the case when not faced with an emergency.

Among the principal stress hormones are adrenalin and noradrenalin, (or epinephrine and norepinephrine) [1]. Secreted by the adrenal glands, adrenaline and noradrenalin send impulses to various smooth muscles (muscles you can't consciously control) such as the heart, sweat glands, muscles controlling oxygen flow to quicken supply to necessary parts of the body; blood vessels to supply more blood to major muscle groups including the heart and lungs and so on. Noradrenalin, in particular, induces vigilant concentration which sharpens mental activation for sensing danger [1] [2]. Noradrenalin is at hand when one is sitting an examination, making a public presentation *etc*.

In addition to adrenalin and noradrenalin, adrenal glands also secrete other stress hormones called glucocorticoids [3]. Glucocorticoids are steroid hormones which activate the body *to generate extra energy* (for example, from fatty reserves) for the body to be able to respond in a manner commensurate with the emergency at hand [10]. Principal among these glucocorticoids is cortisol [1] which circulates with blood to activate various organs in the body for optimal performance. Cortisol activation increases heart rate, blood pressure, sweating, pupil dilation etc. But cortisol also turns off non-essential functions: digestion, growth, tissue repair and reproduction, among others [3]. In this way, the body improves its capacity to respond appropriately and efficiently to save the organism under pressure.

VI. STRESS AND ILL-HEALTH

Biological activation prepares our bodies for immediate fight or flight response to a stressor [2]. The bodily activation enhances our physical and mental defenses and preparedness, focusing our attention and mobilizing the energy and resources necessary for fight or flight action [4] [2] [1]. Insofar as acute stress is concerned, stress is necessary for us to remain productive in the face of changing and challenging situations [4].

As we already saw above, the release of hormones into the blood stream underlies this activation of bodily and cognitive functions. Secretion of catecholamines will result in bodily changes, namely, upswings in blood pressure, heart rate, sweating, pupil dilation *etc*., all of which are experienced as feelings of arousal [1]. Glucocorticoids (or corticosteroids) will induce increased defused internal changes such as increase in the processes of oxidization of carbohydrate stores and release of fatty acids to provide extra energy for impending fight or flight action [1].

Ill-health frequently arises because of occurrence of chronic stress [2] [3]. According to both APA [6] and Sapolsky [3], although acute stress by itself is adaptive, chronic stress causes ill-health because, in today's environment of daily pressure and rush, human beings are forever stuck in this natural alarm system — the "fight or flight" hyperarousal. Under these stressful conditions, the body is flooded with stress hormones that elevate one's heart rate, increase blood pressure, boost energy levels in preparation for a perceived emergency but which in turn contribute to wear and tear on the body [3]. Consequently, it is generally agreed that chronic stress is maladaptive and causes disease [2].

Sapolsky [3] asserts that chronic stress is a recent invention mostly limited to humans and social primates such as baboons and is therefore purely psychological. On the whole, biomedical research has tended to focus on chronic stress in humans for the reason that it is maladaptive – causing physical and mental diseases [11].

Durand and Barlow [2] have also broadened the discourse of stress and ill-health outcomes to include a behavioral pathway. They concede that one set of illnesses attributed to stress is due to biological processes such as hormonal activation; the other sets of diseases is due to long standing behavioral patterns associated with human response to stress, which in turn also puts people at risk of developing certain illnesses. There is an interplay between the two pathways.

Going by the behavioral pathway, when under chronic stress, victims might and are known to, adopt bad habits primarily to cope with stress - such as overeating, alcohol abuse, smoking and other bad habits [6]. Thus, even though stress may not be the direct cause of certain illnesses, it appears stress influences the adoption of these maladaptive behaviors that underlie certain health conditions such as coronary heart disease

(CHD) and diabetes [1]. This is the behavioral pathway that links stress to ill-health [1]. As a consequence, stress has been studied in connection with its influence on these maladaptive behaviors [1]. Smoking, psychotropic drug abuse including alcohol abuse, eating disorders, lack of exercise, self-harm are more likely to be undertaken by distressed individuals [1] [12].

VII. STRESS AND ILL-HEALTH: SYNOPSIS

There appears a clear link between chronic stress and ill-health. One hastens to point out occasional instances of ill-health arising from sudden, acute stress. However, the more problematic stress-health link arises out of chronic stress and so this discussion has been more about that link.

The relationship between stress and ill-health can be understood from Johnston's chronic and acute model of stress–illness link [1]. Going by this model, chronic stress is more likely to involve the release of glucocorticoids, especially cortisol. In turn, chronic stress is linked to wear and tear and the slower process of atherosclerosis and damage to the cardiovascular system [1]. Individuals are more likely to suffer other symptoms of ill-health including decreased immune system functioning and damage to neurons in the hippocampus because of chronic stress.

Furthermore, acute stress operates primarily through changes in sympathetic activation with changes in heart rate and blood pressure. This can contribute to among other conditions: atherosclerosis and kidney disease, heart attacks, blood clot formation, increased blood pressure, increased heart rate, irregular heartbeats, fat deposits, plaque formation and immunosuppression.

Thus, focusing on chronic stress, Sapolsky [9] summarized the stress-related illnesses and medical conditions as those listed heretofore:

- Increased risk of eating disorders - diabetes, metabolic related hypertension, ulcers, obesity etc.
- Coronary heart (or cardiovascular) disease
- Stress dwarfism among children – suppressed growth due to absence of growth hormone during periods of chronic stress
- Osteoporosis – bones becoming porous and increasing danger of breakage
- Reproductive problems – generally loss of libido in both sexes:
  - Erectile dysfunction (impotency) among men due to operating in 'sympathetic activation'
  - Irregular or loss of menstrual cycles, failure of implantation of fertilized egg
- Immunosuppression – increased risk of infectious diseases including common cold, increased risk of full blown AIDS-related infections
- Memory loss due to damage to hippocampal neurons
- Anhedonia (loss of interest in pleasurable activities) due to depletion of dopamine
- Depression and other mental illnesses.

VIII. COPING WITH STRESS

There are different models that researchers have suggested regarding how to cope with stress [1]. Whatever model that researchers have described, for it to be classified as effective, it has to aid the individual under stress to attain two desired effects [1]. First is to reduce the intensity and duration of the stressor. This means coping with stress should result in termination, minimizing or shortening of the stressor [1]. Second, an effective coping should reduce the likelihood of the stress leading to illness. Thus, on the whole, Ogden [1] has proposed that effective coping should reduce the stressor and minimize its negative outcomes. In fact, she also advocates a research focus that shifts coping emphasis away from just absence of illness toward positive outcomes.

When we undertake a coping strategy with the view of remedying the situation or reducing the stressor, it is referred to as a problem-focused coping [1] [12]. In the case of an emergency response person, it could be recommended that they minimize unnecessary exposure to trauma effects such as death or horrific injuries. However, Schwartz [12] argues that problem-focused coping is useful only when someone has the ability to remedy the stressful situation otherwise it could further the frustration. In the case of work overload in Zambian hospitals as has been the case during COVID-19 emergency response, a response might not have the luxury of going off-duty, thereby minimize exposure to people dying for lack of oxygen.

Another coping strategy is to leave the problem alone but turn to dealing with the emotions that are evoked by the stressor [1] [12] [2]. Doing something that can minimize the importance and emotional burden of the situation is an example of such an approach that is referred to as emotion-focused coping. Denial of the existence of a stressor is another good example of emotion-focused coping.

The question regarding which of these approaches people use has been extensively studied [1]. A number of factors has been found to be associated with what type of strategy an individual utilizes to cope [1]. These factors include nature of the stressor, age of the individual, gender of the individual, controllability,

available resources and coping training [1]. Figures 5 and 6 summarize research findings pertaining to the choice of coping strategies as reported by Ogden [1, pp. 326 -327].

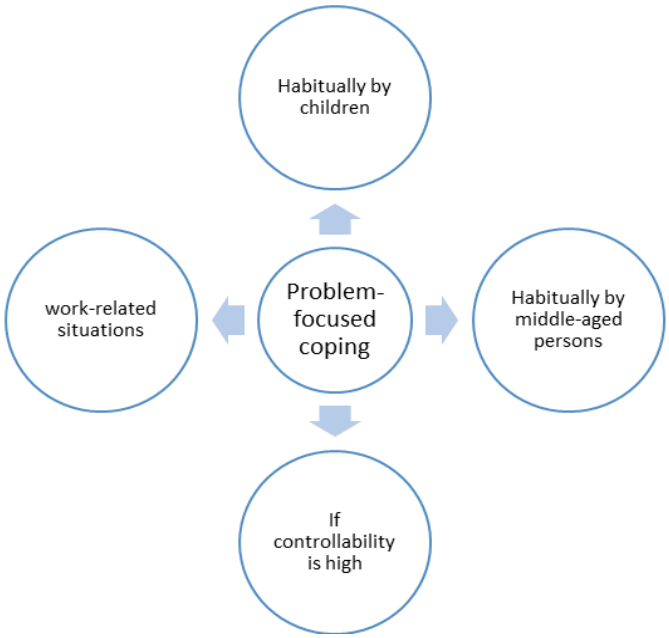

Figure 3: Factors favourable for Problem-focused coping

Various researchers have found that people tend to employ problem-focused coping strategies when the situation is work related rather than health or relational. Furthermore, children have been found to employ problem-focused strategies until they attain adolescent age; some researchers have found that children learn to employ emotion-focused coping only by the time they are adolescents [1]. Middle aged men and women have been found to be more problem-focused than emotion-focused. Women have been found to usually utilize emotion-focused coping more often than men. Research evidence has supported the view that people will use problem-focused coping if they believe that the situation causing the stress can be changed - or is high on controllability. On the other hand, when the situation is perceived as out of control, they will use more of emotion-focused coping. This also appears true when availability of resources is brought into the picture. When one perceives that they lack the necessary resources to handle the stressor, they will tend to utilize the emotion-focused coping.

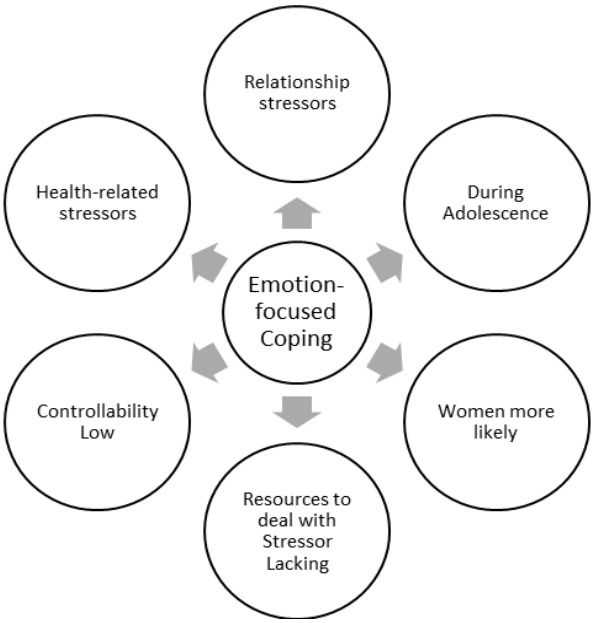

Figure 4: Factors Favouring Emotion-focused Coping

As to how effective various coping styles are in reducing perceived stress as well as minimizing the likelihood of stress inducing illness, research literature suggests that coping styles may moderate the link between stress and health [1]; [2]. The following are evident in research literature:

a) Problem solving and acceptance styles seem to be more effective to reducing stress and distress
b) Active and problem-solving coping are associated with better outcomes whereas passive, avoidant coping are associated with poor outcomes; avoidant coping (e.g., denial) being found to be the least effective coping style.
c) There is a higher probability of a stress-related illness occurring if the individual uses avoidant and emotion-focused coping styles than if one used active problem focused coping.

IX. SOCIAL ISOLATION VERSUS SUPPORT AFFILIATION

A very popular research focus has been the relationship between social support and outcomes of an episode of distress on the person. Social affiliation (or support) encompasses not only the number of friends available to the individual but also their satisfaction with the support they receive from the friends ([1]). Social support has thus been used to refer to 'the perceived comfort, caring, esteem or help one individual receives from others [13].

Social support has been found to have important health outcome during stress episodes. Two theories attempt to explain the efficacy of social support in influencing the development of the stress related illnesses [1].

a) The *main effect hypothesis* explains that social support is beneficial and that its absence is stressful. It can be inferred from this theory that the very presence of social support secludes distress and its absence is a precursor to the development of distress.
b) The *stressor buffering hypothesis* suggests that social support aids in coping with stress by buffering the individual from the stressor. In effect, it has been hypothesized that social support influences the individual's appraisal of the potential stressor [1]. Social support minimizes the importance of a stressor.

Various pieces of research have studied the relationship between social isolation or social support and death [14]. Research evidence has constantly shown that individuals with most ties face the lowest mortality rates and those with fewest social ties suffered the highest rates. Further, this has remained valid even when risk factors such as smoking and alcohol consumption have been statistically controlled [1].

X. MEASURING ONE'S ABILITY TO COPE WITH STRESS

Ways of Coping Checklist by Folkman and Lazarus (1988) and *COPE* by Carver et al. 1989) are some of the most commonly used measures of one's ability to cope with distress. The key self-report measures include the following [1: p.327]:

a) *Active coping* (e.g., I've been taking action to try make the situation better*)*
b) *Planning* (e.g., I've been trying to come up with a strategy about what to do)
c) *Positive reframing* (e.g., I've been looking for something good in what is happening)
d) *Self-distraction* (e.g., I've been turning to work or other activities to take my mind off things"
e) *Using Emotional support* (e.g., I've been getting emotional support from others)
f) *Substance use* (e.g., I've been using alcohol or other drugs to help me get through it)
g) *Behavioral disengagement* (e.g., I've given up trying to deal with it)
h) *Denial* (e.g., I've been saying to myself, 'This is not real')
i) *Self-control* (e.g., I've tried to keep my feeling to myself)
j) *Distancing* (e.g., I didn't let it get to me. I refused to think about it too much)
k) *Escape/avoidance* (e.g., I wished that the situation would go away)

In summary, Sapolsky [3] supposes that effective coping includes:

i. Developing outlets of frustration including engaging in alcohol use, smoking, sports, etc.
ii. Perceiving a sense of predictability in the occurrence of the stressor; the more predictable, the less stressful and the lower the risk of developing stress-related diseases.
iii. Perceiving a sense of control - that you have the ability to overcome the stressor; reduces the stressor and the risk of developing stress-related illness.
iv. Social affiliation (or support) – being high on social affiliation reduces stress; being low on affiliation increases the risk, - the higher the stress and the higher stress-illness link.

XI. CONCLUSION

In this article, an attempt has been made to present a thesis for stress to be better understood and taken more seriously as a mainstream disposing health condition than has been the case traditionally. Like majority of mental health conditions, stress has remained peripheral in policy and practice in many health jurisdictions. As

demonstrated in the article, stress disposes human kind to a whole host of ill-health circumstances – from heart diseases, diabetes to neural decay leading to memory loss and other cognitive defects.

Mainstreaming of psychosocial disciplines in medical training would be one effective approach in bringing mental health concerns into the core-medical training. Getting the mix right in medical training and services means emphasis be on both pharmacological medicine and mental health. Let us close the article with a quote from Lancet [15, p. 1]:

"The scarcity of research mirrors the weakness of mental health services on the continent and the blind eye turned to the problem by many Africans and their governments." (P.1)

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