

**Comparison of programs regarding stress management and specific  
counselling services, including their effectiveness, for medical  
students in the USA and Germany**

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## Table of contents:

1.	Introduction	1
2.	Stress and Stress Management	5
2.1.	Stress – Definition and General Basis	5
2.1.1.	Forms and Outcomes of Stress	8
2.1.2.	Stress Models	9
2.1.2.1.	“Fight or Flight” – W.B. Cannon	10
2.1.2.2.	“General Adaptation Syndrome” – H. Selye	10
2.1.2.3.	“Demand – Control” Model – R. Karasek	12
2.1.2.4.	“Person-Environment Fit” Model – J.R.P French	12
2.1.2.5.	“Social Readjustment Rating Scale” – T. Holmes and R. Rahe	13
2.1.2.6.	“Transactional” Model – R.S. Lazarus	14
2.1.2.7.	“Conservation of Resources” Theory – S.E. Hobfoll	15
2.1.2.8.	“Stress Process” Model – L. Pearlin	16
2.1.3.	Stress Vulnerability	17
2.1.3.1.	“Stress-Vulnerability” Model – J. Zubin and B. Spring	18
2.1.3.2.	Personality	18
2.2.	Stress Management – Definition and General Basis	19
2.2.1.	Forms of Stress Management	20
2.2.2.	Stress Management Concepts	22
2.2.2.1.	Concept – R. Lazarus and S. Folkman	23
2.2.2.2.	Concept – J.R. Weisz	24
2.2.2.3.	Concept – Occupational stress	24
2.3.	Medical Students and Stress – General Basis	24
2.3.1.	Medical Students and Psychological Complaints	26
2.3.1.1.	Depression and Anxiety	26
2.3.1.2.	Suicidality	28
2.3.1.3.	Burnout Syndrome	29
2.3.1.4.	Substance Abuse	30
2.3.2.	Medical Students and Stress Management	31
2.3.2.1.	Individual Coping Abilities	31
2.3.2.2.	Institutional Coping Interventions	32
3.	Central Research Questions and Hypotheses	34
3.1.	Central Research Questions	34
3.2.	Hypotheses	34

4.	Methods	34
4.1.	Literature Review and Website Search of US American Medical Schools	34
4.1.1.1.	Presentation and Organization of the Website Search Results Regarding US American Medical Schools	35
4.2.	Email Requests to US American Medical Schools	35
4.2.1.	Presentation and Organization of the Email Responses	36
4.3.	Literature Review and Website Search of German Medical Schools	36
4.3.1.	Presentation and Organization of the Website Search Results Regarding German Medical Schools	36
4.4.	Presentation of the Differences Between US American and German Medical Schools' Stress Management Programs	37
5.	Results	37
5.1.	Website Search Results Regarding US American Medical Schools	37
5.1.1.	Category 1: "Relaxation Techniques"	59
5.1.2.	Category 2: "Mindfulness"	59
5.1.3.	Category 3: "Stress Reduction"	61
5.1.4.	Category 4: "Learning Strategies"	63
5.1.5.	Category 5: "Online Resources"	63
5.1.6.	Category 6: "Other"	64
5.1.7.	Category 7: "Pet Therapy"	67
5.1.8.	Category 8: "Talks"	68
5.1.9.	Category 9: "Biofeedback"	68
5.1.10.	Category 10: "Wellness Events"	69
5.1.11.	Category 11: "Surveys/Screenings"	70
5.1.12.	Category 12: "Learning Communities"	70
5.2.	Results of the Email Inquiries	70
5.2.1.	Feedback of the Contacted Medical Schools	70
5.2.2.	Targeted Offers Described by the Contributing Medical Schools	71
5.2.2.1.	Category 2: "Mindfulness"	74
5.2.2.1.1.	Overlapping Category 2: "Mindfulness" and Category 5: "Online Resources"	75
5.2.2.2.	Category 3: "Stress Reduction"	76
5.2.2.2.1.	Overlapping Category 3: "Stress Reduction" and Category 8: "Talks"	76
5.2.2.3.	Overlapping Category 5: "Online Resources" and Category 6: "Other"	77
5.2.2.4.	Category 10: "Wellness Events"	77

5.3.	Website Search Results Regarding German Medical Schools	78
5.3.1.	Category 1: “Relaxation”	81
5.3.2.	Category 2: “Mindfulness”	81
5.3.3.	Category 3: “Stress Reduction”	81
5.3.4.	Category 4: “Learning Strategies”	83
5.3.5.	Category 5: “Advising”	84
5.3.6.	Category 6: “Coaching”	84
5.3.7.	Category 7: “Mentoring”	85
5.3.8.	Category 8: “Wellness Events”	85
5.4.	Differences Between US American and German Stress Management Programs in Medical Schools	85
6.	Discussion	86
6.1.	Website Search Results and Email Responses of US American and German Medical Schools	86
6.1.1.	Category “Relaxation Techniques”	88
6.1.2.	Category “Mindfulness”	89
6.1.3.	Category “Stress Reduction”	90
6.1.4.	Category “Learning Strategies”	92
6.1.5.	Category “Wellness Events”	93
6.2.	Evaluations of the Programs at US American Medical Schools	94
6.3.	Recommendation for Stress Prevention Measures regarding Medical Students	95
6.4.	Conclusion	97
7.	Summary	98
8.	Zusammenfassung	99
9.	Abbreviation Index	100
10.	Figure and Table Index	102
11.	References	103
12.	Appendix	128
A.	Email Inquiry to the US American Medical Schools	
B.	Information Sheets of Programs at US American Medical Schools	
B.1	Thomas Jefferson University	
B.2	Georgetown University School of Medicine, Washington, DC	
B.3	University of Pittsburgh	
B.4	Florida International University Herbert Wertheim College of Medicine	
C.	Statement by the Ethics Committee	

- D. Honorary Declaration
- E. Acknowledgments
- F. Publication Index

## **1. Introduction**

The World Health Organization (WHO) defines health as a “state of complete physical, mental and social well-being and not merely as the absence of disease or infirmity” [266]. Medical students undergo an extensive education to best apply this definition to their patients. The goal of medical training is to prepare competent, informed and professional doctors equipped to care for the sick, research the science of medicine and foster the health services. The students and the universities work together with the intention to create socially conducive and personally fulfilling careers. With these prerequisites one would assume that medical school would be a time of personal development and self-fulfillment despite the many challenges. Unfortunately, studies have shown that an increased prevalence of depression and anxiety with definite psychological feelings of stress exists regarding medical students in comparison to other same aged peer groups, not only in Germany but also in the United States [76,221]. Furthermore, it seems that the nature of medical school is a primary factor contributing to this disparity and may further add to the deterioration of developing physicians’ mental health. US American students entering medical school score better on indicators of mental health relative to age-similar college graduates from the general population pursuing other careers [31].

The structure of the medical school programs should be considered, since it is vastly different in both countries. In Germany, hochschulstart.de processes the application and is responsible for the allocation of enrollment at the various universities. Forty percent of spots are awarded directly, half of which due to grades, the other half due to time spent on waiting lists. The remaining sixty percent of spots are dispensed by the universities themselves in a selection process. Some universities decide on grades, others place an importance on specific grades in certain scientific courses. In addition, some states offer the possibility of improving a student’s chances in the selection process by providing a test, the so called “Test für medizinische Studiengänge (TMS)”. This test result factors in the decision-making process of some universities. These universities then generate a ranking list of all applicants based on their selection criterion. If an applicant receives multiple acceptances, the one with the highest preference for location is automatically chosen [64]. The curriculum itself is broken down into two intervals: the four semester long pre-clinical period filled with foundation courses followed then by the clinical stage which incorporates the main courses within six semesters and concludes with a practical

year. A state examination needs to be passed after every interval before receiving a license to practice medicine.

In contrast, medical education in the United States is organized in a vastly different manner. To begin with, the students need to complete a bachelor's degree which integrates the basic courses of biology, chemistry, physics and the liberal arts. The acquired knowledge is then tested in a standardized test called the MCAT, the "Medical College Admission Test". Students then apply for a spot at the individual medical schools with their MCAT score, their undergraduate grade point average and practical experiences regarding patient contact. After a rigorous process the universities decide on the students who will then embark on a four-year medical education. The first two years are based on foundational theories whereas the last two years are filled with clinical rotations. The pressure to succeed with the added time pressure is immense, which emphasizes the necessity of stress management programs even more.

Numerous factors alongside the demanding medical school curriculum, the constant time pressure as well as the enormous workload and responsibility, contribute and affect the health of prospective and working doctors. The mental health of medical students in particular is compromised [49,97,197]. In connection with elevated stress levels throughout medical school, signs of depression, anxiety disorder, burnout syndrome and suicidal tendencies are more prevalent [47,70,74,100,135,194,208,221]. A negative impact of health-related quality of life has already been described [89,133,245]. Regardless, medical students rarely seek professional help. This is due in large part to fear of discrimination and stigmatization [69,101,156].

Furthermore, elevated levels of psychological stress which licensed medical doctors experience, could suggest a continued existence of symptoms with origins in medical school. Medical professionals report a decreased quality of life as well as signs of depression and anxiety [34,98,134,255]. A high workload indicated through hours worked per week, shows a significant correlation and predictor to burnout [193]. Burnout syndrome can have fatal consequences, moreover it is associated with self-reported unprofessional conduct and suboptimal patient care practices [71,231].

Early prevention of health-related complications due to chronic stress in medical school can have far reaching consequences. Such prevention measures targeting medical



students can incorporate varying approaches. These may include stress management programs which convey coping strategies focused on reducing educational and occupational caused distress, leading to a healthier environment regarding the demands and responsibilities associated with the medical profession. Other solutions may encompass in-house mental health professionals, wellness initiatives to promote self-care as well as free materials regarding mental health, burnout and suicide prevention. However, often a lack of resources is cited to describe why such a support may not be feasible and programs that help students learn to cope are not implemented [138]. Yet academic success is closely linked to mental health and thus there is value in investing in the mental health of students [1,65,140].

To finally become a physician means undergoing a long and demanding journey. Numerous multi-international and national studies have been conducted over the years to further research and document the high prevalence of psychological stress among medical students [21,68,197,221]. Despite the substantial amount of literature which continues to explore this subject, effective interventions are still a lacking commodity [6,75]. A recent systematic review and meta-analysis of interventions proposes a comprehensive range of moderately effective individual-focused (stress management, facilitated small group, communication skills training) as well as organizational/structural-level interventions to prevent and reduce physician burnout [262].

The medical school at the Justus-Liebig University (JLU) of Gießen, after collecting research findings on its students and showcasing pertinent experience regarding close student contact under the teaching profession of Priv.-Doz. Dr. biol. hom. Harald B. Jurkat, Dipl.-Psych. B.S, has implemented such an individual focused program directed especially towards stress management for its future physicians. Studies have shown that medical students at the JLU Gießen are slightly more depressed in relation to same aged peer groups and lack suitable coping mechanism regarding stress management [135,223]. They report signs of fatigue and exhaustion, weariness, aggression, irritability and cynicism [223]. Since the fall of 2008 until the spring of 2019, this program called “Stressbewältigung im Medizinstudium” has been offered every semester to students enrolled in medical- as well as dental school at the University of Gießen. It is financially supported for the entire duration by the department of medicine. Most participants who partake stem from the pre-clinical semesters. The methods used are aimed at and include stress management- and relaxation techniques (autogenic training with specific phrases

geared towards medical school), as well as learning strategies, test anxiety and empirical based counsel. At the beginning of each course, it is explicitly emphasized that this program does not function as a support group or psychotherapeutic treatment. If feelings of psychological discomfort arise which go beyond the contents of the course, the students are reminded to utilize the counselling services the university offers to all its students. Individual cases may also turn to the instructor for guidance.

A literature search was performed to obtain a comprehensive overview of other national as well as international programs and services offered to medical students. The existence of such programs at medical schools in Germany as well as the United States was researched, and a definite shortage was detected [159]. Nevertheless, the universities are motivated to improve the mental well-being of their students. Despite all these various promising programs, there is a decline in the number of medical school sponsored programs centered on stress management. The cause of this is unclear [90,168].

The author has completed an extensive online research of the 147 United States medical schools at the time, to review all efforts made to enhance the mental health of medical students. Furthermore, a selected group of these medical schools were directly addressed per email requesting further information regarding their stress management programs. German publications focused on this issue were updated by executing a widespread online research of the programs presented at German medical schools.

Initially there will be a general outline dedicated to the theoretical foundations of stress and stress management as well as the present state of research concerning the mental health of medical students. The following concepts were further explored: stress reduction and relaxation techniques, mindfulness, wellness, learning strategies and advising. The research findings and data collected pertaining to the national and international efforts made by medical schools to curtail the stressful demands of their students, will be illustrated, compared and analyzed. Based on these discoveries, suggestions for improvement to continue the enhancement of the wellbeing of medical students in Germany as well as abroad, will be made. The results may contribute to the improvement and development of other programs created for medical students. An increase in the quality of life and satisfaction regarding the medical choice of profession could be a possible outcome.

## **2. Stress and Stress Management**

### **2.1. Stress – Definition and General Basis**

Stress has been called the “health epidemic of the 21<sup>st</sup> century” by the World Health Organization [87]. It can vary in its meaning and individual perception. Physical or psychological stress is an organism’s response to a stressor; may it be tangible or emotional, real or imaginative. A stressor is any factor which has a negative effect [125]. Herein lies one of the major problems within the concept of stress. It can be caused by any event or circumstance and encompasses all aspects of modern life. Stress has become a common explanation for human behavior and its failures. At the same time, the individual susceptibility to stress and its factors differs immensely. A wide range of feelings can manifest themselves which can furthermore lead to an even wider span of outcomes. The perplexity of this multifaceted idea is reflected in the ambiguity found in its definitions in the academic literature world.

The term "stress" derives its contemporary meaning in the early twentieth century. The physical sciences had long been using the word stress to describe the actions of an internal distribution of a force exerting on a material body, resulting in strain. In the 1920s and '30s however, biologists as well as psychologists started referring to stress as a harmful environmental agent which could cause illness or mental strain [257]. Walter B. Cannon used it in 1932 to signify external factors that disturbed what he called homeostasis, a steady state achieved by coordinating physical processes [59]. He was also the first to coin the phrase “fight or flight”, a universal, immediate and nonspecific response in acute situations [59,86]. From the second world war on forward, Hans Selye, “the father of stress” as called by some, played a fundamental role in promoting the all-encompassing and elusive nature of stress, particularly as it relates to the human condition [29]. He viewed stress as a common and non-specific response to any type of perceived stressor [131,228]. According to Selye, a painful blow can be as stressful as a passionate kiss. Furthermore, a total lack of stress would mean a certain death [229].

In recent modern history, an abundance of definitions has developed, relating stress to either a stimulus, a response or a combination of the two [131]. A popular definition by J.E. McGrath has stress labeled as a “substantial imbalance between demand and response capability, under conditions where failure to meet demand has important (perceived) consequences” [169]. Under this perception, stress occurs in a four-stage process: a

situational demand, a cognitive appraisal, a stress response, and resulting behavioral consequences [169]. Stress has also often been associated with constraints and demands. A definition proposed by Schuler describes stress as “a dynamic condition in which an individual is confronted with an opportunity, constraint, or demand related to what he desires and for which the outcome is perceived to be both uncertain and important” [43]. Ivancevich and Matterson in turn devised an alternative meaning. In their words stress is an “adoptive, mediated by individual characteristics and/or psychological processes that are a consequence of any external action, situation or event that places special physical and/or psychological demands upon a person” [43]. Stress research has often focused on the stimulus-response approach yet has lacked consideration regarding the character of the process. American psychologists Lazarus and Folkman then introduced the notion of a stressful environment and distanced themselves from the types of environmental stressors [155]. Their definition of stress reads as follows: “(stress is) a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being” [155]. This concept is based on the transactional approach. With all these differing opinions there are some who disagree even with the notion that there is a disagreement about the concept of stress. They view it as an “unfortunate but popular misconception” that the notion of stress is perceived as undefinable, and categorize its concept into three approaches: occupational, physiological and psychological [265]. The occupational stress is recognized as an environmental cause of tension in relation to the workplace. The physiological approach instead focuses on the reaction to a broad array of stimuli and hostile environment. The last method, the psychological approach, describes the interaction between the individual and the workplace. This diversity regarding explanations has persisted throughout the years.

The common thread throughout most of these assorted descriptions is the fact that stress is connected to stressors. American psychiatrist Glen Elliot and psychologist Carl Eisdorfer categorized five types of stressors with special emphasis on duration and course: "acute time-limited stressors", "brief naturalistic stressors", "stressful event sequences", "chronic stressors", and "distant stressors" [78]. Acute time-limited stressors include short term tasks such as public speaking, whereas brief natural stressors involve confronting ordinary, every-day challenges. Stressful event sequences start off with a painful life experience, for example the death of a spouse, which leads to ongoing stress

in the immediate future but does eventually conclude. Chronic stressors, unlike the others, persist throughout a person's lifetime, forcing behavioral changes. A person having to flee its native country and becoming a refugee would be subjected to chronic stressors. Lastly, distant stressors encompass past incidents which have the power to inflict physical, in regards to the immune system, and psychological damages in the future due to their lasting cognitive and emotional impacts [23,224]. Traumatic experiences such as having been sexually violated as a child or witnessing a murder can turn into distant stressors. Stressors can also be loosely categorized into physical (heat, hunger, physical labor), psychological (loss of control, fear of failure) and social (isolation, mobbing, conflicts) [157]. Usually social interactions provoke positive feelings. People purposely seek out companionship and social acceptance. However, these same circumstances can also be a burden and turn into social stressors.

Stress is closely linked to the human health, especially to the immune system. In 1975, Selye introduced the first model which connected the two objectives, the immune system and stress. He proposed that stress in general suppresses the immune system [227]. Since then, a more biphasic theory has been adopted. Modern day theory consists of the idea that stress both enhances and diminishes the immune system, depending on the undergone stress being acute or chronic respectively [63]. A meta analytic study suggests that stressors “trigger adaptive upregulation of natural immunity and suppression of specific immunity (acute time-limited), cytokine shift (brief naturalistic), or global immunosuppression (chronic)” [224]. Stressors associated with the “fight or flight” parameters seem to elicit beneficial changes to the body's immune system. However, the more the parameters deviate and convert to chronic, the more components of the immune system are affected negatively.

An often-overlooked aspect of stress is its positive adaptations. Positive stress can lead to a higher sense of motivation. A certain level of perceived stress and heightened stimulation is essential when wanting to achieve the best execution [99]. It improves productivity. Every mental or physical exertion needs a certain amount of stress energy. Maximum performance is only possible by controlling stress. Moreover, a defeated challenge is exhilarating. Stress is unquestionably subjective. Predispositions, experiences, attitude, personality and adopted coping strategies all influence the perception of stress. According to Mehrabian and Russell, based on the Stimulus

Organism Response (S-O-R) framework, a person (organism) processes each stressor differently depending on his or her bias, capability and mood (Fig.1) [157,173,188].

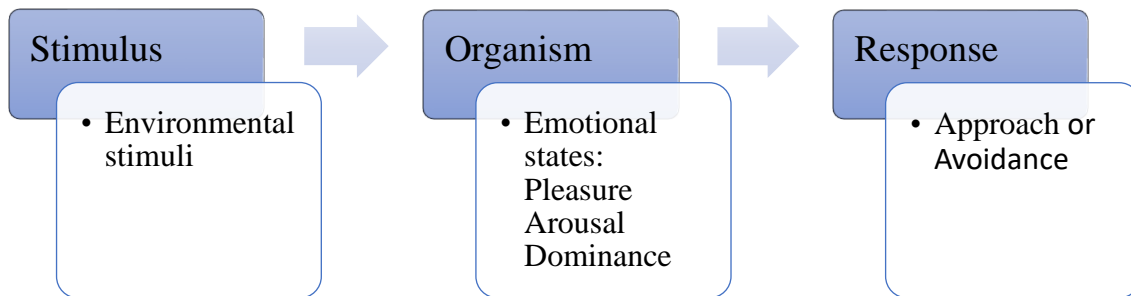


Figure 1: S-O-R Framework

Even objective real-life dangerous situations only lead to stress if the danger is recognized and the belief is formed that the danger cannot be overcome.

On the other hand, peaceful circumstances can be perceived as dangerous and cause stress. Stress is individual. Some may recognize signs of stress but keep calm. Others work themselves up and are so entrenched that their stress reaction becomes a stressor. In particular, three features influence the effect of stressors: perceived controllability, predictability and overload [15]. If a person feels helplessly exposed, he or she will show a greater stress reaction than another who believes to be in control. Furthermore, the subjective perceived controllability is more important than the actual. Expected actions are also better processed and are less likely to lead to an overload.

Stress is inevitable and even vital [184,226]. It is essential for the preservation of bodily functions, promotes performance and adaptability, and contributes to developmental possibilities [184]. Regardless, stress can disrupt the balance of physical processes and have a negative impact on the individual.

### 2.1.1. Forms and Outcomes of Stress

Stress is neutral, the degree of response varies. The ideal situation encompasses the middle ground. Too much and even not enough stress can both lead to a drop of performance [214]. An excess amount can generate nervousness and lack of concentration, whereas an underload can produce fatigue and boredom [157].

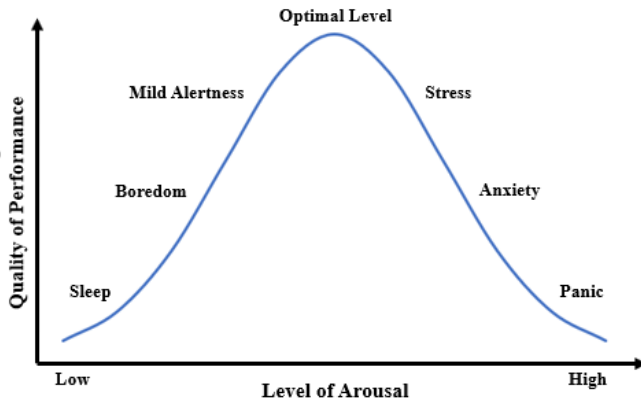


Figure 2: Yerkes-Dodson Law

The Yerkes and Dodson Law demonstrates that the optimal quality of performance peaks at a medium level of arousal. Both amplified as well as subdued phases of stress have a negative impact on execution and health. Performance degrades on both the left as well as the right side of the curve (Fig. 2) [54,268].

In 1955, Hebb indicated that arousal is necessary for behavioral efficiency in everyday life as well. He hypothesized that low arousal levels would produce negative behavioral responses [112].

Since Hebb argues, that a certain level of stress can also have a positive influence on performance, stress itself is not necessarily something negative. Accordingly, stress can be differentiated into “eustress” and “distress” [39].

Eustress describes a positive challenge which can be overcome and does not exceed coping mechanisms; a condition of optimal amounts of stress [33]. It is associated with feelings of joy, relief and hope. On a short-term basis, the body releases adrenalin and increases the heart rate [33]. Since it is a temporary occurrence, it does not pose any harm. These physical changes may enhance cognitive functioning [157].

Distress, on the other hand, arises when confronted with negative stressors. It also forms when a situation cannot be controlled, and even a change of settings does not lead to an improvement of the condition [33]. Distress can contain threatening components, being connected to symptoms of fainting and helplessness [33]. The risk of illness increases with the duration. Being exposed to a continued excess of stress forces the body to release glucocorticoids which in turn promote long-term health risks such as arterial hypertension and mental impairments as in the case of depression [60].

### 2.1.2. Stress Models

The human body responds to the environment and perceived stress in various ways. Since the early nineteenth century, numerous theories of stress have been recognized.

### **2.1.2.1. “Fight or Flight” – W.B. Cannon**

The physiologist Walter B. Cannon was deeply interested in human emotions and their psychological functions. He was searching for connections between the mind and the body [195]. His “fight or flight” conception indicates that different motivational properties provoke a certain response, either attack or escape. Feelings of anger or anxiety fuel the body’s internal autonomic nervous system, producing a drive [238]. The sympathetic adrenal medullary system in turn forces the organism out of homeostasis and directs several changes such as an increase of blood flow to the skeletal muscles, to ensure the threat was met [166]. Cannon focused on the alarm and emergency factors. He viewed stress as a tool for survival, enabling mankind to overcome adversity and hardship [195]. When the threat was eliminated and survival was certain, homeostasis could be reestablished.

### **2.1.2.2. “General Adaptation Syndrome” – H. Selye**

Hans Selye, through clinical experience and laboratory experiments with rats, developed an interest in the organism’s response to a concept he termed “stress”. As part of his biochemical endocrinological research at McGill University in Montreal, he initially described it as a non-specific physiological defense reaction in experimental animals but soon widened the notion into a universal non-specific reaction [257]. In the further development of his ideas, he named the unclear marks of harm done by the environment the “General Adaptation Syndrome” (GAS) and stress the body’s response to these agents [257]. Stress is the condition established by GAS. Selye believed to have found the common threat between the environment and an organism. He was also the first to recognize that homeostasis in itself could not provide stability when confronted with stressors [29]. A key factor was the duration. If the stressor was chronic in its nature, then the body went through the general adaptation syndrome. As seen in Figure 3, GAS is characterized in three phases: the alarm reaction, the stage of resistance and the point of exhaustion [207,228].

1. Alarm reaction: The alarm reaction incorporates the activity of the sympathetic nervous system [59]. When a stressor is first presented, the body begins to pull resources. Hormones such as adrenaline and cortisol are released to adjust physical functions. These adjustments lead to the body’s upsurge of energy levels, muscle tension, blood pressure and a decrease in pain sensitivity as well as digestive function [103,175]. It is the body’s “call



to arms” as Selye points out [228]. If the stressor is so severe that it becomes incompatible with life, the organism dies during the alarm reaction. Otherwise, the following phase commences.

2. Resistance stage:

Throughout this stage, the organism copes with the stressor [59]. The initial symptoms slowly diminish. The body utilizes its resources and becomes increasingly tired and susceptible to illness. Psychosomatic

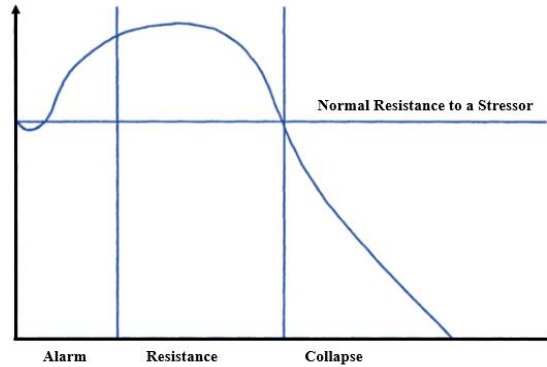


Figure 3: General Adaptation Syndrome Phases

disorders emerge [175]. The body continues to resist until either the stressful stimulus is defeated, or the exhaustion phase emerges.

3. Point of Exhaustion: The organism has failed to defeat the threat, depleted its physiological resources in the process and has reached a state of exhaustion [59]. Behavioral acts of anxiety, irritability and self-destruction are displayed [175]. A hormonal overproduction takes place, causing secondary, harmful effects called the “disease of adaptations”, producing gastroduodenal ulcers and high blood pressure [86].

Selye focused on the relationship between the nervous system and behavioral responses. In fact, this hormonal approach was already part of Walter Cannon’s homeostasis theory [59]. Selye recognized Cannon’s “fight or flight” conception as the first phase of his general adaptation syndrome [86]. It contains the same physiological mechanisms exhibited in an acute stress response. Since then, Selye’s theory of GAS has been subsequently shown to be incorrect [86]. The response to a stressor is not non-specific, but rather directed toward the nature of the stressor [116,145]. To add to the confusion, Selye has claimed that due to his limited knowledge of the English language, he was not able to distinguish between the meanings of “stress” and “strain” [131]. While the three phases of the GAS theory may have been rejected, Selye put the term “stress” on the map and highlighted the fact that chronic stress results in illness.

### **2.1.2.3. “Demand – Control” Model – R. Karasek**

American sociologist Robert Karasek has constructed one of the most influential approaches to occupational stress [131]. It focuses on two main factors: job demands and job control. Job demands refer to the workload and the intellectual requirements while job control defines the individual autonomy and decision latitude [153]. He believes that job control moderates the demands [131]. According to Karasek, four types of work environments are established: high strain, low strain, active, and passive [153].

1. High Strain: A high strain job results by combining a high work demand with a low level of control. Examples include service workers, nurses and in particular machine-paced employees. This arrangement supports job dissatisfaction and mental strain such as depression and fatigue [153]. Overall, the risk of illness is increased up to four times [246].
2. Low Strain: Work which is comprised of a low demand but a high level of control, is called a low strain setting. Examples include architects and dentists [153].
3. Active: Jobs categorized with a high demand as well as a high level of control create an active work atmosphere. Examples include lawyer, manager, engineer and physicians. Active jobs provide stimulation and health promotion [153]. They allow the worker to generate protective behaviors such as delegation [131].
4. Passive: In contrast, jobs with low demand and low control are deemed passive jobs. Examples include janitors and nighttime security workers [153].

Karasek’s work model encourages active job environments which promote learning and independence. It hypothesizes that “workers with active jobs are more likely to seek challenging situations that promote mastery, thereby encouraging skill and knowledge acquisition” [251].

### **2.1.2.4. “Person-Environment Fit” Model – J.R.P French**

The person-environment fit (P-E fit) model has become widely recognized among organizational stress researchers [80]. The P-E fit approach argues stress is a lack of connection between the nature of a person (e.g. abilities) and the surrounding environment (e.g. demands) [77,95]. It views the individual and the environment as linked

elements in stress related outcomes. French and his colleagues have presented two versions of the fit model.

One version focuses on the association between the environment's supply and a person's values (S-V fit) while the other version's emphasis lies on the environment's demands and a person's abilities (D-A fit) [77]. These two forms can be seen objectively as well as subjectively [95]. The central thesis of the P-E fit model states that the subjective misfits of both the S-V fit and the D-A fit produce "strain", a combination of negative psychological, physiological and behavioral outcomes [95]. Recent research has generated a different distinction to further specify the term environment, differentiating between a person-job (P-J) fit and a person-organization (P-O) fit [152]. The person-job fit measures the compatibility of a person's abilities regarding the demands of the particular job. Alternatively, the person-organization fit refers to whether the values of an employee correspond to the values of the rest of the organizational personnel [153]. The perception of a poor person-organization fit has been associated with increased levels of stress, job dissatisfaction and intentions of resigning [158]. On the other hand, a satisfactorily perception of a person-job fit has shown a positive correlation to job satisfaction and a negative association to stress [210]. The P-E fit method has also considered external factors, such as social support from family and co-workers, as a mechanism individuals can use to protect themselves from stress [153]. Overall, the P-E fit model focuses on the interaction between the person and the environmental stressors found in an occupational setting.

#### **2.1.2.5. "Social Readjustment Rating Scale" – T. Holmes and R. Rahe**

The social readjustment rating scale was established as a prognostic tool to categorize and measure stress. Thomas Holmes and Richard Rahe followed up on Adolf Meyer's idea in the 1930's that stressful events are directly related to a susceptibility to illness [207]. They defined stressful life events as events which would initiate a significant change. The social readjustment rating scale holds forty-three such life events, each assigned a number allocating life changing units [124]. Holmes and Rahe enclose not only destructive occasions such as divorce (seventy-three points) but also uplifting experiences such as pregnancy (forty points) and vacations (fourteen points) [124]. Both apparently lead to life altering opportunities which in turn contribute to illness. They postulated that if a range of 200 to 300 points were accumulated within a year, half of the affected individuals

would become ill. If an excess of 300 points were observed, a seventy-nine percent probability of negative health effects were discerned [207].

This model has received extensive criticism. It suggests that every person confronted with one specific experience, faces the same amount of stress and life alterations [207]. Furthermore, the idea to accurately measure stress by single life events entirely forsakes the personality component. Some life events mentioned are also a natural part of aging, belonging to a certain stage of life [207]. This concept, however, does recognize that stress is not just caused by specific events but also by rather mundane, every-day life adventures.

#### **2.1.2.6. “Transactional” Model – R.S. Lazarus**

The transactional model by Richard Lazarus illustrates the behavioral response to stress. Their nature of response emphasizes the evaluation of the situation as well as the aspects of the contributing personal character [154]. It encompasses emotional and cognitive components, and is therefore more suitable than the stimulus-response model represented in the homeostatic idea [58]. “Novelty, uncertainty and absence or loss of control” are essential elements in the assessment process [58]. The behavioral reaction to fear is anticipatory with physiological (alarm response) as well as behavioral (fight or flight) aspects [58]. Alternatively, a response to a safe situation involves a decrease in anxiety [58].

The primary review assesses the general possibility of a negative outcome. Lazarus divides the primary appraisal into three categories: appraisal of – harm, threat and challenge [207]. If harm is detected, the damage has already been inflicted, but if a threat is perceived, the injury is yet to come. The consideration of a challenge on the other hand actually introduces the option of a positive outcome [207].

The secondary appraisal involves the individual’s coping strategies, consisting of active (problem-oriented coping) or passive (emotion-oriented coping) avoidance reactions [58]. If the demands made are greater than the available resources, stress occurs. However, the theory also suggests that if the secondary evaluation reveals an adequate amount of resources which match the demand, the situation may be a challenge rather than harm or threat and therefore be less stressful [182].

This guides the belief that stress is essentially a state within oneself. Interactions with the environment lead to one's own creation of stress. Social support can mediate this self-appointed stress by either impacting it directly or acting as a buffer [58]. Generally, this model hypothesizes that stress is a direct consequence of an individual's behavior.

#### **2.1.2.7. "Conservation of Resources" Theory – S.E. Hobfoll**

The conservation of resources (COR) theory focuses on the ecological approach by concentrating on the individual's response to stress and trauma; it is a stress and motivational theory. It defines stress as "a reaction to the environment in which there is the threat of a net loss of resources, an actual net loss of resources, or a lack of resource gain following investment" [121]. Every person is motivated to acquire resources for success and survival, may they be external (e.g. food, shelter) or internal (e.g. optimism, self-esteem) [121]. The COR framework advocates the relationship between resources, rather than concentrating on isolated variables whereby individuals and settings are independent [119]. Resources are often interdependent and tend to occur together. These are referred to as "resource caravans". The environmental conditions which either support or debilitate these resources are titled "caravan passageways" [119]. These passageways are critical in understanding the reasons a resource either contributes to stress or strengthens the resilience when confronted with distress [121]. The socio-cultural processes which influence the construction of these caravans are crucial. Examining a single, separate resource does not further the understanding of stress.

Within the COR theory, stress and trauma results due to a loss or threat of resources. Trauma and profound distress can cause serious harm to obtained resources, whether they concern primary resources (e.g. safety), secondary resources (e.g. hope) or tertiary resources (e.g. socio-economic status). There are two major principles derived from the conservation of resources theory.

Principle 1: Resource loss is more significant than resource gain [121]. It defines stress. Kahneman and Tversky stated in their prospect theory that the inclination for loss is greater than the inclination for gain. Greater risks are undertaken if faced with the threat of loss of resources as opposed to a situation with a guaranteed gain [137]. The concept that the loss of resource has a greater impact on stress than a gain of resource, was tested by Hobfoll and Lilly [120]. Results showed that resources gained revealed absolutely no direct influence on feelings

of distress, while resources lost exposed a profound negative effect [120]. An alternative study measured the effects of natural disaster on mental health and concluded that resource loss established a greater predictor of psychological stress than a person's characteristics and coping strategies [92,93].

Principle 2: Resource investment provides protection from loss. Resources need a certain worth to be effective. Low self-esteem and an unreliable support system for instance, do not balance a loss. Furthermore, when confronted with stressful events, individuals need to learn to efficiently employ their resources. Resources are often first misdirected or held back for conservation, further demonstrating the importance of resource investment. [121]

The conservation of resources concept underlines the fact that greater initial resources and more developed caravan passageways will result in a broader resilience regarding chronic stress.

#### **2.1.2.8. “Stress Process” Model – L. Pearlin**

The stress process model by Leonard Pearlin has been widely used to explain the relationship between environmental factors and exposure to stressors. According to the model, the three major environmental causes of stress are “social status”, “social role” and the “ambient environment” [16]. Pearlin's research has determined that stressors are not randomly experienced; there is a social distribution of stressors. Differing social roles and statuses correlate to differing events perceived as stressful, which in turn result in differing mental health outcomes [16].

Several key assumptions make up the foundation of Pearlin's concept. He describes his process as a network of dynamic and codependent dimensions. Social stress, similar to Selye's definition, is a part of normal, every-day life. Furthermore, stress originates out of the social environment. Keeping these notions in mind, Pearlin considers four components in his theory: sources of stress, manifestations of stress, mediators of stress, and moderators [16].

1. Sources of stress: Sources of stress entail daily life experiences with the capability of producing strain. They also have the potential to exaggerate already existing strains. On the other hand, a certain social role can also initiate a stressful life event [16].

2. Manifestations of stress: The manifestations of stress describe the possible outcomes in regard to the well-being of an individual [16]. Stress does not just manifest itself in psychological forms of distress such as depression. Disorders such as alcohol addiction and drug dependency are also demonstrations of stress [10,252].
3. Mediators of stress: The pathway between the exposure of stress and its outcome, is filled with mediators. Mediators can include personality traits as well as external factors such as social support [16].
4. Moderators: Mediators can also act as moderators, buffering the outcomes. If the mediator is well established, the impact of stress on mental health can be reduced. Individual coping abilities mitigate these processes [16].

The interaction of these factors depends on the social environment and the role each person plays within that society.

### **2.1.3. Stress Vulnerability**

Vulnerability describes a set of factors which intensifies a person's susceptibility to stress [106]. While a low level of vulnerability corresponds to a high toleration of stress, a high level of vulnerability relates specially to stress sensitivity. Various components influence vulnerability. Not only predispositions such as genetics and biology, but also psychological elements such as cognition and personality [178]. Factors which impact vulnerability are coping strategies, personal outlook, environment and social skills [185]. The common conception includes the idea that vulnerability is a trait which is stable yet dynamic, latent and endogenous [106]. Mental health as in levels of anxiety and social behavior for instance, remain relatively stable and undergo the occasional fluctuation when exposed to a stressful life event. The degree of fluctuation differs individually based on psychobiological and social vulnerability as well as resilience [108]. Early childhood challenges encompass a varying susceptibility factor and rather increase heightened sensitivity to stress in adulthood [5].

### 2.1.3.1. “Stress-Vulnerability” Model – J. Zubin and B. Spring

In an attempt to comprehend the process through which stress may lead to psychosis,

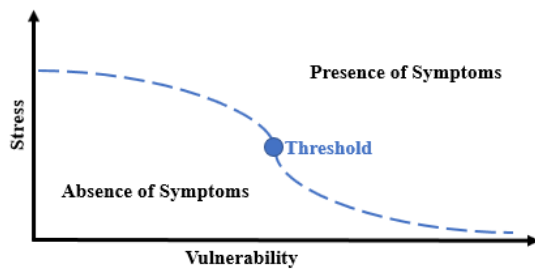


Figure 4: Stress-Vulnerability Model

Zubin and Spring proposed the stress-vulnerability model [270]. This framework proposes that each person has a genetically determined vulnerability to psychosis which can tolerate a certain threshold of stressors, as seen in Figure 4 [165]. Once this limit is surpassed however, the possibility of developing a psychosis increases [165]. The experience of stress

establishes a greater susceptibility to psychopathology. Therefore once the vulnerability has been established, the development of the illness is decided by biological as well as psychosocial determinants [22]. Treatment of the psychosis then should include interventions which reduce psychobiological vulnerability or stress, or which reinforce social support and coping abilities [22].

Similar to the stress-vulnerability model, stress-sensitization has also been linked to a potential impact on psychopathology [107]. This concept is based upon the idea that each person possesses individual genetic differences which interact with the surrounding environment to generate varying stress sensitivities as well as reactivities. The stress sensitization theory further hypothesizes that the first episode of a psychotic illness is provoked by a major stressor connected to an innate vulnerability [165]. Once the psychosis is existent, vulnerability increases and less stress is needed to induce additional or more severe psychotic issues [177].

### 2.1.3.2. Personality

Many factors play a role when a stress response is formed, personality included. Numerous personality types have been categorized over the years. It has been argued that particular personalities possess unique vulnerabilities which are associated with susceptibility to stress if certain environmental conditions are met [82].

The type A personality is perceived to be most affected by stressors. It is characterized as being exceedingly competitive, over-achieving, impatient, antagonistic and living under



constant time pressure [132,235]. A person with a type A personality is said to be entangled “in a never-ending struggle to achieve more and more in less and less time” [242]. These individuals are often societal leaders with great ambition. Most organizations value them as assets even though they are prone to burnout and heart attacks [182].

People who exhibit attenuated or only a few of these symptoms, are referred to as type B personalities. An individual with this character is noted to be “easygoing and relaxed, patient, a good listener, and takes a long-range view of things” [242]. A reduced amount of stress as well as stress related symptoms are accompanied by this personality.

Various traits within a personality influence the person’s ability to cope with stress. Hardiness, locus of control, learned resourcefulness and optimism are a few of these qualities [182]. A hardy person is defined as “a person with a cluster of characteristics that includes feelings of commitment, responding to each difficulty as representing a challenge and an opportunity, and perceiving that one has control over one’s life” [242]. Hardiness can also be built by overcoming and surviving past stressful events [182]. In addition, a high internal locus of control reinforces the self-confidence and belief to be in control of one’s own behavior [182]. This self-control improves resourcefulness [182]. Being exposed to challenges, enhances resourcefulness.

Interestingly, stress susceptibility can also be extended to the circadian rhythm. Studies have shown that evening personalities report an increased amount of psychological and psychosomatic anxieties in contrast to morning characters. Furthermore, evening types seem to experience more difficulties in coping with environmental as well as social demands. [172]

## **2.2. Stress Management – Definition and General Basis**

Understanding the stress response is critical. Stress develops when individuals perceive a discrepancy between the internal and external demands of a situation and the resources available to his or her organism [212]. It accompanies human beings from the prenatal period to birth until the end of life. Stress management refers to a wide range of techniques designed to cope with this stress and improve every-day life. It includes controlling and reducing the strain created in stressful events by making physical and psychological changes. It may involve relaxation techniques, lifestyle management and improving

personal life skills. The more stress management resources a person holds, the more flexible his or her response to stress will be. If enough coping abilities are available, a stressor might not even generate stress. Individuals can be taught to manage stress and cope with distress. The perspective as well as the confidence to challenge the stressor will transform in order to handle all types of stressors. Effective stress management requires the evaluation of one's own attitude and behavior. By recognizing personal strengths and weaknesses, as well as situations which pose a challenge, stress can successfully be conquered.

However, the goal of stress management is not to eliminate stress completely. Eustress does have its purpose when achieving life goals. In certain situations, it is more appropriate to counter stressful events with anti-stressors. Stress during an exam for instance can be relieved by producing a more suitable atmosphere [184]. The optimal level of stress involves physiological homeostasis, mental well-being and behavioral stability [51].

### **2.2.1. Forms of Stress Management**

Coping is an ongoing dynamic process. Each person develops their own skills which are modified to their own personal circumstance. Coping strategies are often connected to either personal or organizational elements, especially in regard to occupational stress management [81]. In 1979, Newman and Beehr performed an extensive review of published personal as well as organizational stress management interventions and concluded that no single, individual method remains as the ideal intervention [81].

Various categorizations regarding coping skills have been formulated. Perrez and Reicherts have suggested a systemic sorting of three classes [189].

1. Situational coping: This type of coping involves an active as well as a passive involvement. Escape or withdrawal is often utilized here. An active approach is suitable when controllable situations are encountered. Situations which are in transition require a more passive attitude. Negative circumstances often necessitate flight such as a change in workplace [189].
2. Representational-oriented coping: Representational-oriented coping is distinguished by either a search or a suppression of information to alter the perception of a stressor [189].

3. Evaluation-oriented coping: In contrast, evaluation-oriented coping is exercised when adjusting to a stressor [189].

A specific coping strategy is valuable in different settings. The effect of a coping skill depends on the perceived source of stress as well as the individual acquired resources, not on the particular coping strategy used. A flexibility in application is key for successful stress management.

In 1986, Mathney and his colleagues, after performing an extensive review on stress management research, have proposed an alternative categorization of coping strategies [164]. They grouped stress management interventions into the following two categories: preventive coping and combative coping [164]. Preventive coping is utilized when the stressor is first perceived while combative coping is beneficial once the stressor is already in progress [207]. Furthermore, they proposed classes of strategy associated with each category, as seen in Table 1 [164,207]. However, defining a specific class as either combative or preventive is not always accurate; some may incorporate elements of both. For instance, assertive skills can both be useful when struggling with a coworker but also prevent future disputes with a supervisor [207].

**Table 1: Coping Strategies**

<b>Coping Strategies</b>	<b>Classes</b>
<b>Combative</b>	<p><b>Avoiding Stressors through adjustment</b></p> <ul style="list-style-type: none"> <li>• Family/work balance</li> <li>• Career Planning</li> </ul> <p><b>Altering stress-inducing behavior</b></p> <ul style="list-style-type: none"> <li>• Type A behavior pattern</li> </ul> <p><b>Developing coping resources</b></p> <ul style="list-style-type: none"> <li>• Social</li> </ul>
<b>Preventive</b>	<p><b>Monitoring stressors and symptoms</b></p> <ul style="list-style-type: none"> <li>• Stress diaries</li> <li>• Muscle monitoring</li> </ul> <p><b>Finding resources and attacking stressors</b></p> <ul style="list-style-type: none"> <li>• Social skills training</li> <li>• Problem solving skills training</li> <li>• Assertive training</li> </ul> <p><b>Tolerating stressors</b></p> <ul style="list-style-type: none"> <li>• Cognitive appraisal</li> </ul> <p><b>Lowering arousal</b></p> <ul style="list-style-type: none"> <li>• Relaxation techniques</li> <li>• Guided imagery</li> <li>• Yoga</li> <li>• Physical exercise</li> <li>• Autogenic training</li> </ul>

Stress affects everyone. People must take responsibility and take positive action in developing and improving their coping skills. Stress management skills are essential.

### **2.2.2. Stress Management Concepts**

Stress management is complex and there is no single best way to manage stress. Effective stress management needs to identify strategies which are best suitable to each participant at any given point in time. It requires a dynamic and flexible characters, since life is not static either.

### **2.2.2.1. Concept – R. Lazarus and S. Folkman**

The transactional model of stress by Richard Lazarus defines stress as a process focusing on elements including active appraisal and coping. Cognitive appraisal and coping are two components which link the environment to the individual and are responsible for the various reactions generated in response to stress. When the struggle to balance internal and external demands exceeds coping abilities, stress results. Coping is a goal oriented process, resolving the source of stress and managing the emotional responses to stress [154]. Lazarus and Folkman define coping as “constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” [142,236]. This definition proposes the concept of coping as process oriented and not trait oriented [236]. They suggested two types of coping reactions: emotion-oriented and problem-oriented [142].

1. Emotion-oriented coping: Emotion-focused coping is mostly applied in uncontrollable situations. It involves the reduction of negative emotional responses such as embarrassment, anxiety, excitement and frustration. Drug therapy for instance is a type of emotion-oriented intervention. It focuses on the arousal or depression caused by stress, not the original source. Other types of emotion-oriented methods include distraction, meditation (e.g. mindfulness), alcohol, suppression and cognitive appraisal [142]. These interventions are especially constructive when health related issues are encountered. The compliance of medical treatments increases, and when faced with setbacks, the experienced psychological distress decreases [236]. Emotion-focused coping can however also include negative side effects since the confrontation with the actual issue is only delayed. It is not suitable for a long-term solution [142].
2. Problem-oriented coping: Problem-focused coping is directed toward the actual relationship between the environment and the individual [142]. It includes efforts made to control or change the stressor. For instance, learning new skills, removing barriers or generating alternative solutions are all attempts of problem-oriented techniques [236].

Both types of coping are integral when relieving emotional, psychological and physical burdens. According to Lazarus and Folkman, coping strategies are essentially neutral, neither adaptive nor maladaptive [236].

In addition, Lazarus and Folkman are also credited with establishing a self-report index of coping, known as the “Ways of Coping” checklist (WOC). It enlists sixty-six items to reflect emotion and problem focused coping. It quickly became the gold standard in coping management research, being a measure applicable to various areas, including disease management, occupational stress and personal loss. [236]

#### **2.2.2.2. Concept – J.R. Weisz**

J.R. Weisz and his colleagues have proposed a similar coping model to that of Lazarus and Folkman. Both agree that coping is goal and motivational oriented. However, the concept suggested by Weisz focuses on coping efforts which are directed at maintaining and modifying the own personality and surrounding environment [142]. Various controls levels are described. The primary control coping is defined as coping which influences situations, whereas secondary control coping refers to coping focused at maximizing an integrating response to the current situation [142]. When no attempt at coping is made, it is called relinquished control. Furthermore, Weisz and his colleagues differentiated between coping responses, its objectives and outcomes [142].

#### **2.2.2.3. Concept – Occupational stress**

Organizational stress is related to the amount of occupational stress experienced by its employees. Individual stress responses may contain a direct concern to organizations when coping mechanisms such as escape behaviors, resulting in reduced work availability involving a high turn-over rate, are utilized [52]. Newman and Beehr applied concepts of objective, target and agency when classifying stress management [52]. The interventions employed are often characterized by implied objectives such as prevention, timely reaction and rehabilitation which correlate to managing hazards, problem-solving and enhanced worker support respectively [53]. The issue of target and agency revolves around the notion of how an organization can help the individual help themselves [52]. The most common types of stress management interventions encountered in occupational stress research include primarily the reduction and control of work hazards, secondarily worker training, focusing on psychological skills in terms of health promotion and tertiarily employee assistance through counseling.

### **2.3. Medical Students and Stress – General Basis**

Sir William Osler (1849–1919), a renowned physician, once stated: "To each one of you the practice of medicine will be very much as you make it – to one a worry, a care, a

perpetual annoyance; to another, a daily joy and a life of as much happiness and usefulness as can well fall to the lot of man" [171]. Not every medical doctor shares enjoyment in their chosen profession but rather struggles with daily demands.

Medicine is a highly demanding career which takes a life-long path. Medical education is recognized as a stressful time which often exerts a negative outcome regarding academic performance, mental well-being and physical health. Medical students encounter a wide range of emotions during the transformation of an insecure student to a knowledgeable young resident physician. Even though stress can also be conducive by inducing motivation, it often leads to feelings of fear, incompetence, anger and guilt. A specific set of stressors targeting the medical profession, including exposure to death and suffering, ethical conflicts and the ever-competitive environment, have been identified [75]. A vicious cycle of stress is formed [149]. Interestingly, it is suggested that during the pre-clinical education phase, stress stands as a predictive feature to academic performance. Once this period has been concluded however, stress has shown to hold a less predictive value [241]. During the clinical stage, the majority of students identified poor team dynamics among the most stressful factors [127]. Furthermore, it appears that the number of stressful sources have a slightly higher impact on academic performance in comparison to the level of stress [237]. Older, female medical students with a high perceived stress levels, are at the greatest risk of low performance [149].

Research has suggested that medical students develop a reduction in mental health from the commencement of medical school on forward [31]. It is the prolongation of stress which is significant. Although other students may face similar challenges, they do so to a lesser extent and fewer years. The medical schools' application process in itself is grueling, and many students despair of receiving an acceptance letter.

In the year 2018/19 (the academic year includes applications for enrollment in the fall of the given year), according to the Association of American Medical Colleges (AAMC), 849,678 applications out of 52,777 applicants were received by 151 American medical schools. This illustrates an average of sixteen applications per applicant. However, the acceptance rate was only forty one percent; 21,622 matriculants were recorded. [13]

In contrast, Germany has two application processes a year, one in the fall and an additional one in the spring. The enrollment in the spring is much smaller and not all

medical schools participate. In the fall of 2018, 43,631 applicants applied for one of the 9,232 medical school spots available. This resulted in five applicants for one place of study. Only twenty one percent of all applicants were awarded a chance to study medicine. On the other hand, in the spring of 2019, 18,928 applicants applied, hoping to obtain one of the 1,687 open places. The selection in the spring was much tougher, eleven applicants for one place of study. Out of all applicants, only eleven percent were chosen. [122]

The selection process is severe. In 2013, the Association of American Medical College's (AAMC) Innovation Lab Working Group (ILWG) and Admissions Initiative initiated a multistep, multiyear study to identify core personal competencies important to matriculants' success in medical school [144]. This report concluded nine personal competences linked to behaviors essential to achievement which should function as a common taxonomy for admission authority: "ethical responsibility to self and others; reliability and dependability; service orientation; social skills; capacity for improvement; resilience and adaptability; cultural competence; oral communication; and teamwork" [144].

Many students spend several years trying to be admitted with no success, increasing the expectations of family and friends. Then once enrolled, most first year medical school students who ranked as the best and brightest in their previous school, are now entering a new educational environment encountering equals, introducing feelings of competitiveness [196]. The joys first felt at the acceptance to medical school are short lived and replaced with the demands of an intense study routine, time management and distance from the family. The mental health impairments acquired in medical school often continue on into the medical profession without adequate coping abilities [171,253].

### **2.3.1. Medical Students and Psychological Complaints**

#### **2.3.1.1. Depression and Anxiety**

Emotional disorders in medical students are quite common. Depression inflicts the mind and the body. Often without treatment it may last for weeks, months or years. Afflictions of depression and anxiety are among the most prevalent psychological distress symptoms [76,225]. Stressors specific to medical education for depression and anxiety include information overload, financial burden, lack of leisure time, fatigue, the confrontation of death and the pressure of a future career choice [88,243]. Non-academic risk factors



incorporate the female gender [55,180], family history of depression and anxiety, the loss of a close relative in the recent past and substance abuse [141].

Nearly one third of Danish medical students reported feeling depressed [105]. A recent cross-sectional study registered eighty three percent of Saudi medical students with high levels of depression [7]. These complaints appear to increase throughout the years at medical school [11,49,180], with some studies noting a doubling of depression between the beginning and the end of the medical school career [258]. First year medical students in Brazil showed a prevalence of common mental disorders of thirteen percent, whereas medical students in their fifth year reported an increase of prevalence to forty two percent [50]. Furthermore, a study conducted at the German medical university of Düsseldorf including their newly enrolled medical students, revealed that 4.7 percent suffer from major depression, 5.8 percent from other depressive symptoms and 4.4 percent from anxiety. These fractions were higher than the general public but lower than medical students further along in their education. [261] Medical students resorted to “crying” as the most common depressive symptom, and “fear of worst happening” as the most common anxiety manifestation [3].

World-wide research has indicated a variety of incidences regarding mental health concerns in medical students, ranging from 7.7 up to 65.5 percent for anxiety, 6.0 up to 66.5 percent for depression and 12.2 up to 96.7 percent for psychological distress disorders [126]. Yet only about sixteen percent of medical students who demonstrate positive health markers for depression sought psychiatric treatment [208].

Feelings of depression and anxiety are dependent on specific personality traits, and are related to emotional instability as well as stress vulnerability [36]. Students who chose the medical career solely based on anticipated prestige and income showed a higher persistence of depression levels [233]. Also, high levels of test anxiety are frequently related to specific and often social fears, extending the duration of the medical education, further prompting feelings of distress [213].

In an effort to prevent, treat, and identify causes of psychological feelings of distress among medical students, reliable estimates of depression prevalence during medical education are essential [232]. Especially considering the high rate of depression in resident physicians [163].

### **2.3.1.2. Suicidality**

“Suicide is one of the leading causes of death among medical students, second to car accidents!”[249]. Male physicians are one to four times more likely to commit suicide than other men, while female doctors are two to three times more likely to take their lives than other women [62].

If signs of depression are left untreated, ideations of suicide may develop. Suicidal ideations consist of thoughts, considerations or planning of suicide. Research has illustrated a broad rate of suicidal ideations among medical students, ranging from six up to fifty four percent [47,74,161,254]. Furthermore, female medical students are more influenced by suicidal ideations than male students [74].

Medical physicians are among the high-risk groups affected by suicide [218,230]. Medical students present a higher prevalence of suicidal ideation accompanied by depression in comparison to the general population [46,47]. However, research cannot positively disclose if the occurrence of suicidal ideation progressively increases with time spent in medical school [47].

Several factors related to both personal and professional strain are associated with morbid thoughts. Predictors such as lack of control, single marital status, negative life events, feelings of anxiety, depression and neglect, a previous psychiatric diagnosis, lower socioeconomic status and drug abuse are indicators for suicidal ideations [47,254]. Personality traits such as perfectionism, obsession, neuroticism, introversion and low self-esteem, often found in newly enrolled medical students, are associated with increased ideations of suicide [118,128]. Special attention should be given to students who prefer to live alone and dwell on thoughts of abandoning their courses [249]. Additional factors associated with suicide are despair and sleep related disorders [191]. The heavy academic workload as well as the perceived stress throughout their medical training, render medical students especially susceptible to sleep disturbances [19]. Inversely, a recent German study revealed that a high work-related personality stability factor serves as a protective factor for depression and suicidal ideations among medical students. One possible explanation may include the fact that these individuals hold a high internal resilience feature. [45] Resiliency encompasses the ability to manage and control academic as well as occupational pressures such as failure, excessive demands and stress [38].

Medical students, however, rarely seek professional help for their mental health concerns. Apprehensions about time, confidentiality, stigma, and the potential negative effects on their careers deeply guide the rate of undertreatment regarding medical students [47]. Cycling, running and swimming are the most common methods practiced to positively affect suicidal thinking [206].

### **2.3.1.3. Burnout Syndrome**

Burnout is an alternative measure of physical fatigue and psychological distress. It incorporates indicators such as exhaustion, cynicism, depersonalization and inefficiency [162]. Studies have shown that just one of these burnout symptoms can already have a far reaching effect on medical students, causing fatigue, eating disorders, emotional instability and drug abuse [12,28]. Burnout is also associated with the increased probability of suicidal ideation [68,69,130]. In contrast, the recovery from burnout is linked to fewer morbid inclinations [69]. An average of thirty four percent of medical students suffer from burnout in the first four years of their medical education [211]. Female medical students are much more likely to suffer from burnout syndrome than their male counterparts [8].

Many occupations which involve heavy human interactions are associated with burnout syndrome. It leads to low job performance [187] as well as low career satisfaction [9,102]. Furthermore, it predicts stress related health concerns [20,162]. An environment which consists of excessive amounts of work with limited time and resources, as it pertains to the medical training, is a breeding ground for the development of burnout syndrome [85]. Key factors are known to be stress and a lack of adequate coping abilities [171].

American-based research has illustrated rates of burnout concerning medical students, ranging from forty five to seventy one percent [83,209]. Stressors are associated with their surrounding environment. Medical students in Middle Eastern countries such as Lebanon face an entirely different set of stressors than medical students in Spain for instance, which may explain the divergent occurrence of burnout rates stating seventy five percent [85] and fifteen percent [96] respectively.

Strategies which effectively counteract burnout are versatile. A recent study showed that one possible approach includes the alignment of personal and organizational values. In order to accomplish this, physicians should be able to devote at least twenty percent of their work activities to the part of their medical practice which engages them the most.

[209] Extracurricular activities outside of the medical training (e.g. physical exercise, music, social activities) are also linked to reduced levels of burnout [85]. Enhancing coping mechanisms such as positive interpretations and expression of emotions improve the psychological [162] as well as the physical [186] well-being, further downgrading burnout. Student mentorship programs are especially recommended since they are found to relay coping techniques and reduce burnout [83]. Also, medical students who rank high on empathy indicators experience statistically lower scores of burnout [109,123]. Preventive measures advocating motivation, optimism and empathy among medical students should become fundamental. Interestingly, studies have also shown that interventions based on organizational changes such as the curriculum and the overall institutional environment of the student body might be more successful in reducing the perceived stress levels of medical students in comparison to interventions focused on individuals personal resources such as coping abilities [114].

Evidence has underlined the fact that burnout is a chronic health condition with little prospect for improvement in the prolonging medical training [28,211].

#### **2.3.1.4. Substance Abuse**

Substance abuse and its consequences are a universal concern, also affecting medical students. However, medical students consume substances in fewer quantities than same aged peer groups and the general public, except for alcohol in some areas of the Western world [160,204]. Practicing physicians especially but also to a lesser degree medical students, are more susceptible to substance abuse due to their ready accessibility to the substance.

A literature review of 1988 up through 2013 yielded the knowledge that alcohol (twenty four percent), tobacco (seventeen percent) and marijuana (twelve percent) are the substances most consumed by medical students. The rates of hypnotic and sedative drugs settle at ten percent, the use of stimulants at eight percent and cocaine at two percent; opiates are used very rarely (0.4 percent). Male students also more commonly consume substances than female medical students [39,174,204]. A 2016 study representing forty-nine United States medical schools reported that ninety one percent of their students drank alcohol within the past year; thirty four percent of medical students consumed five or more alcoholic beverages in one setting within the past two weeks [17]. Furthermore, it has been suggested that fifty eight percent of medical students binge drink monthly [250].

Medical students do understand the harmful effects of alcohol. Nevertheless, alcohol is the most socially accepted drug and therefore the use of it is not seen as anything which should be evaluated by a professional health care physician. The use of substances also seems to increase with time spent in medical school [39]. Medical students who are religious, live with their parents or have a steady employment are more likely to decline the use of psychoactive drugs [39].

Consequences of alcohol and drug abuse include cognitive impairments, interpersonal altercations, traffic violations, and academic failures to name a few. The consistent abuse of these substances may lead to an addiction which can ensue even more serious outcomes. Medical physicians are already affected by an increased prevalence of addiction and subsequent restricted quality of life [181,201]. The roots may lie in medical school.

### **2.3.2. Medical Students and Stress Management**

Medical students tend to neglect their own interests and hobbies when confronted with the demands of medical school. Recreation time is often sparse. As illustrated in the above-mentioned chapters, the well-being of medical students appears to endure various challenges which suggests a lack of coping abilities. In an effort to reduce the far-reaching consequences the stressful environment of medical training accompanies, most medical institutions have recognized and commenced health promotion programs which target the individual as well as the organizational structure of medical schools.

#### **2.3.2.1. Individual Coping Abilities**

Medical students report high levels of apparent stress to which they apply individual coping strategies. Resources which are adaptive are vital to a coping process. Personal qualities such as optimism and self-efficiency appear to act as a buffer to stress [150]. Optimism also holds an inverse correlation to depression and suicidality [42,110,117]. In medical students, optimism has been associated with higher levels of psychological well-being [150]. It has been stated that “optimism may significantly influence mental and physical well-being by the promotion of a healthy lifestyle as well as by adaptive behaviors and cognitive responses, associated with greater flexibility, problem-solving capacity and a more efficient elaboration of negative information” [48]. Coping abilities which reduce or control stressors are positively influenced by optimism, while avoidance coping abilities are negatively affected [183]. Optimists often utilize problem-oriented

coping [217]. They are able to employ adaptive strategies such as acceptance, humor and positive reevaluation in various stressful situations [48]. In order to accomplish this feat, a certain amount of emotional intelligence is indispensable. Emotional intelligence is defined as “the ability to perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional meanings, and to reflectively regulate emotions so as to promote both better emotional and intellectual growth” [30]. Medical students who score higher on emotional intelligence assessments are registered to perceive lower levels of stress [104,198]. Additionally, students who focus on self-care involving nutrition, physical nutrition and spiritual growth for instance are employing a positive, functional approach to reducing stress effects while improving quality of life [18,79].

Medical students generally utilize active coping strategies focused on problem solving [176]. However, over the medical education span, active coping mechanisms are applied with fewer frequency and a shift to emotional strategies can be observed. Active coping is associated with higher clinical performance whereas emotional coping is related to poorer performance as well as increased depression and anxiety. [219,240]

Medical students often seek out social support in times of distress, which reduces perceived stress [248]. The encouragement of friends and his or her partner especially impact quality of life [129]. Teamwork, learning groups and mutual assistance from fellow students all contribute to a supportive social environment, thereby lowering feelings of distress [176].

After reviewing literature, Dunn and his colleagues (2008) developed a conceptual model called the “coping reservoir”. According to this concept, medical students are confronted with psychological feelings of stress and burnout due to either an already reduced amount of resilience or an increased usage of limited coping abilities. Events experienced throughout medical training can either drain or replenish this reservoir. Its structure is based on personality traits, temperament and coping style. [67] Due to the described fluctuation, possible outcomes can include burnout and stress but also resilience and improved mental health.

#### **2.3.2.2. Institutional Coping Interventions**

Individual resources may not be sufficient enough to decrease perceived stress levels. Students who already maintain high levels of personal resources nevertheless experience

stress [114]. Alternative possible interventions regarding the structural organization of the medical training are essential in combating the challenging demands medical students face. The belief alone that the medical school has recognized and implemented changes targeting stress reduction, is reflected by fewer days of depression and decreased suicidal ideations [100]. In contrast, a perceived lack of support from medical school authorities may add to feelings of stress [170,196]. Medical students self-reported stressors include administrative failures and lack of assistance with career planning [115].

Transitional timeframes particularly between college and medical school, preclinical and clinical training, and clinical training to licensed physician, are characterized as stressful [196]. Throughout these crucial periods, the guidance and support of the institution is especially critical [196]. Near-peer mentoring has been suggested as a method which eases the transition of first-year medical students [4]. Official interventions which lower exposure to academic stress factors might include changes to the medical curriculum or the examination schedule [114]. Studies which have evaluated the replacement of the present grading schema (A-F) with a pass/fail grading system, encountered no effect on student performance but reported a greater level of student satisfaction [200,202,239]. Furthermore, student involvement in the development of the curriculum fosters autonomy; a sense of ownership in their educational training is generated [75]. Students bring a unique perspective to the table and provide feedback on effective teaching methods. The AAMC advises medical schools to promote a positive learning environment by encouraging teacher student relationships and student-led support groups which are recognized stress reduction strategies [75]. Overall student feedback, academic guidance and satisfactory learning resources may lessen professed stress [176].

A variety of additional programs have been implemented in order to alleviate stress. Anonymous counseling as well as psychiatrists not connected with medical education appear to lower the rate of depression and suicidal ideations of medical students [247]. Breaking down the stigma associated with mental health and in turn allowing students to be comfortable in seeking care, is vital. In the meantime, providing students off-campus confidential resources covered by the student health insurance plan, would address the present barriers to treatment. Also, programs based on stress management skills, self-awareness and personal health reduce strain and increase awareness. These programs may incorporate peer discussion groups which allow students the opportunity to express,

analyze, and share feelings, reducing the prospect of burnout. [75] The shared reflection demonstrates the ordinary regularity of their struggles and provides insight into how peers have solved their conflicts [190].

### **3. Central Research Questions and Hypotheses**

#### **3.1. Central Research Questions**

- (1) Which specific programs regarding stress management and targeted coping services are implemented at US American medical schools?
- (2) To what extent are evaluations taking place?
- (3) What are the differences and similarities in comparison to programs at German medical schools?

#### **3.2. Hypotheses**

- (1) Despite the fact that numerous national and international studies have engaged in detailing the mental health challenges medical students face throughout their medical training, there is still a relative lack of concrete programs implemented into US American medical institutions. The specific research undertaken has uncovered numerous stress reduction initiatives, however not every medical school provides evidence of such ventures.
- (2) Evaluations are necessary to further improve and expand the already existing programs by reviewing their effectiveness and efficiency. These processes are still widely absent.
- (3) German as well as US American medical schools offer stress management programs and specific counselling services. Resources available at American medical schools are comprised of a wide range of selections while German universities on the other hand, focus on comprehensive stress management programs.

### **4. Methods**

#### **4.1. Literature Review and Website Search of US American Medical Schools**

An impact focused literature research of PubMed was performed to review available publications concentrating on stress management programs and counselling services at various US American medical schools. A general sense of presented projects was captured. Furthermore, a website search of all 147 medical schools at the time was executed to form a complete list of existing ventures offered at each institution regarding



stress reduction efforts. Every website was explored in detail. Additionally, the individual phrases “stress management”, “mindfulness” and “wellness program” were typed into the search boxes of each medical school’s website. If a service was not offered by the medical school itself but another division of the university, it was still considered as an offer to the medical student body as long as the opportunity was mentioned and linked at the medical school’s website. The results were continuously updated through the end of 2017.

#### **4.1.1.1. Presentation and Organization of the Website Search Results Regarding US American Medical Schools**

The outcomes of the internet research are presented in a table format wherein the medical schools are listed alphabetically. To ensure a better overview, the available offers are classified into twelve categories and further discussed in the text:

- Category 1: “Relaxation Techniques”
- Category 2: “Mindfulness”
- Category 3: “Stress Reduction”
- Category 4: “Learning Strategies”
- Category 5: “Online Resources”
- Category 6: “Other”
- Category 7: “Pet Therapy”
- Category 8: “Talks”
- Category 9: “Bio Feedback”
- Category 10: “Wellness Events”
- Category 11: “Surveys/Screenings”
- Category 12: “Learning Communities”

Many institutions offer multiple projects in various categories and are labeled accordingly. All programs which were uncovered from the initial internet search up through the final update are listed. General advising as well as mentoring is offered at every school with very few exceptions and therefore taken out of consideration.

#### **4.2. Email Requests to US American Medical Schools**

Based on publications and discovered information on their online platform, forty-eight United States medical schools were selected to be directly addressed per email requesting further information regarding their programs and possible evaluations. However, only thirty-eight websites of the selected schools provided any type of contact email address,

therefore only thirty-eight email requests were sent out. If the emailed person could not supply the intreated information, a request for the relevant contact person was issued. The first reminder email was sent out one month after the initial email, trailed by a second reminder the following month. The official written cover letter is found in the appendix.

#### **4.2.1. Presentation and Organization of the Email Responses**

The programs discussed in the email responses are illustrated in a table format and listed according to their alphabetically ordered medical school. The results are evaluated and examined for the following information:

- Above-mentioned Category
- Format
- Administrator
- Launch
- Timeframe
- Participants
- Possible Evaluations

If an institution enclosed multiple projects in various categories, they are thus labeled accordingly. Further elaboration of each program is provided in the text.

### **4.3. Literature Review and Website Search of German Medical Schools**

A literature review of publications concerning stress management programs at German medical schools was performed. The results included a dissertation called “Aktuelle nationale und internationale Angebote zur Stressbewältigung für Medizinstudierende“ by Lydia Gebauer. She researched existing stress management programs at medical schools in the German speaking countries of Germany, Switzerland and Austria up through March of 2013. As part of this dissertation, the findings regarding the German medical schools were transferred and updated through the fall of 2018 by examining the websites of all thirty-six German medical institutions.

#### **4.3.1. Presentation and Organization of the Website Search Results Regarding German Medical Schools**

The updated results are illustrated in a table format wherein the medical schools are listed alphabetically. To ensure a better overview, the available offers are classified into eight categories and further discussed in the text:

- Category 1: “Relaxation Techniques”
- Category 2: “Mindfulness”
- Category 3: “Stress Reduction”
- Category 4: “Learning Strategies”
- Category 5: “Advising”
- Category 6: “Coaching”
- Category 7: “Mentoring”
- Category 8: “Other”

Multiple available programs are identified according to their categories.

#### **4.4. Presentation of the Differences Between US American and German Medical Schools’ Stress Management Programs**

The stress management programs are contrasted with regards to their categories and illustrated in a table format.

### **5. Results**

#### **5.1. Website Search Results Regarding US American Medical Schools**

Out of the 147 medical schools at the time, only sixty-eight percent of institutions presented an opportunity on their online website which targets the improvement of perceived stress by medical students. Forty-seven medical schools did not display any type of stress reduction service offered to medical schools. A total number of 322 offers enclosed in twelve categories were discovered, as seen in Figure 5.

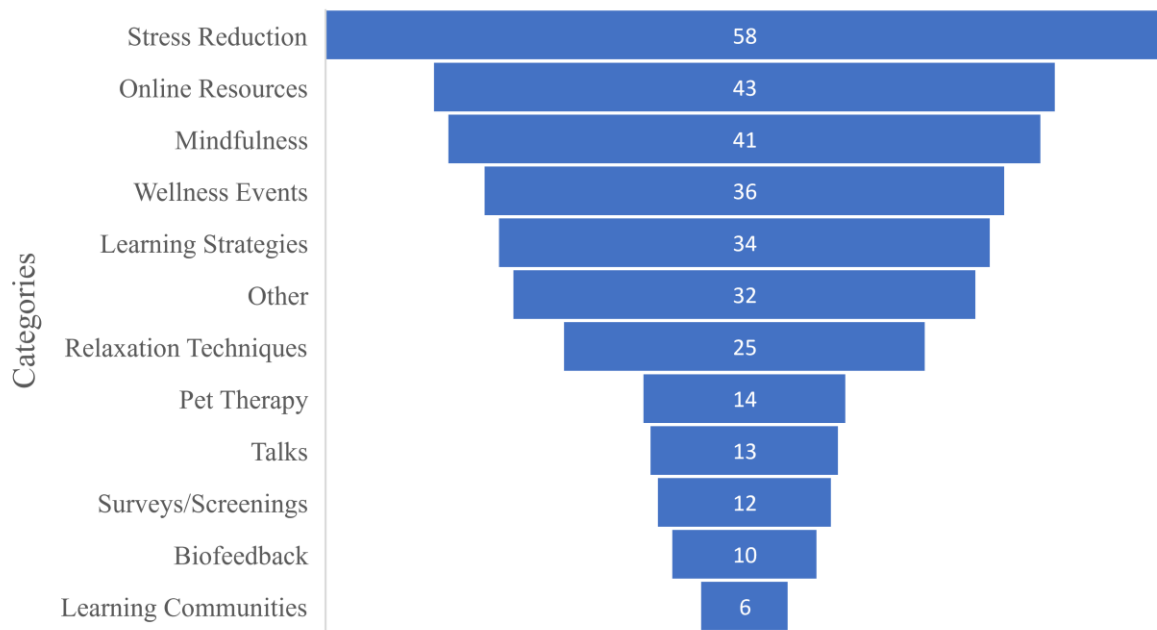


Figure 5: Distribution of online listed stress management services at US American medical schools according to each category (numerical values in absolute numbers)

A detailed listing of all available services according to the individual medical school is demonstrated in Table 2.

**Table 2: Outline of online listed stress management services at US American medical schools**

**Legend:** Category 1= Relaxation Techniques, Category 2= Mindfulness, Category 3= Stress Reduction, Category 4= Learning Strategies, Category 5= Online Resources, Category 6= Other, Category 7= Pet Therapy, Category 8= Talks, Category 9= Biofeedback, Category 10= Wellness Events, Category 11= Surveys/Screenings, Category 12= Learning Communities

**Abbreviations:** CAPS= Counseling and Psychiatric Services, Cat.= Category, e.g.= For Example, Indiv.= Individual, Nr.= Number

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
1	Baylor College of Medicine	10				- BCM Student Wellness Program - Wellness Committee Events		
2	California Northstate University College of Medicine	2, 3, 6, 7, 10	- Wellness Electives: Healer's Art, Leadership - Counseling Center Workshops: e.g. Stress Management, Test Anxiety, Time Management	- Wellness Elective: Mindfulness-Based Stress Reduction - RIO Series: Mindfulness and Resilience			- Online Relaxation Exercises	- Talk One2One: 24/7 Counseling Hotline - Therapy Dog Events - Brochures for sale - Weekly Tuesday @ 7 Workshops - Innovation Pods
3	Carle Illinois College of Medicine	1, 2, 3, 5, 6						
4	Charles E. Schmidt College of Medicine at Florida Atlantic University	1, 2, 3, 5	- CAPS Program: "Anxiety & Stress Management Therapy" Group	- CAPS Program: "A Glimpse into Mindfulness"	- CAPS Program: "Relaxation Group" - "HealthFirst" Health and Wellness Initiative		- Apps - Owls Care Health Promotion Tips	
5	Chicago Medical School at Rosalind Franklin University of Medicine and Science	2, 3, 10, 11, 12	- Wellness Council Healthy U: Stress Management Programs	- Wellness Council Healthy U: Mindfulness Meditation Programs		- Wellness Council Healthy U: Monthly Wednesday Wellness Events - Wellness Works Program		- Student Satisfaction Survey - House and Learning Community Program - Self-Screening Questions - Mental Health Rounds - Wellness Works Program: Puppy Pet Therapy
6	Columbia University College of Physicians and Surgeons	1, 7, 8, 10, 11			- Wellness Works Program: Yoga Classes, Meditation			
7	Creighton University School of Medicine	3, 6, 9	- Individual Academic Success Consultation on Stress Management/Test Anxiety					- Resources for Personal Use: e.g. Biofeedback Devices, LiteBooks

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
8	Donald and Barbara Zucker School of Medicine at Hofstra/Northwell	2, 10		- Humanities in Medicine Program: Medical Yoga & Mindfulness		- Humanities in Medicine Program		
9	Drexel University College of Medicine	3, 6, 7, 10	- Wellness Program Seminar Series: Stress Management, Managing Personal Finances, Sleep - Medical School Counseling and Wellness Center (Indiv./Group); e.g. Lifestyle Management, Burnout, Resiliency Building, Time Management, Sleep Hygiene			- Wellness Program - Wellness Week		- Weekly "Wellness Group" Meetings (1 <sup>st</sup> and 2 <sup>nd</sup> year Students) - Wellness Program: Dog Therapy - Panther Learning Communities - Medical School Counseling and Wellness Center (Indiv./Group); Study Skills Sessions, Biofeedback Sessions
10	Florida International University Herbert Wertheim College of Medicine	3, 4, 9, 10, 12				- Fit & Well Program - Wellness Health Outreach Love Expression (WHOLE)		
11	Florida State University College of Medicine	6, 8						- Nutrition, Exercise, and Wellness Organization: Guest Speakers - Pilot Study: Hearth Math Stress Reduction Technique - Netter WellConnect Student Assistance Program
12	Frank H. Netter MD School of Medicine at Quinnipiac University	6						

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
13	Geisel School of Medicine at Dartmouth	3, 4	- Office of Learning Services: e.g. Time Management, Stress Management  - Workshops: e.g. De-Stress your Life, The Pivotal Role of Emotional Intelligence					- Office of Learning Services: e.g. Learning Skills, Test-Taking Strategies, Organization Techniques  - Hoya Health Hut - The Stall Seat Journal - Longitudinal Wellbeing Survey - Self Assessments - Learning Societies
14	Georgetown University School of Medicine	2, 3, 6, 11, 12		- Mind/Body Medicine Elective Course				
15	Harvard Medical School	2		- Center for Wellness: Mindfulness Based Stress Reduction Program				
16	Howard University College of Medicine	3, 4	- Learning Skills Program workshops: Stress Management, Time Management					- Learning Skills Program Workshops: Study Skills, Organization Techniques, Testing Skills
17	Jacobs School of Medicine and Biomedical Sciences at the University at Buffalo	2, 3, 6, 8	- Wellness Education Center: Stress Management Program	- Koru Mindfulness and Meditation Program				- Student Wellness Committee: Lunch Lectures, Events - Mentoring
18	Johns Hopkins University School of Medicine	3	- Student Assistance Program (JHSAP) Educational Workshops: Stress & Anxiety, Depression, School Trouble					

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Learning Communities
19	Larner College of Medicine at the University of Vermont (University of Vermont College of Medicine)	1, 2, 4, 5, 6, 10		- The Center for Health and Wellbeing: Engage Mindfulness Classes	- The Center for Health and Wellbeing: Group Counseling: e.g. Anxiety Busters, Get Out of Your Mind, Hypnosis for Anxiety	- Committee for Medical Student Wellbeing - Living Well Program	- The Center for Health and Wellbeing: Mindfulness Audio and Video Exercises	- Medical School Academic Support: e.g. Study Skills - Biannual Wellness Newsletter - Exam Snacks
20	Lewis Katz School of Medicine at Temple University	2, 3, 5, 7, 9	- Online Health Seminar: "IBX Stress Management Module"	Mental Health Services: Mindfulness Training			- Online Health Seminar: "IBX Stress Management Module"	- Pet Therapy Sessions - Mental Health Services: Bio/Neurofeedback
21	Loma Linda University School of Medicine	5					- Academic Tips: e.g. Concept Mapping - Coping Skills Workshop	
22	Louisiana State University School of Medicine in New Orleans	5						
23	Loyola University Chicago Stritch School of Medicine	1, 5, 11			- "The Transcendental Meditation" Elective		- Student Counseling - Perspectives for Students Program: "Perspectives Online"	- Perspectives for Students Program: Self-guided Wellness Assessments
24	Marshall University Joan C. Edwards School of Medicine	1, 4, 5, 10			- Relaxation Recordings by Dr. William A. McDowell	- Medical Students Wellness Committee - MUSOM Wellness Wheel	- Online Relaxation Recordings	- Medical H.E.L.P. Program
25	McGovern Medical School at the University of Texas Health Science Center at Houston (University of Texas Medical School at Houston)	3, 4, 6	- Student Wellness, Resiliency Program					- Student Wellness, Resiliency Program



Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Learning Communities
26	Medical College of Georgia at Georgia Regents University	2, 3, 6, 10	- "Be Well" Campaign: Time Management Seminar, Workplace Skills Seminar - Resident and Student Mental Health Program: Stress Management Program	- "Be Well" Campaign: Mindfulness and Stress Management Seminar	- Relaxation Recordings	- "Be Well" Campaign		- "Be Well" Campaign: Free massages
27	Medical College of Wisconsin	1, 3, 5					- Online Relaxation Recordings - Written Example Situations of Communication Styles to reduce Stress by practicing Prioritization and Assertiveness - Tips on Sleep Wellness/Hygiene	
28	Medical University of South Carolina College of Medicine	3	- CAPS Educational Workshops: Stress Management, Test Anxiety, Time Management, Conflict Resolution					
29	Meharry Medical College	1, 3, 4, 5	- The Center for Educational Development and Support (CEDS): Skills Improvement Instruction in Time Management, Stress Management		- Meditation Videos		- Apps - YouTube Videos	- The Center for Educational Development and Support (CEDS): Skills Improvement Instruction in Test Taking, Study Techniques
30	Morehouse School of Medicine	12						- "Quality Enhancement Plan"

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
31	New York Medical College	1, 4, 5			- Relaxation Classes		- Wellness Apps	- Academic Support Workshops: Study Skills - Student Affairs' Learning Center: Pre-matriculation Program, Summer Workshops
32	Northeast Ohio Medical University	4						
33	Northwestern University: The Feinberg School of Medicine	1, 2, 3, 5, 6, 9	- Stress Management Clinic Workshops: e.g. Stress Break, Work-Life Balance - "Introduction to Stress Management" by Dr. Henry J. Perkins - "Progressive Muscle Relaxation" by Dr. Henry J. Perkins	- Stress Management Clinic Workshops: e.g. Introduction to Mindfulness, Enhancing Attention through Mindfulness - "Mindfulness" by Rob Durr	- Stress Management Clinic Workshops: e.g. Drop-In Meditation Groups - "The Relaxation Response" by Dr. Sara Gruzlewski		- Audio and Video Guides	- NU Listens: Phone Peer Listening Service - Stress Management Clinic workshops: e.g. Biofeedback, Peak Performance Training, Happiness 101
34	Oakland University William Beaumont School of Medicine	4, 6, 10				- Wellness Portal		- Academic workshops - PRISM Program
35	Ohio State University College of Medicine	1, 2, 3, 5, 8, 10	- Integrative Health and Wellness Services - Drop-in Workshops: e.g. Monday Beating Anxiety	- Mind-Body Skills Training for Resilience, Effectiveness, and Mindfulness (STREAM) Program - Integrative Health and Wellness Services	- Drop-in Workshops: e.g. Relaxation Station	- Student Wellness Team	- Online Burnout Lecture for Medical Students - STREAM Program	- Annual Spring Symposium on addressing Wellness and Burnout in Health Sciences Professionals

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Learning Communities
36	Oregon Health & Science University School of Medicine	2, 3, 4, 5, 6, 7, 10	- JBT Health & Wellness Center: e.g. Suicide Prevention Resources, Sleep and Insomnia workshop	- JBT Health & Wellness Center: e.g. Mindful Based Stress Reduction		- Student Stress Relief Day	- JBT Health & Wellness Center Handouts: e.g. Stress Management Tips, Student Stress Relief	- Student Learning Support Specialist - Student Center Resources: Animal Assisted Therapy - Free membership to "March Wellness and Fitness Studio": Classes on Stress Management, Mindfulness Based Stress Reduction
37	Perelman School of Medicine at the University of Pennsylvania	3	- Peace of Mind in Stressful Times Program					
38	Rush Medical College of Rush University Medical Center	5					- Counseling Center Resources	
39	Rutgers New Jersey Medical School	3,5	- Student Wellness Program: Prevention-Oriented Groups and Workshops e.g. Stress Management				- Alphabet of Stress Management and Coping Skills	
40	Rutgers, Robert Wood Johnson Medical School	3, 4	- Student Wellness: Prevention-Oriented Groups and Workshops					- Student Support Services Seminars: Study Strategies, Test Taking

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Learning Communities
41	Sidney Kimmel Medical School at Thomas Jefferson University Hospital	2, 3, 10, 12	- Office of Student Affairs & Career Counseling Service Activities	- Mindfulness Institute at Jefferson-Myrna Brind Center of Integrative Medicine - Mindfulness-Based Stress Reduction Elective Study		- Jefferson Recreation and Fitness Center		- Learning Societies
42	Southern Illinois University School of Medicine	3	- Carbondale Campus: Wellness Orientation Session: Stress Management					
43	Stanford University School of Medicine	1, 4, 5, 11			- Wellness Elective: Med 130 - The Practice of Happiness		- Academic Support: List of Learning Strategies Tips	- Office of Medical Student Wellness Survey: Learning Environment and Wellness Survey 2013, Start-of-Year Survey 2014
44	State University of New York Upstate Medical University	5, 11					- Student Counseling Services: Links, Self-Screening Tools	- Student Counseling Services: Online Student Satisfaction Survey (2008-09)

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
45	Stony Brook University School of Medicine	2, 3, 7	<p>- CAPS Workshops: e.g. "Finding Resilience"</p>	<p>- CAPS Workshops: e.g. Introductory Mindfulness Meditation Group, A Taste of Mindful Self-Compassion (MSC), Mindful Self Compassion for Yourself and Others (MSC) I+II, Mindfulness Based Cognitive Therapy</p>				<p>- Animal Assisted Therapy: "PALS" Program: Pet Away Life Stress</p>
46	Texas A&M Health Science Center College of Medicine	3, 4, 5	<p>- Office of Academic Support Services: (Indiv./Group) Stress Management</p>				<p>- Office of Academic Support Services: Tips for Time Management, Learning Strategies, Test Taking, Effective and Efficient Reading</p>	
47	The Commonwealth Medical College	3, 4, 11	<p>- Center for Learning Excellence: (Indiv./Group) Time Management, Stress Management</p>					<p>- Student Health Services: Periodic Surveys          - Center for Learning Excellence: (Indiv./Group) Memory Techniques, Higher-Level Study Skills, Organization, Presentation Skills, Reading Efficiency</p>

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Learning Communities
48	The Warren Alpert Medical School of Brown University	2, 8, 10		<ul style="list-style-type: none"> <li>- Mindfulness Curriculum</li> <li>- Weekly Lecture and Roundtable series: e.g. "Mindfulness, Healing and Empathy in Healthcare"</li> <li>- Weekly Mindfulness Meditation Drop-in Sessions</li> </ul>		- Wellness Program		
49	Tufts University School of Medicine	1, 2, 3, 5, 8	- PAW Program	- COMPASS Program	- PAW Program Meditation Techniques		- Student Wellness Advising and Health Promotions	- PAW Program Guest Lectures
50	Universidad Central del Caribe School of Medicine	3, 4	- Professional Counseling Services Workshops; Stressful Situations, Safety Attitudes					- Professional Counseling Services Workshops; Study Habits
51	University of Alabama School of Medicine	4, 7, 10, 11				- "Stress Relief Oasis" Events		<ul style="list-style-type: none"> <li>- "Hand in Paw" Pet Therapy</li> <li>- PRIME Pre-Matriculation Program</li> <li>- Assessments: VARK Learning Modality, MBTI</li> <li>- Academic Success Resources (Indiv): Test-Taking Strategies</li> </ul>
52	University of Arizona College of Medicine - Tucson	2, 3, 5, 6, 11	- Workshops: Test Anxiety	<ul style="list-style-type: none"> <li>- Mindful Ambassadors</li> <li>- "Finding Your Center" Group</li> </ul>			- Online Resources: Books, Websites, Videos	<ul style="list-style-type: none"> <li>- Screenings for Anxiety and Depression</li> <li>- Project Lifeline-Suicide Prevention</li> </ul>

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
53	University of Arizona College of Medicine - Phoenix	2, 3, 4, 7, 10	- Workshop Wednesdays: "Think Tank" - CAPS: Test Anxiety Workshop	- Mindful Ambassadors		- Wellness Program: e.g. Mental Health Awareness Week, Art and Painting Stress Relief Event		- Dog Therapy Events - Learning Specialists
54	University of California, Davis, School of Medicine	8, 10				- Office of Student Wellness: e.g. Annual Wellness Lecture		
55	University of California, Irvine, School of Medicine	1, 3, 5, 10	- Wellness Program: Group Therapy		- Meditation/Relaxation Techniques	- Wellness Program: Annual Wellness Retreat	- Apps - Recordings	
56	University of California, Los Angeles David Geffen School of Medicine	2, 3, 4, 6, 7, 10	- Student Well Being Committee - Well Being Workshops	- "Practical Mindfulness Training for Medical Students" Workshop		- Well Being Office		- Monthly Pet Therapy Events - Learning Skills Office - Peer Mentoring
57	University of California, Riverside School of Medicine	2, 3, 4, 10, 11	- On-Campus Mental Health Services Workshops: e.g. Stress Management Strategies, Gender Issues, Goal Setting	- The School of Medicine Wellness Program: Mindfulness Activities		- The School of Medicine Wellness Program		- Office of the Learning Skills Specialist - Myers Briggs Personality Test Assessments
58	University of California, San Francisco, School of Medicine	2, 10		- Well-Being Linked Sessions: e.g. Mindfulness Meditation		- Mental Health Awareness Week		

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
59	University of Central Florida College of Medicine	1, 2, 3, 5, 6, 7, 11	- "Guided Muscle Relaxation Techniques with Dr. Katherine Daly"	- "Mindfulness Meditation" Weekly Drop-in Group	- Guided Relaxation Techniques		- Videos - "Feel Better" Links - TAO Connect: Therapy assisted Online	- Animal Assisted Therapy - "Paws-actively" Stress Free Events; CAPS's own dog - Peer Academic Coaching Program (PAC) - Online Mental Health Screening - Campus Connect - Suicide Prevention Program
60	University of Chicago Division of the Biological Sciences: The Pritzker School of Medicine	1, 4, 5			- Relaxation Recordings: Passive Muscle Relaxation, Sunlight Meditation, The Beach		- Audio Recordings	- Pritzker Wellness Initiative: Wellness Interventions
61	University of Cincinnati College of Medicine	2, 3, 6, 10	- Urban Zen Integrative Therapy (UZIT)	- Student Mind-Body Workshop - Mindful Moments for Students				- Wellness Resource Room - Free Auricular Acupuncture
62	University of Colorado School of Medicine	1, 2, 3, 9	- Wednesday Workshops: "Stress Less" - Student Mental Health Services: Stress Management Techniques	- Mindfulness Practices Workshop/Seminar - Student Mental Health Services: Mindfulness Techniques	- Relaxation Room			- Biofeedback Program
63	University of Connecticut School of Medicine	2, 3, 5, 10				- Wellness Retreat	- Mindfulness Meditation Clips - Yoga Clips	



Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
64	University of Florida College of Medicine	2, 3, 5, 6, 7, 9, 10	- Office of Student Counseling and Development: Videos on Test Anxiety, Stress Management Strategies, Fighting Procrastination	- Group Therapy: "Reducing Stress with Mindful Movement" - Weekly "Mindful Relaxation Minutes" - "Mindfulness in Medicine" Seminar		- Student Wellness Day	- "thedesk": Interactive Website - TAO Anxiety: 7 Week Therapist assisted online Program - Teaching Center Videos	- Animal Assisted Therapy - "Live Happy Like a Dog", "Yappy Hour" - Peer Mentoring Academic Program (PMAP) - Biofeedback Lab
65	University of Illinois College of Medicine	1, 2, 3, 6, 8, 9, 10	- "Mood Masters" Group - "Self-Compassion" Workshop	- "Mindfulness and Stress Reduction" Drop-in Class - "Mindfulness and Stress Reduction" Elective - Koru Mindfulness Workshop	- Yoga-Informed Psychotherapy Group	- Monthly Wellness Events		- "The State of Medical Student Wellness: A Call for Cultural Change" Study - Monthly Wellness Talks - Biofeedback Services
66	University of Iowa Roy J. and Lucille A. Carver College of Medicine	2, 3, 4	- Medical Student Counseling Services Workshops: Stress Management, Test Anxiety	- "Mindfulness Foundations" Course				- Medical Student Counseling Services: Study Skills
67	University of Kansas School of Medicine	5, 6, 7					- Student Wellness Program Online Resources	- Monthly Therapy Dog Visits - Free Messages during Finals Week
68	University of Kentucky College of Medicine	2		- "Mindfulness in Medicine: Practical Mind Body Skills for Self-Care and Patient Care" Elective				
69	University of Louisville School of Medicine	4						- Academic Support

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
70	University of Maryland School of Medicine	10				- Stress Less and Decompress Wellness Program		
71	University of Massachusetts Medical School	1, 2, 5		- Center for Mindfulness: Mindfulness Based Stress Reduction Seminar, Mindful Hatha Yoga - Systems and Psychosocial Advances Research Center: Mindfulness Presentations	- Meditation Practices		- Apps - Guides - "All Campus" Virtual Mindful Sessions	
72	University of Michigan Medical School	6						- "M Home" Program
73	University of Minnesota Medical School	3, 5, 6, 7, 8, 10	- "De-Stress" Program			- Wellbeing Events - Wellbeing Incentive Program	- "Taking Charge of your Health & Wellbeing: Stress Mastery" Model	- The Boynton Arts Program - PAWS Program: Pet Away Worry and Stress - Wellbeing Lunch Lectures
74	University of Mississippi School of Medicine	3, 4	- Academic Consulting Services: e.g. Medical School Transition, Stress Management, Coping Strategies					- Academic Consulting Services: e.g. Study Skills, Test-taking Strategies

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
75	University of Missouri-Kansas City School of Medicine	3, 4, 5	- Academic Support Year 1 & 2 (Curriculum); Learning Basic Medical Sciences Course, Basic Science Study Groups - Office of Student Affairs Wellness Program: "The Work" Workshop - Counseling & Student Development Center: Stress Management Training				- Links: e.g. Mind-Body Connection Program, Kangaroo Pantry, Peer Mentors	- Office of Students Affairs Wellness Program
76	University of Nebraska College of Medicine	3, 8, 9						- Symposium: "Elevating the Conversation: Stress and Emotional Well-Being" - Counseling & Student Development Center: Biofeedback Training - Wellness Wednesdays
77	University of Nevada, Las Vegas School of Medicine	6						
78	University of Nevada, Reno School of Medicine	2, 3, 5, 6, 10	- Wellness Program Workshops: e.g. Dealing with Test Anxiety, Stress Management Techniques	- Wellness Program: Mindfulness Based Stress Reduction Program - The Implicit Bias Research Group (IBRG): Modified Mindfulness-Based Stress Reduction (MBSR) Training		- Wellness Program Events	- Wellness Program Online Resources	- "N-ergy" Wellness Program

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
79	University of New Mexico School of Medicine	3, 5, 12	- Office of Medical Student Affairs Wellness Program: Workshops on Wellness, Resiliency, and Self-Care - Educational Resource Coordinator: Stress Management Techniques, Time Management, Organization Skills, Recognizing Strengths and Weaknesses	- Program on Integrative Medicine: Mindfulness-Based Stress & Pain Management, Mindful Self-Compassion Sessions, Mind-Body Skills Group, Mindfulness Skills for Changing Your Relationship with Food, Mindfulness-Based Stress Reduction, Mindfulness to Enhance Athletic Performance, Mindful in Communication Talk			- Wellness Program Online Resources	- Learning Communities
80	University of North Carolina Chapel Hill School of Medicine	2, 3, 4, 6, 8, 10				- Wellness Initiative		- UNC Wellness Centers Health & Wellness Expo - Advising Colleges Brown Bag Workshop Series - Educational Resource Coordinator: Study Skills
81	University of North Dakota School of Medicine	5					- Total Wellness Program: Online Flyers	

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
82	University of Oklahoma College of Medicine	3, 5, 10, 11	- Student Wellness Program Resources: e.g. Stress Management, Test Anxiety, Focus and Concentration, Mental Toughness			- Student Wellness Program: Annual "DeStress" Fest, Out of Darkness Suicide Awareness Walk	- Student Wellness Program Online Resources	- Personal Wellness Assessment
83	University of Pittsburgh School of Medicine	2, 4		- Mindfulness for Medical Students - Mini Elective M1				- Academic Resource Center Workshops: e.g. Learning Styles, Test Preparation - The Academic Resource & Support Office: e.g. Free Peer Tutoring Sessions (1 <sup>st</sup> /2 <sup>nd</sup> Year Medical Students)
84	University of South Carolina School of Medicine Greenville	6						- Lifestyle Medicine Curriculum
85	University of South Dakota, Sanford School of Medicine	4, 10				- Wellness Program Events		- Academic Learning Specialist
86	University of Tennessee Health Science Center College of Medicine	1, 3, 4, 5	- Student Academic Support Services and Inclusion Workshops: e.g. Transforming Stress and Test Anxiety		- Weekly Meditation Sessions		- Student Academic Support Services and Inclusion Online Resources	- Student Academic Support Services and Inclusion Workshops: Test Taking, Study Skills

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
87	University of Texas at Austin Dell Medical School	1, 2, 3, 5, 9	- Progressive Muscle Relaxation Techniques	- Counseling and Mental Health Center: e.g. Mindfulness Meditation Group, Mindfulness for Stress and Anxiety, Overcoming Anxiety with Yoga and Mindfulness	- Meditation		- Audio Guides	- Mind Body Lab: Biofeedback
88	University of Texas Southwestern Medical Center Southwestern Medical School	4, 5					- Student Academic Support Online Resources	- Student Academic Support Services: e.g. Learning Skills Assessment, Learning Skills Development
89	University of Utah School of Medicine	1, 2, 5, 6, 7, 8		- Wellness Monthly Lunch Series: e.g. Mindfulness Stress Reduction	- Physical Wellness: Yoga, Relaxation/Meditation	- Wellness Program Events	- Online Resources: Apps, Blogs, Books	- Wellness Monthly Lunch Series - Pet Therapy - Finals week: Snacks and Massage Vouchers
90	University of Washington School of Medicine	1, 3, 4, 5, 7, 10	- Counseling and Wellness Workshops: e.g. Stress Management, Family Issues		- Weekly yoga Classes - Meditation	- Counseling and Wellness Workshop Events: e.g. Brown Bag Workshops	- Audio Guides - Videos	- Therapy Dog Visits - Academic Support Services
91	University of Wisconsin School of Medicine and Public Health	1, 2, 3, 4, 5, 6	- Mental Health and Wellness: Strategies to Reduce Stress Anxiety	- Health Services Workshops: "Mindful Living Group", "Mindfulness Sampler"	- Mental Health and Wellness Resources		- Audio Guides - Online Resources	- "Neighborhood" Program - COMPASS - Academic Support Services - Meditation/Breathing/Body Scan

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
92	USF Health Morsani College of Medicine	2, 6		- "The WELL"; Mindfulness Meditation Workshops				- The Center for Wellness, Engagement, Leadership and Learning (WELL)
93	Vanderbilt University School of Medicine	1, 6, 9, 10, 11			- Center for Student Wellbeing: Meditation, Yoga	- "The Colleges" Program: Events, Retreats, Commodore Challenge		- Student Wellness Program: "Student Wellness Committee", "The Colleges", "VMS Live" - CAPS: e.g. Biofeedback, Mind Body Lab - Substance Use Screenings
94	Virginia Commonwealth University School of Medicine	1, 2, 3, 4, 5, 6	- Campus Wide Wellness Resource Center (The Well); Weekly Drop-in Stress Management Workshops - "GPS Student Wellness" Program - "Reclaiming Life from Anxiety" Group	- "Unwind" Program - "GPS Student Wellness" Program	- Relaxation Exercises, Meditation		- Online Resources: e.g. Adult Stress Fact Sheet, Student Guide to Surviving Stress, Video Guides (Progressive Muscle Relaxation Exercise)	- Stall Seat Journals - Academic Success Resources: Note Taking, Study Skills, Test Taking Strategies
95	Virginia Tech Carilion School of Medicine	4, 5, 10				- VTCSoM Student Wellness Events	- VTCSoM Student Wellness Online Resources	- Academic Counseling Services: e.g. Learning Style & Effective Study Methods

Nr.	Medical School	Cat.	Stress Reduction	Mindfulness	Relaxation Techniques	Wellness Events	Online Resources	Other, Learning Strategies, Pet Therapy, Talks, Biofeedback, Survey/Screenings, Learning Communities
96	Wake Forest School of Medicine of Wake Forest of Baptist Medical Center	2, 3, 10	- Counseling Services: Stress Management Training	- Counseling Services: Mindfulness Meditation Training		- Counseling and Wellness Events		
97	Wayne State University School of Medicine	2, 3, 10	- Health and Wellness Program Seminars: "The Impact of Stress on Performance", "Medical Student Stress and Burnout" - Student Health Services: Stress Management Workshops	- Health and Wellness Program Seminar: "Mindfulness and Meditation"		- Annual Wellness Week		
98	Weill Cornell Medicine	6						- Peers Advocating Wellness (PAWs) Program
99	Wright State University Boonshoft School of Medicine	3, 6, 8	- Resilience Program for Medical Students: "POW=R: Pearls of Wisdom"					- Balancing Life Talks (BLT's) - Radio Rounds: Talk Show
100	Yale School of Medicine	1, 2, 5		- Yale Stress Center: "Mindfulness-Based Stress Reduction" Training Series	- Weekly Drop-in Meditation Sessions		- Online Resources on Stress Management	



### **5.1.1. Category 1: “Relaxation Techniques”**

In the category “Relaxation techniques”, twenty-five services, which mostly evolve around meditation and relaxation sessions in form of audio- and video recordings as well as drop-in groups, are discovered. Yoga is also a popular practice applied to ease tension.

The Loyola University Chicago Stritch School of Medicine and the Stanford University School of Medicine are the only medical schools to highlight meditation as a method to combat stress by offering elective classes focused on breathwork and relaxation techniques. Loyola offers an elective course called “The Transcendental Meditation”. It is described as inhabiting an integral part in their students’ transformation throughout their medical training. The elective includes individual training for students to practice the technique themselves for about twenty minutes twice per day, as well as a lecture series comprised of topics such as “The Transcendental Meditation Technique for You and Your Medical Practice” which is open to the entire medical community. Stanford alternatively offers an elective course called “The Practice of Happiness: Meditation Practices for Wellbeing”. It concentrates on conveying sustainable tools needed for happiness and wellbeing. Students will review happiness-based research and participate in discussions, yoga and mindfulness activities.

### **5.1.2. Category 2: “Mindfulness”**

The category “Mindfulness” is a complex group consisting of forty-one offers ranging from simple mindful moment sessions and weekly drop-in gatherings to comprehensive programs. Seven medical schools - the California Northstate University College of Medicine, Georgetown University School of Medicine, the Sidney Kimmel Medical School at Thomas Jefferson University Hospital, the University of Illinois College of Medicine, the University of Iowa Roy J. and Lucille A. Carver College of Medicine, the University of Kentucky College of Medicine and the University of Pittsburgh School of Medicine - have incorporated the topic of mindfulness in their selection of electives. The Sidney Kimmel Medical School at Thomas Jefferson University Hospital offered their mindfulness-based stress reduction (MBSR) elective between the years 1996 and 2000 to second year medical students as part of a prospective, nonrandomized, controlled study [205]. The elective was comprised of ten weekly sessions, each lasting ninety minutes and conveying methods of mindfulness meditation practices, body scan, breath awareness, mindful stretching, various approaches of meditation and guided imagery. The

analysis showed that the students who participated in the MBSR course demonstrated not only significantly lower scores in the “Total Mood Disturbance (TMD)” scale when compared to the control group, but also displayed an improvement of their baseline scores. [205] The mindfulness course elective which is currently offered at Sidney Kimmel Medical School at Thomas Jefferson University Hospital as well as at Georgetown University School of Medicine will be further described in the following section concerning the email responses of the individual medical schools. Opportunities which often closely resemble these electives, are workshops and seminars established by assorted departments and organizations at each medical school. Many institutions such as Stony Brook University School of Medicine, the University of California, Los Angeles David Geffen School of Medicine, University of Illinois College of Medicine, the University of Cincinnati College of Medicine, the University of Florida College of Medicine and Yale School of Medicine provide workshops varying in design and descriptions. The “Student-Mind Body” course directed by the Center for Integrative Health and Wellness at the University of Cincinnati College of Medicine for instance includes eleven weekly sessions, each encompassing two hours of mind-body techniques such as mindfulness, biofeedback and guided imagery. Similarly, “the Practical Mindfulness Training for Medical Students” workshop at the University of California, Los Angeles David Geffen School of Medicine is divided into six weekly sessions, each lasting ninety minutes.

The Warren Alpert Medical School of Brown University has taken the concept of mindfulness one step further and constructed an entire curriculum around it. First year courses focus on developing basic mindfulness practices while second year courses target resilience training. During the third year, lunchtime sessions are organized which aim to connect the acquired mindfulness skills to daily clinical experiences. Mindfulness is therefore a notion which cannot be circumvented. The Universities of Arizona College of Medicine at Tucson as well as Phoenix have taken a different approach and implemented so called “Mindful Ambassadors”. These emissaries consist of student volunteers who are trained in mindfulness and visit various venues on campus to which they were invited to present brief mindful moments.

Other medical institutions have created programs embracing mindfulness. The Tufts University School of Medicine for instance has founded the “Co-leader Orientation in

Mindfulness for Patients and Student Support (COMPASS)” program. It is intended for incoming first-year students. These matriculated students are selected into groups led by two second-year student volunteers and meet biweekly to impart coping and study skills. The University of Nevada, Reno School of Medicine’s Office of Diversity and Inclusion on the other hand has assembled an interdisciplinary research team called the “Implicit Bias Research Group (IBRG)” which concentrates on evaluating curriculums using a behavior scientific framework. They provide modified MBSR online training sessions as well as hands on practice workshops to inform about burnout and promote a healthy well-being.

The greatest impact of mindfulness is discovered at the University of Massachusetts Medical School, home of the “Center for Mindfulness”. Various MBSR courses based on the stress reduction program founded by Dr. Jon Kabat-Zinn in 1979 are ascertained. Furthermore, a weekly virtual mindfulness session where students are able to join by video conference or phone is produced for the entire campus. Numerous medical schools throughout the United States have based their MBSR program on Dr. Kabat-Zinn’s method. One such program assembled within the concept of integrative medicine is introduced by the University of North Carolina Chapel Hill School of Medicine. It introduces basic as well as graduate mindfulness programs. A separate MBSR course, modeled after Dr. Kabat-Zinn, is offered as an eight-week elective course at the California Northstate University College of Medicine. It reviews mindfulness and meditation exercises as well as evidence-based mindfulness research.

### **5.1.3. Category 3: “Stress Reduction”**

The principle of stress reduction is integrated in numerous opportunities presented at medical schools across the United States, making it the category with the highest number of propositions. Fifty-three percent of the fifty-eight services offered are structured as workshops, seven of these workshop models are organized by the Counseling and Psychiatric Services of the individual institution. The “Mood Masters Group” hosted by the University of Illinois College of Medicine, serves as an example. This workshop is a twelve-week structured course, based on dialectical behavior therapy designed to convey healthy coping strategies. Emotional skills which encourage a healthy wellbeing are communicated with skills-building worksheets and activities, mindfulness exercises, and

discussions. In addition to such objectives, most undertakings aim to promote time as well as stress management techniques.

Sometimes these goals are also reached through events or programs. In 2016, the McGovern Medical School at the University of Texas Health Science Center at Houston created a new wellness and resiliency program for its first-year medical students as a response to the distressing results of an in-house student survey administered the previous year. The model consists of six components: “enhanced master advisory program”, “occupational development”, “professionalism and leadership”, “personal health and self-care”, “interpersonal growth” and “cultural and environmental proficiency”. These modules are set to address topics such as academic as well as emotional strategies, student stress, professionalism and career counseling. A different approach is taken by the University of California, Irvine, School of Medicine. Their wellness program has installed so called process groups which gather four times a year per class year. These groups get together in a circle and provide an opportunity for students to express their problems as well as receive comfort and solutions. Depending on the class level, there are differing themes which are raised to discuss. While first year students focus on topics concerning the transitioning to medical school, managing relationships, stress reduction techniques and anatomical dissections, second year students discuss subjects more closely associated with test anxiety and burnout syndrome.

A few medical schools such as the Perelman School of Medicine at the University of Pennsylvania and the University of North Carolina Chapel Hill School of Medicine focus on the individual student in contrast to the body as a whole. Pennsylvania’s “Peace of Mind in Stressful Times” program provides a wellness educator who offers individual stress reduction sessions, creating a safe haven for students to express their concerns. Chapel Hill also allocates an educational resource coordinator who meets with students individually reviewing stress management techniques amongst other topics.

A stress reduction technique which is rarely seen is the practice of progressive muscle relaxation. Four medical schools appear to utilize this method as part of their service: the Northwestern University: The Feinberg School of Medicine, the University of Central Florida College of Medicine, the University of Texas at Austin Dell Medical School and Virginia Commonwealth University School of Medicine. Progressive muscle relaxation is based upon the simple practice of tensing one muscle group at a time followed by a

relaxation phase with the decisive release of the tension. With practice and time, signs of stress can be diminished.

#### **5.1.4. Category 4: “Learning Strategies”**

By examining the website of each medical school, thirty-four projects concerning learning strategies were revealed. The majority, twenty-five projects precisely, involve academic support services which offer study skills sessions and a review of test-taking strategies. Five medical schools organize a student learning support specialist which facilitates workshops, presentations or discussions revolving around learning strategies. The University of North Carolina Chapel Hill School of Medicine’s educational resource coordinator meets with students individually, evaluating their learning style preferences for example.

An alternative concept which two medical institutions, the Northeast Ohio Medical University and the University of Alabama School of Medicine, are implementing consists of a pre-matriculation program. It is a tool designed for students entering their first year of medical school who wish to get a head start on certain classes and familiarize themselves with academic success strategies.

Other medical schools, such as the McGovern Medical School at the University of Texas Health Science Center at Houston and the University of Chicago Division of the Biological Sciences: The Pritzker School of Medicine, incorporate the transmission of learning strategies through workshops integrated into their wellness programs. The Marshall University Joan C. Edwards School of Medicine is the exception in that it offers a comprehensive yet fairly expensive four-week - as well as a two-week intensive course through their medical “Higher Education For Learning Program (H.E.L.P)” which instills study sessions, proactive time management, and strategic test taking skills combined with mindfulness techniques.

#### **5.1.5. Category 5: “Online Resources”**

The forty-three services regarding the “Online Resources” category mainly include health – and academic promotion tips, endorsements of various books and apps, as well as audio and video guides targeting relaxation techniques. The Rutgers New Jersey Medical School offers an online resource called “The Alphabet of Stress Management and Coping Skills” where each letter in the alphabet represents coping strategies which can be applied

in times of stress. For instance, the letter B lists “Bounce a stress ball, Breathe slowly, Baking, Basketball, Be attentive”.

Furthermore, a few medical schools present online resources which involve health seminars, burnout lectures, wellbeing models and online programs. The online “Taking Charge of your Health & Wellbeing: Stress Mastery” model by the University of Minnesota Medical School, targets concepts of health, relationships, environment, security, community and purpose. An online wellbeing assessment which indicates areas especially in need of change was constructed to direct the students to specific resources. Two medical schools, the University of Central Florida College of Medicine and the University of Florida College of Medicine, impart the opportunity of an online interactive assisted therapy program called “TAO” which introduces self-paced on-line modules and video conference sessions for example.

The Ohio State University College of Medicine is the only medical school which provides an entire online education program called “The Mind-Body Skills Training for Resilience, Effectiveness, and Mindfulness (STREAM)” program. Medical students can participate at a discounted cost. It is comprised of twelve online one-hour self-reflection modules embedded in mindfulness training. The concepts presented include relaxation, mindfulness, positive cognition and guided imagery. This program was evaluated from May of 2014 through September of 2015. The assessment concluded that even a brief online training correlates to small but significant increases in mindfulness scores, providing benefits by promoting mental health [139]. Further details pertaining to this program are listed in the section pertaining to the email responses.

#### **5.1.6. Category 6: “Other”**

The category of “Other” contains a broad mix of thirty-two amenities including LiteBooks, free massages, free snacks during exam period, free fitness studio memberships, art projects, wellness newsletters and various wellness group meetings/events. In 2009, The Wright State University Boonshoft School of Medicine established a weekly radio talk show called “Radio Rounds” orchestrated to promote humanism and empathy in the medical profession. It is the first of its kind in the United States, hosted and produced solely by medical students. Featured guests have included Pulitzer Prize winner Tracy Kidder and best-selling author Samuel Shem who wrote “The House of God”. Another distinctive endeavor is assembled at the Georgetown University

School of Medicine and the Virginia Commonwealth University School of Medicine. Both institutions maintain a “Stall Seat Journal”. The journal consists of a monthly newsletter covering health and safety topics placed in a plastic case on the back of bathroom stalls across campus. A further program aimed at increasing physical activity and improving eating habits is presented by the University of Nevada, Reno School of Medicine and called “N-ergy”. Students partake in four weekly sessions comprised of outdoor activities and nutrition sessions. After successfully completing the modules, students are entered into a raffle to win a prize.

A medical school which has devised wellness and self-nurturing as crucial aspects in regard to their education is the University of South Carolina School of Medicine Greenville. It is the first medical school in the United States to fully integrate health and wellness, also known as lifestyle medicine, into all four years of their curriculum. In the year 2018, lifestyle medicine was first offered as a track of distinction, featuring core graduating goals beyond the already existing education. Exercise, nutrition, health behavior changes and self-care including resiliency with emphasis on continuing care past the medical training are key aspects of this lifestyle medicine curriculum.

Two institutions, the University of Arizona College of Medicine-Tucson and the University of Central Florida College of Medicine, have established suicide prevention programs, “Project Lifeline” and “Campus Connect Suicide Prevention Program” respectively. The Campus Connect project is based on an online simulation tool called “Kognito” revolving around a virtual environment and role-play conversations with emotionally-responsive avatars. Through hands-on practice and personalized feedback, users learn to lead real life conversations and hopefully be better able to communicate their personal health needs. The literature research revealed that the University of California San Diego School of Medicine has also initiated a “Suicide Prevention and Depression Awareness Program” in 2009, however this program could not be found online and therefore was not listed. As part of the program, medical students participated in an anonymous online assessment combined with grand rounds on burnout, depression and suicide in the medical profession [179].

Several medical schools also established assorted counseling services which do not only pertain to mental health benefits but also embrace legal and debt counseling. Features such as hotlines and phone peer listening services are instituted. In addition, several

medical schools have implemented mentoring programs. Some of these programs are extended to form entire communities which consist of students grouped into numerous “houses” sharing organized house mentors. The University of Michigan Medical School, the University of Wisconsin School of Medicine and Public Health as well as the Carle Illinois College of Medicine have all formed their own version of a community model called the “M Home” program, the “Neighborhood” program and the concept of “Innovation Pods” respectively. Each setting aspires to foster skills enhancing awareness, resiliency, learning, professionalism and future career development. Additionally, in the year 2004, former mentors of The University of Wisconsin School of Medicine published a journal article in the Wisconsin Medical Journal describing a “Class Mentor Program” which has been put into effect since 1985 [215]. It is unclear whether this program is connected to the “Neighborhood” program stated above since this the term “Class Mentor Program” finds no mention on their website. This mentoring program allows every freshman class an assigned mentor who is an experienced and trained physician. The medical doctor advocates for his students until they receive their degree, going so far as accompanying them to all their classes in the first two years. The Liaison Committee on Medical Education (LCME) reviewed this program in 2002 and pronounced that “the class mentor program that allows a practicing physician to take classes alongside students is a distinctive and creative approach that provides the dual benefits of well-formed student counseling and useful feedback about the educational program.” [215]

In 2005, a unique program called the “Vanderbilt Medical Student (VMS) Wellness Program” is commenced at the Vanderbilt University School of Medicine. It is the first published model of a comprehensive medical student wellness initiative. The organization incorporates a parallel system of three measures: the “Advisory College System”, the “Student Wellness Committee”, and “VMS Live”. The structure of the VMS Wellness Program is complex and multi-layered, with the dotted lines representing cooperation across each module, as illustrated in Figure 6. Each unit maintains its own tasks. The “Advisory College System” is constructed around four colleges led by two faculty advisors. Their function is based on wellness and career counseling. Each year the different colleges compete in an Olympic-style event called the college cup. This event is incredibly popular with a participation rate of ninety-seven percent of first and second year students, further promoting interpersonal relationships. In contrast, the “Student Wellness Committee” is responsible for supporting student life throughout the year by



arranging wellness events and providing resources. This student-run branch is composed of five subcommittees, each supporting a different area of student well-being: physical, emotional, interpersonal, intellectual, and environmental. The third element of the VMS Wellness Program entails the “VMS Live” team. It organizes mandatory annual half-day wellness retreats comprised of workshops centered on self-reflection and discussion. The overall mission of the VMS Wellness Program is to find a balance between responsibility and relaxation with the goal of a healthy well-being. It focuses on the core aspects of mentoring, student guidance and personal development. [66]

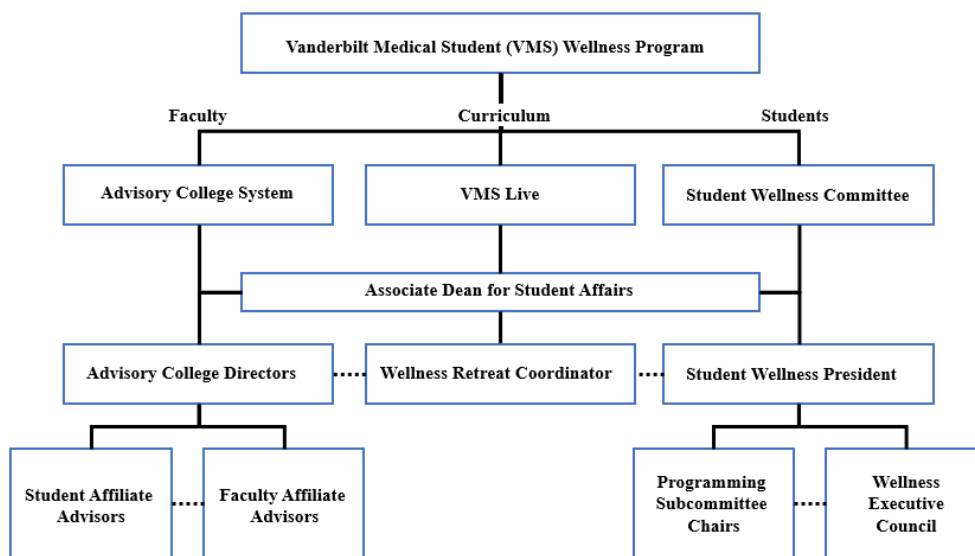


Figure 6: The organizational structure of the Vanderbilt Medical Student Wellness Program

### 5.1.7. Category 7: “Pet Therapy”

Animal assisted therapy is a tool utilized by fourteen different medical schools across the United States. In each case, the animal which is employed is a dog. These pet therapy sessions are mostly combined with wellness events open to all students. Animals are accepting, non-threatening and non-judgmental, creating occasions for students to unwind and open up. The University of Central Florida College of Medicine organized an event called “Paws-a-tively Stress Free” and allowed students the opportunity to take a break from studying to spend time with therapy dogs. Most of the dogs participating are owned by private handlers throughout Central Florida. However, one pet is essentially employed at the University of Central Florida Counseling and Psychological Services (CAPS), a Havanese dog named Bodhi. He has been working at CAPS as a registered

therapy dog for three or four days a week helping students ever since he was sixteen weeks old in June of 2012.

#### **5.1.8. Category 8: “Talks”**

Thirteen medical schools provide services which fall in the category “Talks”. The majority of these talks are integrated into grand rounds or lunch lectures series. Grand rounds are an integral component of medical education. They are organized as meetings at which physicians discuss the clinical case of one or more patients with their medical students. Originally, grand rounds were considered as part of residency training wherein new information was taught and clinical reasoning skills were enhanced.

The Warren Alpert Medical School of Brown University hosted a weekly lecture and roundtable series called "Mindfulness, Healing and Empathy in Healthcare" every Thursday for three months in 2016. The Tufts University School of Medicine offers their first-year students a similar opportunity, the “The Practical Approaches to Wellness (PAWs)” course. It is an optional, six session series where each one-hour module is organized around a guest speaker followed by allocated time to practice meditation techniques. Topics covered may include time management, the physiology of stress, sleep hygiene and nutrition.

Another distinctive program called “POW=R: Pearls of Wisdom” was established by the Wright State University Boonshoft School of Medicine. It is a voluntary prevention focused resilience program, based on methods of positive psychology, existentialism, cognitive-behavioral therapy and mindfulness. To earn a certificate of completion and a note of recognition from the dean in one’s medical student performance evaluation, at least ten so called “Balancing Life Talks (BLTs)” must be attended throughout one academic year. These lectures embrace subjects of resilience, stress, relaxation and mental health. For instance, BLT’s may include “Resilience in Medical Education: What is it and why is it important? Does it impact patient care?” or “Dealing with Difficult Emotions in Medical School”. The administrator for this program responded to the email request for more information, therefore further details will be provided in a later section.

#### **5.1.9. Category 9: “Biofeedback”**

Biofeedback training is offered as an amenity at ten medical schools. This technique is learned to be able to hold control over some bodily functions, such as heart rate. During

biofeedback, the body is connected to electrical sensors which in turn transmit information about the body. This feedback allows subtle changes in physical responses, such as relaxing certain muscles, in order to achieve the desired results, such as reducing pain. In essence, biofeedback training permits practicing new ways of control, often to improve a health condition or physical performance.

#### **5.1.10. Category 10: “Wellness Events”**

A broad range of activities are included in the thirty-six wellness events highlighted in this category. Medical students are experiencing “crafternoons”, hikes, barbecues, potlucks, road races, yoga, tai chi and massage therapy sessions. Team building as well as large group activities are often organized to advance interpersonal relationships. The University of Connecticut School of Medicine sponsors numerous wellness events to promote the personal growth and well-being of their students. One activity they arrange for instance is a three-day wellness retreat at Kripalu Center for Yoga and Health, entailing hands-on educational sessions focusing on nutrition, stress reduction, and integrative medicine. Furthermore, the wellbeing committee at the University of Minnesota Medical School has initiated a wellbeing incentive program which encourages students to form healthy habits by creating a means to track weekly healthy actions and compare one’s standing to the class’s average. Students can log their wellbeing activities at weekly check-ins by completing a quick survey and track their statuses across multiple weeks. To further incentivize their students, an end-of-semester raffle featuring gifts and discounts from local businesses is held, where each completed weekly activity check-in counts as an entry.

An alternative popular concept is the arrangement of a student stress relief day. The Oregon Health & Science University School of Medicine, the University of Alabama School of Medicine and the University of Arizona College of Medicine in Phoenix all organize a fun filled day at least once a year packed with various outlets for students to relieve stress. The University of Arizona College of Medicine in Phoenix along with three other medical schools – Drexel University College of Medicine, the University of California, San Francisco, School of Medicine and Wayne State University School of Medicine – further expand this idea of a stress relief event to embark on an entire mental health awareness week. Throughout this week, daily wellness activities, seminars, free massages, lectures and workshops are planned based on student interests.

### **5.1.11. Category 11: “Surveys/Screenings”**

Surveys and screenings are tools used by twelve medical schools to assess the wellbeing or satisfaction level of their student body. They are offered mostly as self-screening online instruments aimed to evaluate a student’s substance use or mental health levels especially regarding levels of anxiety and depression. The Commonwealth Medical College’s Student Health Services perform periodic focus groups and assessment surveys to ensure the needs of their students are met and modify any available programs regarding stress management, nutrition and exercise accordingly. In 2017, Georgetown University School of Medicine has also initiated a longitudinal wellbeing survey which is implemented in the beginning and end of each curricular year to efficiently assess the development of their students and direct the necessary interventions in a suitable manner. The University of Alabama School of Medicine and the University of California, Riverside School of Medicine both offer the Myers Briggs Personality Test to their students as a means of assessment.

### **5.1.12. Category 12: “Learning Communities”**

The category “Learning Communities” only encompasses programs at six US American medical schools: Chicago Medical School at Rosalind Franklin University of Medicine and Science, Florida International University Herbert Wertheim College of Medicine, Georgetown University School of Medicine, Morehouse School of Medicine, Sidney Kimmel Medical School at Thomas Jefferson University Hospital and University of New Mexico School of Medicine. Matriculated students, once they enter their first-year, are selected into specific learning communities or societies which will accompany them throughout their time spent there. These learning groups are formed to enhance the students’ development of interpersonal relationships and careers as professionals with the support of faculty led mentors. They meet at regular intervals to organize wellness activities or discuss topics pertaining to the balance of medical training and personal health.

## **5.2. Results of the Email Inquiries**

### **5.2.1. Feedback of the Contacted Medical Schools**

Of the thirty-eight medical schools which were invited to participate in this study, ten chose to contribute, one declined and three initially replied, but after several follow up

emails failed to respond. An overall response rate of 36.8 percent was observed, as seen in Table 3.

**Table 3: Feedback Overview**

Total Number US American Medical Schools	147
Identified for further evaluation	48
Contacted	38
Total Number of Responses	14 (36.8%)
Contributed	10 (26.3%)
Initial Response, but no contribution	3 (7.9%)
Declined	1 (2.6%)

The medical schools who initially replied but failed to respond after a follow up request are Harvard Medical School, the University of California, Los Angeles David Geffen School of Medicine and the University of Missouri-Kansas City School of Medicine.

The medical school who declined their participation is the University of Nevada School of Medicine. No reason was stated.

**5.2.2. Targeted Offers Described by the Contributing Medical Schools**

The majority (fifty-four percent) of the outlined opportunities are based on the concept of mindfulness. The remaining programs are divided among five other categories; three programs incorporate characteristics of two categories and are identified as such. Figure 7 illustrates a summary of the particular offers sorted pertaining to the categories already utilized with the website search.

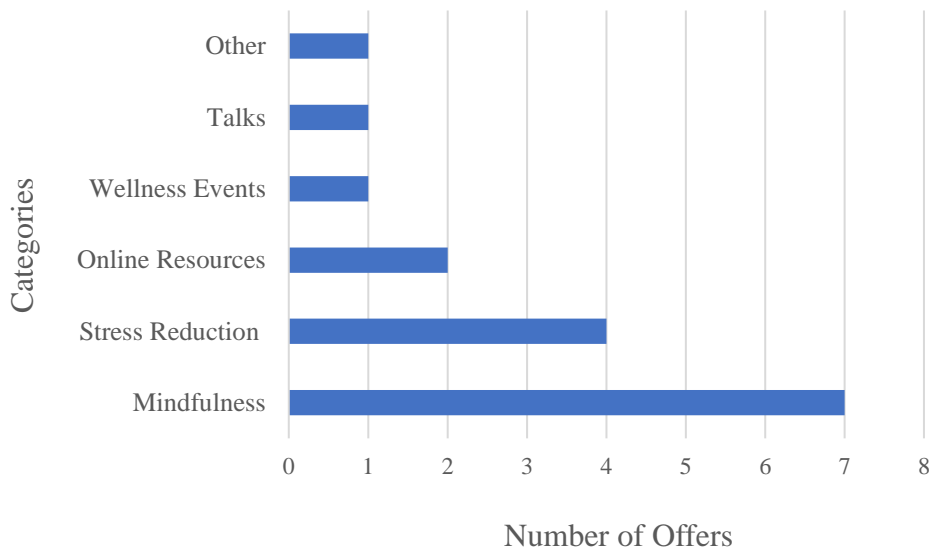


Figure 7: Distribution of stress management services based on email responses according to each category (numerical values in absolute numbers)

Only two institutions state evaluations have been performed: Florida International University Herbert Wertheim College of Medicine and Drexel University College of Medicine. It was not further elaborated on what types of methods are utilized for these evaluations. The correspondent of Ohio State University College of Medicine did however include a number of attached articles in her email communication which her university has published on past courses. These courses were neither found online nor were they mentioned in the email exchange.

An account of the opportunities which were included in the email responses is listed in Table 4 according to each medical school.

**Table 4: Outline of services at US American medical schools based on email responses**

**Legend:** Category 2= Mindfulness, Category 3= Stress Reduction, Category 5= Online Resources, Category 6= Other, Category 8= Talks, Category 10= Wellness Events

**Abbreviations:** approx.= approximately, Cat.= Category, hr.= hour, max.= maximum, med.= medical, min.= minutes, n.a.= not applicable, Nr.= Number

Nr.	University	Cat.	Offer	Administrator	Launch	Timeframe	Participants	Evaluation
1	Drexel University College of Medicine	2	Mindfulness for Wellbeing Seminar (12hr. Elective Course)	n.a.	2006	1 course/semester	approx. 100 1 <sup>st</sup> /2 <sup>nd</sup> year med. students/course	Yes
2	Florida International University Herbert Wertheim College of Medicine	10	Fit & Well Program and PLC Wellness	Medical Student Counseling and Wellness Center	2009	1 session/week or every other week	n.a.	Yes
3	Georgetown University School of Medicine	2	Mind-Body Medicine: An Experiential Introduction course	Office of Medical Education	n.a.	11 sessions: 1/week each 120 min.	- 1 <sup>st</sup> /2 <sup>nd</sup> Year med. students - 10 students/class	n.a.
4	Ohio State University College of Medicine	2, 5	Mind-Body Skills Training for Resilience, Effectiveness and Mindfulness (STREAM)	Center for Integrative Health and Wellness	2013	12 online modules each 60 min.	n.a.	n.a.
		5, 6	Herbs and Dietary Supplements Across the Lifespan	Center for Integrative Health and Wellness	n.a.	14 online modules each 60 min.	n.a.	n.a.
5	Sidney Kimmel Medical School at Thomas Jefferson University Hospital	2	Mindfulness Course Elective	The Mindfulness Institute	n.a.	1 course/semester, 4 sessions: 1/week each 90 min.	50 1 <sup>st</sup> year med. students/course	No
6	Tufts University School of Medicine	3	1. Drop-in Gatherings/Stress Breaks 2. Transitions Support Group	Student Advisory and Health Administration Student Advisory and Health Administration	n.a. n.a.	3 <sup>rd</sup> Thursday every month n.a.	n.a. n.a.	n.a. n.a.
7	University of Colorado School of Medicine	2	1. Mindfulness Practices Seminar 2. Mindfulness Practices Workshop	n.a.	n.a.	monthly	approx. 20 students	n.a.
8	University of Pittsburgh School of Medicine	2	Mindfulness for Medical Students Mini Elective	Office of Medical Education	2015	1 course/semester, 6 sessions: 1/week each 120 min.	approx. 50 1 <sup>st</sup> /2 <sup>nd</sup> med. students max. 15 students	n.a. n.a.
9	Wayne State University School of Medicine	3	The Impact of Stress on Performance Seminar	Office of Student Affairs and Career Development	2013	1 course/year	required for all 1 <sup>st</sup> year med. students	No
10	Wright State University Boonshoft School of Medicine	3, 8	Resilience Program	Office of Student Affairs and Admissions	2016	12 sessions/semester each 40-60 min	average attendance of 52 1 <sup>st</sup> year med. students	n.a.

### **5.2.2.1. Category 2: “Mindfulness”**

The concept of mindfulness is the most represented model in the programs mentioned in the email correspondence. Four of the seven mindfulness programs are rooted in elective courses spread among the following medical schools - Georgetown University School of Medicine, Drexel University College of Medicine, Sidney Kimmel Medical School at Thomas Jefferson University Hospital, and the University of Pittsburgh School of Medicine. They are offered once per semester and vary in number and length of sessions. Mindfulness practices, meditation and body scans are key components in every course.

Georgetown University School of Medicine’s elective called “Mind-Body Medicine: An Experiential Introduction” is not only offered to first and second year medical students, but also to graduate physiology students, nursing students, law school students and faculty members. Each class is comprised of ten students and two faculty members who co-facilitate the sessions. A safe environment is created which allows for a positive, supportive and non-judgmental communication. Every session begins with an invitation for reflection and discussion of concerns regarding the medical training. Through the exchange of painful and often intimate experiences, interpersonal relationships are formed. The rest of the session is spent on mind-body methods including meditation, guided imagery, journal writing, biofeedback, autogenic training and art. Following the introduction of the techniques, students have the opportunity to practice them. It is the only institution who practices autogenic training as part of their lesson.

The elective course at Drexel University College of Medicine on the other hand, is a derivative of a full length MBSR course, according to its instructor. Theories which are presented include body scan, awareness of breath, sounds and thoughts, mindful eating and walking, and cultivation of wholesome states. At the end of the course, an inquiry is undertaken. Participants are first- and second-year medical students. Approximately a hundred students take some portion of the course, while only about forty students complete the entire course. The instructor of the course did not elaborate on the method or extent of the evaluations taking place.

The Sidney Kimmel Medical School at Thomas Jefferson University Hospital has run several different mindfulness elective courses for their medical students throughout the years. At the time of the inquiry, a four-week, ninety minute per session mindfulness



course for first year medical students was offered in the form of a humanities elective. Each course is limited to a total of fifty students. Evaluations have not been implemented.

The mini-elective at the University of Pittsburgh School of Medicine is modeled after the MBSR program founded by Dr. Kabat-Zinn. The aim of the course is to provide students with the means of immediate stress reduction skills. Each session includes a thirty to forty-five-minute meditation practice followed by various other exercises and a group discussion. Part of the course includes at-home exercises which may involve journal writing or the use of an alternate approach to a normal, ordinary task. Some sessions may require yoga mats.

Copies of the detailed programs featured at Georgetown University School of Medicine, Sidney Kimmel Medical School at Thomas Jefferson University Hospital and the University of Pittsburgh School of Medicine are found in the appendix.

The University of Colorado School of Medicine offers a monthly mindfulness practices group alongside their mindfulness workshop. According to the administrator, the monthly group seminar does follow a formal curriculum. Every month students are invited to participate in a thirty-minute silent mindfulness meditation exercise. Each new month one additional stress reduction technique is introduced. The workshop follows a more practical approach, where each lesson includes mindfulness breathing, relaxation, body scan and several stress reduction techniques. In the spring of 2016, fifty-five first- and second-year medical students attended, while in the fall of 2016 twenty-five fourth year medical students participated.

#### **5.2.2.1.1. Overlapping Category 2: “Mindfulness” and Category 5: “Online Resources”**

The remaining program which reflects a mindfulness approach is a unique and extensive program called “Training for Resilience, Effectiveness, and Mindfulness (STREAM)” program presented by the Ohio State University College of Medicine. It is an online program and therefore always accessible. Due to the web-based feature of this program, it is also characterized in the category “Online Resources”. The twelve one-hour modules are based on four groups: “relaxation response”, “mindfulness”, “heart centered practices”, and “guided imagery and hypnosis”. Free mp3 recordings are included. The email reply only featured an online link to the program’s website, no further information was included.

### **5.2.2.2. Category 3: “Stress Reduction”**

The category “Stress Reduction” includes four prospects presented at Tufts University School of Medicine, Wayne State University School of Medicine and Wright State University Boonshoft School of Medicine. The email communication with Tufts University School of Medicine provided only a superficial description of the drop-in gatherings and the jumbo support groups offered through the student wellness advising office. These gatherings are implemented every month to give students the opportunity for a break and interact with the wellness advisor. One specific goal of these meetings is to normalize the action of seeking help, to counteract the stigma associated with it. Healthy snacks as well as stress reducing resources are provided in this setting. Furthermore, joining the “Transitions Support Group” facilitates an alternative safe, comfortable, and supportive space for peers to interact and exchange insight to shared experiences.

Whereas these services are all voluntary, Wayne State University School of Medicine appears to be the only medical school which requires all first-year students to attend a lecture specifically geared towards stress management. The assistant professor who delivers this lecture provided the PowerPoint slides through her email communication. Some of the slides are interactive, with students able to participate anonymously on their cell phone and the responses showing up automatically on the PowerPoint presentation. It highlights the relationship between anxiety and performance, the external as well as internal factors contributing to stress especially in medical school, the suicide risk concerning medical students, sleep deprivation and burnout, and finally treatment options and recommendations regarding ways to limit or reduce stress.

#### **5.2.2.2.1. Overlapping Category 3: “Stress Reduction” and Category 8: “Talks”**

In contrast, Wright State University Boonshoft School of Medicine implants stress reduction in their 2016 initiated resilience program called “POW=R: Pearls of Wisdom”. This program is characterized by the category “Talks” as well since it evolves around so called “Balancing Life Talks (BLTS’s)” which can be voluntarily attended. By completing at least ten out of the twelve available sessions in one academic year, a certificate of completion and a note of recognition from the dean will be handed out. The director of Student Services & Counseling reported that in the fall of 2016, eighty-seven percent of first year students chose to participate in at least one training module. Four students (3.5 percent of the class) completed all ten sessions, while fifty-eight percent of

first year students chose to participate in five to ten sessions. The average student attendance at each BLT included fifty-two students.

#### **5.2.2.3. Overlapping Category 5: “Online Resources” and Category 6: “Other”**

The Ohio State University College of Medicine makes two online programs available to their students. The STREAM program has already been reviewed in the category section “Mindfulness”. The second program is called “Herbs and Dietary Supplements Across the Lifespan”. Similarly, to STREAM, it is featured entirely online and consists of fourteen interactive modules. Modules such as “Enhancing Human Performance” or “Mental Health Part 1: Non-Herbal Supplements” provide in a series of case studies, question and answer exercises for reflection, and links to resources and materials, a distinctive approach for students to improve their mental health.

#### **5.2.2.4. Category 10: “Wellness Events”**

The Florida International University Herbert Wertheim College of Medicine provides a comprehensive Medical Student Counseling and Wellness Center for their students. Offers include, amongst other services, crisis intervention, therapeutic assessments, biofeedback and mediation/stress management as well as aromatherapy and nutrition/health counseling. Furthermore, a prevention program called “FIT & WELL” open to all students, faculty and staff, was established. The members of “Fit & Well Program and PLC Wellness” host events which incorporate sport and meditation activities as well as courses on stress management, time management, learning styles and mindfulness meditation for medical students. Utilization is around eighty-five percent. Participating students receive extra credit which benefits their academics. The 2015/2016 end of the year survey demonstrated that seventy-four percent of students who completed the survey rated the impact of the exposure to these wellness events as “extremely impactful/moderately impactful”. Eighty-three percent of the same students are also “extremely likely/somewhat likely” to integrate these activities into their daily life, while seventy one percent of students are “extremely likely/somewhat likely” to share their acquired knowledge with others.

### 5.3. Website Search Results Regarding German Medical Schools

Based on a thorough exploration of the websites generated by each institution, out of thirty-six German medical schools, thirty-one universities have initiated at least one stress management program. Therefore, eighty six percent of medical schools in Germany are offering opportunities for their students to improve their mental health. The five medical schools who do not present an initiative are the universities at Göttingen, Greifswald, Halle Wittenberg, Magdeburg and Mainz. The remaining universities feature a total number of fifty-nine services enclosed in eight categories, as seen in Figure 8.

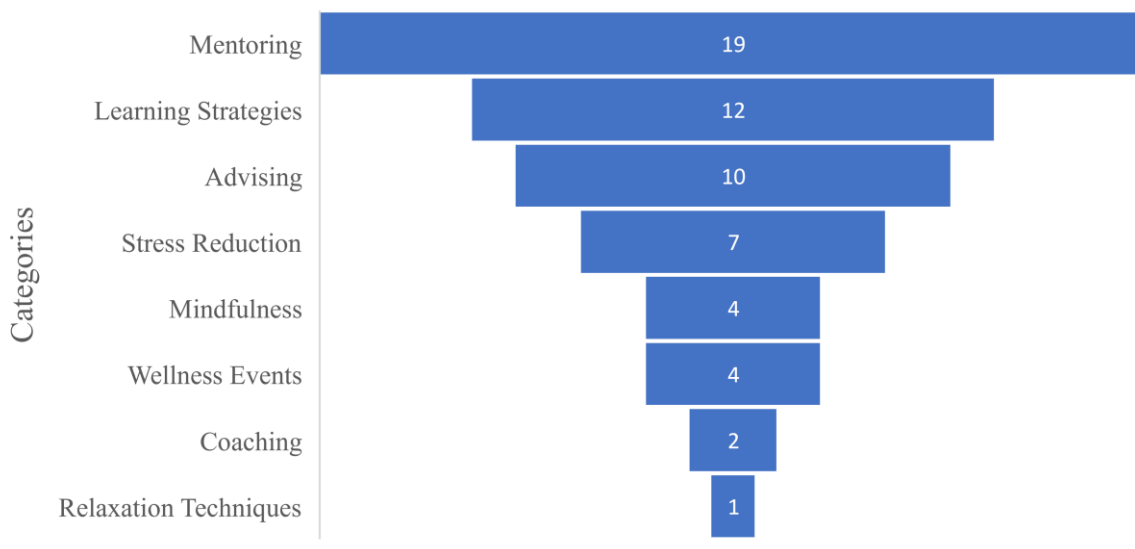


Figure 8: Distribution of online listed stress management services at German medical schools according to each category (numerical values in absolute numbers)

A detailed listing of all available services according to the individual medical school is demonstrated in Table 5.

**Table 5: Outline of online listed stress management services at German medical schools**

**Legend:** Category 1= Relaxation Techniques, Category 2= Mindfulness, Category 3=Stress Reduction, Category 4= Learning Strategies, Category 5= Advising, Category 6= Coaching, Category 7= Mentoring, Category 8= Wellness Events

**Abbreviations:** Nr.= Number

Nr.	Medical School	Category	Mentoring	Learning Strategies	Advising	Stress Reduction, Mindfulness, Other, Coaching, Relaxation Techniques
1	Aachen	7	- "TANDEMmed"			
2	Charité Berlin	2, 6, 7	- Charité Student Mentoring			- "Medicoach" - Mind-Body Medicine and Stress Reduction Course
3	Bochum	8				- University Sports Center
4	Bonn	3, 8				- "TK Mentalstrategien" Program
5	Dresden	5			- Counseling Center	- University Sports Center
6	Duisburg-Essen	5, 7	- "MentiZin"		- Counseling Center	
7	Düsseldorf	2, 3, 7	- "A2" Mentoring Program - "SelmaMeyerMED-Start"			- Mind-Body Medicine Elective - Stress Management for Medical Students Elective
8	Erlangen-Nürnberg	4		- Workgroup "Lernstrategien und Prüfungsangst" - Special Consultation Hours		
9	Frankfurt	4, 5			- Counseling Center Group Workshops - Individual Advising	
10	Freiburg	7	- Elective in Combination with Mentoring Program			
11	Giessen	3, 4, 5		- Study Skills Tutorial	- Counseling Center	- Project: "Stressbewältigung im Medizinstudium"
12	Hamburg	7	- General Mentoring Program - Mentoring Program for Excellent Students - Mentoring Program for Students having Difficulties			
13	Hannover	4		- "Lernwerkstatt"		
14	Heidelberg	4, 5, 6, 8		- Exam Preparation Tutorial	- Counseling Center Workshops	- "MediCo" - University Sports Center
15	Jena	3, 7	- "Mentoring LÄK"			- Stress Reduction Seminar
16	Kiel	7	- Mentoring Program			

Nr.	Medical School	Category	Mentoring	Learning Strategies	Advising	Stress Reduction, Mindfulness, Other, Coaching, Relaxation Techniques
17	Köln	4, 7, 8	- Mentoring Program	- Group Therapy Workshop for Test Anxiety		- University Sports Center
18	Leipzig	7	- "MedMentorL"			- Mind-Body Medicine Elective: "Auszeit für mich"
19	Lübeck	2, 3, 7	- Mentoring Program			- Stress Reduction Program in Cooperation with the Techniker Krankenkasse - "Gesund durchs Studium" Elective - "Gesundheit und Wohlbefinden für Medizinstudenten und Ärzte" Elective
20	Mannheim	7	- Mentoring Program			
21	Marburg	4		- "Lernen und Lehren in der Medizin" Elective		
22	LMU München	7	- "MeCuM-Mentor"			
23	TU München	7	- "TUM Mentoring"			
24	Münster	5, 7	- "OMENTUM"		- Counseling Center	
25	Regensburg	5			- Advising	
26	Kostock	1, 4		- "Effektive Prüfungsvorbereitung-Lernstrategien erfolgreich umsetzen" Elective		- Relaxation Techniques Workshop
27	Saarland-Homburg	7	- Mentoring Program			
28	Tübingen	4, 7	- Mentoring Program for first-year students	- Seminars: Learning Strategies, Time Management, Test Strategies		
29	Ulm	5			- Advising	
30	Witten-Herdecke	2, 4		- "Die Lernwerkstatt im IBAM" - Seminar: "Prüfungswerkstatt für Medizinstudierende"		- Meditation Room Workshops: Mindfulness, Mindfulness Based Stress Reduction
31	Würzburg	4, 5, 7	- "Mentoring MED 5Plus1" - "KOMPASS" - Buddy Program	- Project: "Effiziente Prüfungsvorbereitung von Studierenden für Studierende der Medizin"	- Counseling Center Workshops	

### **5.3.1. Category 1: “Relaxation”**

Relaxation techniques are employed by only one medical school, the University of Rostock. The workshop which incorporated these exercises has also not been offered since the year 2011. It included relaxation methods with practical exercises. The course also encompassed progressive muscle relaxation training as prescribed by Jacobson.

### **5.3.2. Category 2: “Mindfulness”**

Mindfulness is a concept four universities focus on: the Charité University in Berlin and the Universities of Düsseldorf, Lübeck and Witten-Herdecke. Each university, except Witten-Herdecke, presents mindfulness in the form of an elective course.

Düsseldorf initiated its seven-week Mind-Body Medicine course in the summer of 2014. It communicates the theoretical background of salutogenesis and mind-body medicine by conveying methods of relaxation response, salutogenic communication, placebo, mindfulness meditation, embodiment, solution-oriented hypnotherapy, empathy and coaching tools.

The Charité University as well as the University of Lübeck both offer a Mind-Body Medicine elective which is modeled after the Mind-Body Medicine course at Georgetown University School of Medicine. A video displaying the founder of Georgetown’s program is shared on the University of Lübeck’s website. She describes the objectives of this program to be self-awareness and self-care, and the instructed skills to be embedded in meditation, guided imagery, autogenic training, hypnosis and biofeedback.

The University of Witten-Herdecke on the other hand, has constructed an entire meditation room which offers workshops related to mindfulness, MBSR, autogenic training and progressive muscle relaxation for instance. Outside of these activities, medical students are allowed to enjoy this room by simply relishing the quiet, peaceful atmosphere.

### **5.3.3. Category 3: “Stress Reduction”**

The category “Stress Reduction” encompasses seven initiatives. Its principles are represented in three electives, three comprehensive programs and one seminar. The University of Lübeck provides the opportunity of not one but two stress reduction electives called "Gesund durchs Studium" and “Gesundheit und Wohlbefinden für Medizinstudenten und Ärzte“. These electives supply information on approaches which

enhance mental as well as physical wellbeing by organizing group discussions and hands on activities. In addition to these prospects, the university, in cooperation with the health insurance Techniker Krankenkasse, has initiated a program called "Auf dem Weg zur Gesunden Hochschule" which is being implemented through the years 2017 and 2021. The project evaluates the effectiveness of a newly instigated stress reduction course as well as the medical curriculum itself. The goal is to incorporate the foundation of a healthy well-being into the syllabus. The University of Düsseldorf offers the third elective focused on stress reduction called "Stressmanagement für Studierende der Medizin". In a five-week course, notions of stressors geared especially towards medical students as well as proposed solutions are discussed and practiced in a group setting.

Like Lübeck, the University of Bonn has also consented to a cooperation with the health insurance Techniker Krankenkasse for the introduction of a program called "TK-MentalStrategien". It is offered to all medical students free of charge even if they are not a policyholder of this health insurance. The program entails eight elements in seven sessions, each lasting three hours. Topics such as stress management, time management and test anxiety are embraced. The "Karlsruher Institut für Technologie (KIT)" has evaluated the effectiveness of this program and professed the positive effects, making the program "TK-MentalStrategien" the first evidence-based stress reduction program offered to students in Germany.

A comparable approach is utilized at the University of Giessen. The project "Stressbewältigung im Medizinstudium" includes eight seminars which combine relevant themes of stress management and test anxiety with practical instructions targeted especially towards learning strategies. Each lesson concludes with an autogenic training session comprised of formulas pertaining to the medical training.

Finally, the University of Jena offers a stress reduction seminar as part of both clinical and outpatient tracks of distinction. It is divided into six sessions, each lasting ninety minutes, and contains elements emphasizing stressor analysis, coping strategies, progressive muscle relaxation and autogenic training. These tracks of distinction are offered to students entering the clinical part of the medical education. Each week, a different event or workshop is organized for students pertaining to their track. At the end of the tenth semester, there is an exam in the form of an objective structured clinical examination (OSCE).



#### **5.3.4. Category 4: “Learning Strategies”**

Learning strategies can be conveyed through numerous approaches. Workshops, electives, tutorials, lectures and special consultation hours embody the twelve services included in this category.

The Universities of Marburg and Rostock both place elective courses focusing on learning strategies in their medical education composition: “Lernen und Lehren in der Medizin” and “Effektive Prüfungsvorbereitung-Lernstrategien erfolgreich umsetzen“. The elective in Rostock is mandatory for all medical students in the second semester.

The University of Erlangen-Nürnberg focuses on a different approach by initiating the workgroup cooperation “Lernstrategien und Prüfungsangst” which engages over seven departments. A lecture series combined with seminars not only underlining study skills but also emphasizing methods which combat test anxiety is facilitated. Similarly, the University of Würzburg has also introduced a lecture and workshop series which is especially geared towards students first entering the university. The project is called “Effiziente Prüfungsvorbereitung von Studierenden für Studierende der Medizin“ and encompasses topics of exam preparation, time management, study skills, learning strategies, work organization and test anxiety. Workshops are furthermore offered at the University of Hannover as part of their “Lernwerkstatt”. They include added themes of academic learning blocks, management of complex information presented in lectures as well as comprehension of the differing types of examinations. The University of Köln has embedded their workshops in a group therapy setting: “Gruppentherapeutische Angebot für hochprüfungsängstliche Studierende der Human- und Zahnmedizin”. These workshops focus especially on coping skills in relation to general anxiety but also particularly as it concerns test performance. Parallel to these group discussions, every student receives three individual meetings and obtains the option for two additional therapy sessions.

A unique program is demonstrated by the University of Witten-Herdecke. A research project by the university in association with the “Integriertes Begleitstudium Anthroposophische Medizin (IBAM)” has led to students studying and reviewing the essence of learning. The elements of this project assess topics regarding obstacles to learning, variables of learning, meditation, sleep rhythm and skills development. The

connected “Lernwerkstatt” has organized workshops for students which implement and communicate the aspects collected in this process.

### **5.3.5. Category 5: “Advising”**

Advising is offered by ten medical institutions, mostly by their counseling center. It is designed for medical students in the pre-clinical time period. Students who undergo a stressful time in their medical training are able to receive support through individual as well as group therapy sessions and workshops. These activities provide information and solutions relating to self-management skills, efficient learning, time management and stress management.

### **5.3.6. Category 6: “Coaching”**

The category “Coaching” is represented by two medical universities: the Charité University in Berlin and the University of Heidelberg. Coaching is a consulting format where students are offered interventions based on various psychotherapy schools. Students decipher along their coaches the concerns and subsequent goals pertaining to their medical education and ensuing career as a physician.

The Charité University initiated a coaching program called “Medicoach” in 2010. Medical students can participate in individual as well as group coaching sessions. The group coaching course takes place once a semester in six sessions, each lasting two hours. Students are able to seek solace in their peers. Topics which are discussed center around strategies concentrating on time management, motivation and self-organization. The aim of this program is the early recognition and prevention of stress induced health concerns, therefore fostering the successful completion of the medical training. A 2016 published report of this program underlines the importance of specific interventions targeting situational burdensome concerns, a clear distinction to a mere advice giving function [27]. Students who participate in this program are on average in their fifth semester, just entering the clinical phase of the medical education. Female students make up seventy-two percent of participants. Multiple reasons are presented as the cause for seeking out treatment through this coaching program. Fear of failure and test anxiety has been evaluated as the biggest motive (twenty six percent). Stress Management (twenty one percent), transition from home (nineteen percent), depressive symptoms (seventeen percent), self-organization (seventeen percent), academic workload (sixteen percent) and ambivalence of the medical career (thirteen percent) are all discussed as causes. [27]

A similar project called “MediCo” is offered at the University of Heidelberg. Individual as well as group coaching sessions are offered. Students are encouraged to develop stress management skills and to create concrete personal goals for the future. The individual medical training progress is reviewed and reflected upon. The coaching program is also organized as a guide to additional internal and external counseling services established by the university.

### **5.3.7. Category 7: “Mentoring”**

The tool of mentoring is the most represented concept in the programs mentioned on the medical universities’ websites; nineteen mentoring services are found overall. Mentors are usually peers in higher semesters or experienced physicians, accompanying the student along their studies. As part of their mentor roles, they often report of their own struggles throughout the medical training and aid with matters regarding the future careers of their mentees. Participation in the programs at each university is voluntary.

### **5.3.8. Category 8: “Wellness Events”**

The category “Wellness Events” harbors various services offered by the university sports centers’ of Bonn, Bochum, Köln and Heidelberg. Workshops and events include stress management, autogenic training, mindfulness, meditation and mental training, just to name a few. In addition to these opportunities enhancing mental health, students can sign up for a variety of physical activities such as yoga and swimming for instance.

## **5.4. Differences Between US American and German Stress Management Programs in Medical Schools**

**Table 6: Outline of differences between stress management programs**

	<b>US American</b>	<b>German</b>
Relaxation Techniques	25 ( 7.8%)	1 ( 1.7%)
Mindfulness	41 (12.7%)	4 ( 6.8%)
Wellness events	36 (11.2%)	4 ( 6.8%)
Stress Reduction	58 (18.0%)	7 (11.9%)
Learning Strategies	34 (10.6%)	12 (20.3%)
Online Resources	43 (13.4%)	
Pet Therapy	14 ( 4.3%)	
Talks	13 ( 4.1%)	

	<b>US American</b>	<b>German</b>
Bio Feedback	10 ( 3.1%)	
Surveys/Screenings	12 ( 3.7%)	
Learning Communities	4 ( 1.2%)	
Advising		10 (16.9%)
Coaching		2 ( 3.4%)
Mentoring		19 (32.2%)
Other	32 ( 9.9%)	

## **6. Discussion**

### **6.1. Website Search Results and Email Responses of US American and German Medical Schools**

Stress management resources are implemented in both countries, however with different focus and availability. The exploration of all 147 US American and thirty-six German medical school websites led to the unsatisfactory discovery that only sixty eight percent of American institutions provide an opportunity for their students to engage in an activity or program which focuses on improving their mental health. In contrast, a surprising eighty six percent of German universities have recognized the importance of this issue and implemented a program targeting stress reduction. Thus, the first hypothesis has been validated.

Medical schools located in the United States and Canada fall under the dominion of the Liaison Committee on Medical Education (LCME). The LCME accredits these medical education institutions leading to a MD degree. The process of accreditation is entirely voluntary and includes a peer-reviewed progression which determines if certain established standards are met. The yearly updated standard guidelines clearly state that academic support as well as career advising should be an objective of every medical education program (“Standard 11”). Furthermore, “Standard 12.3” highlights the importance of mental health under the heading “Personal Counseling/Well-Being Programs”: “A medical school has in place an effective system of personal counseling for its medical students that includes programs to promote their well-being and to facilitate their adjustment to the physical and emotional demands of medical education.”[14] With these specifications, every medical school is committed to providing support services for their students, promoting a healthy and balanced future career as medical physicians.

However, having these conditions in place, it is astounding that only sixty-eight percent of US American medical schools present some kind of stress reduction service. It cannot be ruled out that further opportunities exist, but they are not listed on their website. On the other hand, advising and mentoring are concepts which show a widespread implementation, with very few exceptions. Mentoring programs show the willingness of the universities to create an optimal environment between the professors and their students. They aim to provide and promote support to medical students regarding career counseling, professional skills, personal development and interest in research. Counseled students describe an experience of increased personal satisfaction and rate their overall well-being as higher [94]. In 2002, the LMCE assessed the “Class Mentor Program” of the University of Wisconsin Medical School and praised its work as a unique and unparalleled support for students. This program allows every freshman class an assigned mentor who is an experienced and trained doctor. The medical professional advocates for his students until they receive their degree, going so far as accompanying them to all their classes in the first two years [215].

Additionally, a wide and diverse selection of activities is offered. Yet they often lack a clear structure and are seldom incorporated into organized programs. While some US American medical institutions also offer detailed stress management programs and even though stress reduction appears to be the primary focus since eighteen percent of discovered programs target stress reduction, most do not offer comprehensive programs. They present a whole range of opportunities, often under the heading of wellness. From online handouts covering sleep hygiene [215], free snacks during finals to wellness events where students are able to pet therapy dogs, there are many different ways students can reduce their stress throughout the year. The category “Other” does contain as many as thirty-two services. Services included in the categories “Online Resources”, “Pet Therapy”, “Talks”, “Biofeedback”, “Surveys/Screenings” and “Learning Communities” are only found at US American medical schools.

In contrast, German medical universities concentrate their stress management resources on defined courses. The stress management programs are often multi layered. They make us of various approaches covering learning strategies and relaxation techniques. Consequently, the third hypothesis has been validated. Furthermore, Germany appears to focus heavily on advising, coaching and mentoring programs. Thirty-two percent of

medical schools have established some type of big brother project while seventeen percent of universities have also implemented support in the form of advising. Two medical institutions have initiated coaching programs. However, these three manners of counseling are difficult to differentiate. Individual coaching for medical students is costly and difficult to achieve, prompting medical schools to introduce advising and mentoring programs instead.

The additional feedback of the contacted US American medical schools regarding detailed information of their programs fell short of expectations. A meager response rate of thirty-seven percent was recorded. The initial low selection of forty-eight medical schools, which was further reduced to thirty-eight schools due to inaccessible contact information, was mostly attributable to the limited amount of comprehensive medical programs which were available for selection. Only ten medical schools decided to contribute to this study. Seven of the thirteen described programs involve the concept of mindfulness.

Services embedded in the five categories “Relaxation Techniques”, “Mindfulness”, “Stress Reduction”, “Learning Strategies” and “Wellness Events” are presented at medical schools in both countries. Opportunities which include learning strategies are the only endeavors which prevail in Germany; the remaining features all dominate in the United States.

#### **6.1.1. Category “Relaxation Techniques”**

Relaxation techniques include meditation practices, breathing exercises and yoga activities. These efforts are concentrated mostly at medical schools in the United States. While relaxation methods constitute eight percent of services at US American medical education programs, only two percent of ventures at German medical universities incorporate these practices. The University of Rostock is the only German medical school that features a program centered on relaxation techniques.

The practice of relaxation can be a valuable intervention when developing coping strategies. The effectiveness of various relaxation techniques such as self-hypnosis to counteract feelings of stress and anxiety has been proven [32,263]. However, these methods are practiced rarely in a regular fashion by medical students [148]. Reasons for non-usage may be time constraints and a lack of knowledge. Acquiring the handling of

relaxation practices is nevertheless identified by students as a potentially beneficial tool regarding health promotion [146]. Progressive muscle relaxation, which is utilized in the program at the University of Rostock for instance, has also been shown to increase quality of life while reducing levels of anxiety at the same time [61]. A single course instructing autogenic training and progressive muscle relaxation can generate a positive impact affecting anxiety and burnout in medical students [220,264]. In Germany, these two methods are among the most common relaxation techniques [147]. After a short introduction, both can be further practiced independently and without any added equipment. Predictors of course participation among medical students appear to contain the female gender, high levels of anxiety, low career ambitions and emotional isolation [147]. Only four US American medical schools employ progressive muscle relaxation as part of their stress reduction program: the Northwestern University: The Feinberg School of Medicine, the University of Central Florida College of Medicine, the University of Texas at Austin Dell Medical School and Virginia Commonwealth University School of Medicine

Yoga has also featured as a primary form of relaxation at US American medical schools. Self-assessments have illustrated that yoga and meditation create a positive impact on self-confidence, personal satisfaction, happiness, endurance and focus in medical students [192]. It effectively reduces stress and enhances the mental wellbeing of medical trainees [84,113].

### **6.1.2. Category “Mindfulness”**

The concept of mindfulness is centered in the United States. Thirteen percent of programs at US American medical schools incorporate the teachings of mindfulness meditation in their agenda. Most American medical education programs which do portray a defined course organization evolve around mindfulness. This is also reflected in the email correspondence with the selected American medical schools. Fifty-four percent of described programs which contributed with a detailed course description, embrace mindfulness. These comprehensive courses are embedded in electives or even form an entire mindfulness curriculum as is the case at Warren Alpert Medical School of Brown University. German medical universities on the other hand, still struggle with modeling programs around the concept of mindfulness. Only seven percent of services, which entail exactly four programs, encompass mindfulness. Two of these programs, initiated at the

Charité University in Berlin as well as at the University of Lübeck, offer a Mind-Body Medicine elective which is modeled after the Mind-Body Medicine course at Georgetown University School of Medicine.

Interventions based on mindfulness have gained popularity in medical education. The most well-known mindfulness program is the “Mindfulness Based Stress Reduction (MBSR)” developed by Kabat-Zinn at the University of Massachusetts Medical School. His notion of mindfulness meditation produces a “detached observation” where the sensation of pain is isolated from the experienced reaction, and due to the subsequent cognitive reappraisal a reduced level of pain is felt [136]. The course instills focused attention and informal practices to nurture mindful moments in daily activities. Numerous studies have shown that mindfulness meditation improves the wellbeing of medical students [111,167,256,259]. It has also been shown to expand empathy and compassion toward patients among health professionals [151]. A medical student peer-led mindfulness course illustrated in a pre/post study lower levels of stress yet enhanced self-compassion and mindfulness impulses [56]. Furthermore, the principles of MBSR produce higher levels of satisfaction combined with a positive perception in medical students when they are communicated in a voluntary setting [2].

Keeping in mind the heightened acceptance of programs offered on an optional basis as well as circumventing curricular constraints and self-selected participation due to the elective nature of most mindfulness interventions, an increasing number of web-based mindfulness programs are offered. It promises easy access, flexibility, low cost and privacy. A recent study reviewed the feasibility of online based mindfulness meditation targeting medical students and concluded that this form of program is acceptable, generating satisfaction among students [57]. The Ohio State University College of Medicine for instance has recognized these advantages and initiated the “The Mind-Body Skills Training for Resilience, Effectiveness, and Mindfulness (STREAM)” program, an online design comprised of self-reflection modules. Germany’s medical universities do not present any type of online service or program which proposes a potential for improvement.

### **6.1.3. Category “Stress Reduction”**

Opportunities available to medical students focusing on stress management have the highest disclosure among services at medical schools in the United States, with an overall



eighteen percent. German medical universities in contrast, devote twelve percent of their service resources to stress management programs. While American services describe a range of endeavors with more than half of all existing efforts infused into workshops and the rest spread out in events, educational counselors and wellness programs, Germany concentrates on developing comprehensive programs. Each of the seven German programs is comprised of a multi-session curriculum with lessons of stress management and related coping strategies conveyed in a group setting, often accompanied by hands on activities.

In both countries, topics such as time management and test anxiety appear to be the main subject matters confronted in the discussions taking place. The mental and physical wellbeing of the individual medical student is often neglected in these dialogues and constitutes a viable approach for future improvement. Specific experiences which medical students face during their medical education should be raised for discussion. Particular stressful situations such as certain anatomical courses can be addressed in a safe environment surrounded by peers who are in turn able to express their concerns. This setting provides the opportunity for mutual support and an exchange of experiences which consequently reduces stress. Peer course instructors who have gone through the same struggles and are able to act as mentors, as exemplified in the program “Stressbewältigung im Medizinstudium” at the University of Giessen, impart a sense of authenticity to the course and are worthy of consideration [199]. Furthermore, the time table of these programs should be considered. Medical students are already pressed for time and these sessions should be scheduled at night and separate of final examinations.

Programs aimed at stress reduction should include educational aspects of specific stressors which the future physician faces. Unrealistic perceptions and disillusionments are thus prevented. The discrepancy between student expectations and the realities encountered in a clinical setting, is found to be a main stressor in medical students [24]. Identifying these incongruities and informing students about the types of distress (i.e. burnout) professional physicians combat, communicates the importance of this issue and encourages students to seek help when needed.

A further expansion of stress management programs is needed in the United States as well as Germany. Only forty-five percent of students at the University of Giessen indicated possessing an adequate amount of coping strategies; fifty-eight percent of

students considered a tailored stress reduction course as meaningful [133]. The group of medical students who fall in the collection with the lowest risk of future burnout, acquire coping strategies during medical school which focus on direct confrontation yet do not express negative behaviors in an effort to reduce stress. They develop a resistance to burnout and experience the highest quality of life but are neither overly competent nor satisfied with their career. Alternate priorities govern their lives. [244] These are indicators in the personal development of medical students which may predict a tendency in the future medical profession.

#### **6.1.4. Category “Learning Strategies”**

The conveyance of learning strategies constitutes a main focus at German medical schools. It is the only category of services which demonstrates a greater emphasis in Germany in contrast to the United States. Germany allocates twenty percent of their efforts to advancing their students’ test taking abilities and the associated anxiety. These endeavors are concentrated mostly in organized workshops, electives and tutorials. Courses which are especially stressful often pertain to the preclinical period in the medical education. Consequently, attempts to alleviate these stressors by imparting study skills and coping strategies in reference to test anxiety should be focused in the early years of the medical education program. Alternatively, US American medical schools, in part due to the guidelines issued by the LCME, have seventy-four percent of their overall eleven percent of services embracing learning strategies embedded in academic support services. These efforts are also concentrated in teaching study skills and test taking strategies. Both countries’ education programs heavily utilize the multiple-choice exam structure. However, while American students are more familiar with this format since it is also employed in high school as well as college, most German students encounter this exam configuration for the first time in medical school. The introduction of this new testing arrangement may lead to further test anxiety and should be addressed early on. The pre-matriculation program at the Northeast Ohio Medical University and the University of Alabama School of Medicine for instance provides an excellent opportunity for incoming first-year medical students to convey academic success strategies and prepare the new matriculants for the new learning environment of medical school. German medical universities should consider implementing such programs at their institutions to further alleviate the growing obstacles faced in studying.

Medical students are confronted with an enormous amount of material which needs to be grasped and replicated each year, emphasizing the importance of learning strategies. Difficulties in studying and test anxiety may lead to a delayed completion of the medical degree [213]. These interruptions can further facilitate stress. Furthermore, the study conditions at each institution contribute to the burnout rate in medical students [73]. Each student employs individual learning strategies. A growing research interest exists in self-regulated learning. Self-regulated learning entails a proactive approach with behavior maximizing the effects of learning. Medical students who apply this method are experiencing academic success, accomplishments in clinical skills and improvements in mental health [44]. On the other hand, medical students who adopt a surface learning approach are confronted with poorer academic performance due to the temporary learn effect [25]. Medical students have also indicated that team-based learning in comparison to problem-based learning is the preferred method complimentary to learning, commitment and participation [37]. With the ever-increasing expansion of the internet, a growing number of students avoid traditional printed books as learning resources and make use of e-learning means. One third of medical students report not having read the course textbook and only forty percent of students partake of personal study groups [222]. Health professional teachers should adapt to the evolving technology and their students' transformed study habits by providing online accessible learning material.

#### **6.1.5. Category “Wellness Events”**

Wellness events are much more common at US American medical schools (eleven percent) than at German medical universities (seven percent). Germany's extent to wellness is limited to services offered at four different university sports centers in Bonn, Bochum, Köln and Heidelberg. Membership is free and students are able to partake in workshops and events presented around the year. These include theoretical ideas such as mindfulness and mental training but also physical activities like yoga. However, they are subject to registration and allow only a limited number of participants. The United States in contrast attaches greater importance to occasions which are staggered throughout the year, often restricted to a few fun filled hours, a stress relief day or a wellness week. These events are organized by various committees with a focus on outdoor adventures and simple activities such as crafting, tai chi, road races and barbecues. The wide variety draws students from all walks of life to participate and allocates room for spontaneity.

A potential countermeasure to stress is found in physical exercise. Physical exercise has demonstrated the capacity to reduce levels of depression, anxiety, and emotional exhaustion [40,41]. The risk of burnout has been shown to negatively correlate with healthy exercise habits in medical students [72]. A recent study concluded that medical student participation in group exercise classes imposes an added benefit to individual fitness in regards to decreased levels of stress and improved quality of life [269]. The social aspect of group activities is therapeutic. Conversely, medical students are grounded in a sedentary lifestyle mostly comprised of attending classes and studying, yet when they are able to engage in physical activities, they foster interrelationships and enhance their mental health in the process. Furthermore, medical students who value physical engagements are also more inclined to promote the importance of physical action to their patients [91]. Being physical active can positively influence many qualities in life, leading to a healthier lifestyle with fewer consequences of stress. Social physical activities should be included in every medical school's wellness initiative to lower future burnout rates.

## **6.2. Evaluations of the Programs at US American Medical Schools**

It is noteworthy that only two correspondents of US medical schools state evaluations have been performed: Florida International University Herbert Wertheim College of Medicine and Drexel University College of Medicine. It was not further elaborated on what types of methods are utilized for these evaluations, only that they are being executed. It is unclear if the programs are assessed for overall satisfaction or rather for specific impacts devised by each course content; both being indispensable. Essentially, each program should be appraised of its effectiveness and efficiency to further improve and expand the already existing program. Six out of the ten responding institutions simply disregarded the inquest concerning possible evaluations taking place. If assessments are being implemented at these medical schools, it is unknown. Thus, the second hypothesis has been validated

Not only should inquiries be made regarding the competence of each program, but also explorations into which specific content related approaches medical students respond to the most should be undertaken. Furthermore, it is consequently relevant to check whether programs integrated into the curriculum affect stress levels of medical students differently than courses offered as part of an extracurricular service. Additionally, it is worthwhile

to know if a distinction can be observed between voluntary compared to mandatory participation. These concerns should be integrated into the evaluation methods.

### **6.3. Recommendation for Stress Prevention Measures regarding Medical Students**

The researched programs in the United States as well as Germany focus on medical students developing effective coping strategies ensuring a better management of stressors related to the medical profession, beginning in the medical education. It is transparent that an expansion of these programs is needed in all categories listed. By increasing the supply and easing the access of mental health services, the stigma associated with mental health may be reduced, prompting more medical students to seek out help. Feelings of stress and its consequences should be addressed within the scope of the medical training.

In addition, based on the email correspondence and descriptions written on individual medical schools' websites, most institutions have recognized the importance of stress prevention measures and taken initiatives to extend existing stress management programs every year. However, it appears that only a limited amount of exchange regarding information, knowledge and experience occurs between the medical schools. An improved cooperation between the medical schools across each country should be pursued to further improve primary as well as secondary prevention of burnout and usage of coping strategies.

The continual expansion of programs represents a significant step. Nonetheless, each university can further reduce the perceived stress of their students by modifying the structure of the medical program itself, identifying root causes of stress embedded within the curriculum. Since the 2009/2010 academic year, the Saint Louis University School of Medicine has already been applying major curricular changes into their preclinical program. Alterations in "course content, contact hours, scheduling, grading, electives, learning communities, and required resilience/mindfulness experiences" were established. Assessments have shown these new modifications correlate with significantly reduced symptoms of depression, anxiety and stress, as well as significantly higher levels of community cohesion in their student body [234]. The University of Virginia School of Medicine as well as the Mayo Medical School reported a similar change in their students' well-being when the letter grading system was changed to a pass/fail system. They described an improved psychological well-being without a

reduction in performance [26,203]. The pass/fail grading systems presents a notable option for medical schools since it shows an association with improved well-being without any significant change in test scores. Additionally, the curriculum should balance clinical as well as non-clinical exposure time. Increased clinical encounters lead to fewer occurrences of burnout and stress in medical students [260]. To ensure a successful execution of curricular changes, student representatives are vital by providing crucial input based on their experiences; they provide feedback and ease the transition [267]. It is frightening to comprehend that progressively more medical students appear to accept inferior teaching as normal, necessary, and sufficient [216]. Medical schools need to retain their students' trust in providing quality education while shaping healthy minds of future medical professionals.

In an effort to facilitate change, Germany has launched reformed medical programs at numerous universities; the Charité University in Berlin being the first to implement these changes in the fall of 1999/2000. The new educational structure focuses on teaching concepts revolving around comprehensive organ-systems. For instance, one module would concentrate on the topic of respiration where all subjects including the anatomy of the lungs, the physiology as well as clinical diseases such as pneumonia are included. Students encounter patient contact from the very first semester and are confronted with case-oriented learning. Since this structure does not allow for a separation between pre-clinical and clinical section of the medical training, the first examination at the end of the pre-clinical time frame no longer applies. This significant alteration relieves pressure on the students and reduces feelings of stress and anxiety. Furthermore, instead of lectures held in vast auditoriums, lessons are often taught in small group settings. The increased contact between student and medical professional, as well as the clear outline of requirements and fewer concerns of competitiveness, all lead to increased levels of student satisfaction when compared to traditional medical education programs in Germany [143]. The traditional programs could start by initiating small changes targeting a closer relationship between the student body and faculty as well as implementing a pass/fail grading system.

US American medical schools receive regulations and guidelines from the LCME to instigate services supporting medical students coping with study related stressors. To date, no comparable official parameters have been initiated in Germany, even though

German medical students face equal feelings of stress and anxiety when confronted with their medical training [35]. The introduction of such policies should be considered, forming a uniform foundation of stress management programs in each medical university across the country.

#### **6.4. Conclusion**

Research focusing on the well-being and mental health of medical students has become more prevalent with each passing year. The number of students who are impacted by stress and its effects is staggering and raises alarm, especially considering the rising occurrence of burnout in the medical profession. The examination of US American and German medical schools has shown that many institutions have in fact recognized this concern and begun implementing structures into their educational program, supporting their student body by communicating coping skills and basic tools to combat feelings of distress.

Even though more than half of US American medical schools and more than three-quarters of German medical universities offer some type of stress reduction service to their students, there is still room for improvement. Apart from advising as well as mentoring perspectives and arrangements which are already widespread in both countries, there is an overall lack of comprehensive programs readily accessible to medical students. Germany especially needs to expand on extracurricular approaches, providing the space for spontaneity and community cohesion. For the existing programs, more comprehensive evaluations should be considered to improve their effectiveness in order for students to obtain the most benefits. To maximize the advantages, medical institutions should take part in an exchange of information and experiences regarding their effective course offers. This appears to be a rarity at the moment and should be practiced more often, giving more medical students the opportunity to partake in particular worthy programs.

## **7. Summary**

An ever-increasing prevalence of depression, anxiety, and stress perception exists regarding medical students in comparison to other same aged peer groups, not only in Germany but also in the United States.

Forty-eight United States medical schools were identified to be directly addressed per email requesting further information regarding their programs, by performing an impact focused literature research of PubMed as well as a website search of all 147 United States medical schools at the time, reviewing the available resources and publications. The email responses were evaluated and examined for format, time duration, participants and possible evaluations, and compared to German publications focused on this issue up through the year 2017. The German findings were further updated by reviewing the websites of all German medical schools to include all services offered up to the fall of 2018.

Results show that both countries, the United States as well as Germany, have recognized the importance of this issue and have begun to address it. Eighty six percent of German medical schools offer some type of stress reduction service to their students, while sixty eight percent of US American schools do as well. Mentoring and advising services are widespread in both countries. While the United States focuses on extracurricular wellness activities and a wide variety of services emphasizing the teachings of mindfulness, German universities are concentrating their stress relief efforts on structured programs geared especially towards stress reduction. After sending out inquiries to selected US American schools for further information, a low response rate of thirty-seven percent was recorded. Only ten medical schools decided to contribute. Two correspondents stated evaluations are being conducted.

Even though steps are being taken and more programs are being implemented each year, there is still a shortage. The United States should elaborate on holistic programs while Germany should expand on their offer of extracurricular services. Furthermore, the effectiveness and efficiency of the already established courses should be assessed by more comprehensive evaluations. Overall, an improved cooperation between the medical schools across each country should be pursued, maximizing the effects of each program on the mental health of medical students.



## **8. Zusammenfassung**

Studien haben erwiesen, dass eine erhöhte Prävalenz von Depression und Angstgefühlen mit psychischem Stressempfinden bei Medizinstudierenden im Vergleich zu Altersgleichen besteht, nicht nur in Deutschland, sondern auch in den USA.

Mittels einer Literaturrecherche über PubMed, welche auf Impact geordneten Publikationen fokussiert war, sowie einer Recherche der Webseiten von allen 147 US-amerikanischen medizinischen Fakultäten, wurde eine Auswahl von 48 US-amerikanischen medizinischen Universitäten vorgenommen, welche im Verlauf per Email gezielt hinsichtlich ihrer Stressbewältigungsangebote kontaktiert wurden. Diese sollten Angaben zu Organisation/Struktur, Bestehensdauer, Teilnehmern und möglicher Evaluation beinhalten. Informationen zu den in Deutschland verfügbaren Programmen wurden zusätzlich mittels Literaturrecherche bis einschließlich 2017 aktualisiert. Weiterhin wurde ein Update der deutschen Angebote bis zum Herbst 2018 durch ein erneutes Aufrufen der Webseiten aller deutschen Medizin-Hochschulen gewährleistet.

Ergebnisse zeigen, dass beide Länder den belasteten Gesundheitszustand ihrer Medizinstudenten erkannt haben und immer mehr in präventive Maßnahmen investieren. 86 % der deutschen medizinischen Fakultäten bieten eine Art von Stressbewältigung an, während nur 68 % der US-amerikanischen Hochschulen dies tun. Mentoren-Programme sowie Beratungsangebote sind weit verbreitet in beiden Ländern. Während die USA sich auf Wellness-Aktivitäten außerhalb des Lernplans und ein breites Spektrum an Programmen, basierend auf Achtsamkeit fokussiert, streben deutsche Universitäten eher strukturierte Programme, welche speziell sich auf Stressbewältigung konzentrieren, an. Anfragen an den ausgewählten US-amerikanischen Hochschulen ergab nur eine Antwortrate von 37 %. Insgesamt nahmen nur zehn medizinische Fakultäten an der Umfrage teil. Zwei, der teilnehmenden Fakultäten gaben an, dass Evaluationen der jeweiligen Stressbewältigungsprogramme stattfinden.

Obwohl Schritte eingeleitet und mehr Programme jedes Jahr initiiert werden, besteht immer noch ein Mangel. Die USA sollten ihr Angebot an ganzheitlichen Programmen ausbauen, während Deutschland eher seine extracurricularen Konzepte erweitern sollte. Weiterhin sollte die Wirksamkeit der bereits bestehenden Programme durch umfassendere Evaluationen beurteilt werden. Allgemein sollte ein verstärkter Austausch zwischen den medizinischen Fakultäten des jeweiligen Landes herrschen, um die Effekte der bedeutsamsten Programme zu maximieren.

## 9. Abbreviation Index

AAMC - Association of American Medical Colleges

BLT - Balancing Life Talk

CAPS - Counseling and Psychological Services

COMPASS - Co-leader Orientation in Mindfulness for Patients and Student Support

COR - Conservation of Resources Theory

D-A Fit - Environment's Demands and a Person's Abilities Fit

Dr. - Doctor

e.g. - For Example

Fig. - Figure

GAS - General Adaptation Syndrome

H.E.L.P. - Higher Education for Learning Program

IBAM - Integriertes Begleitstudium Anthroposophische Medizin

IBRG - Implicit Bias Research Group

i.e. - In Essence

ILWG - Innovation Lab Working Group

JLU - Justus-Liebig University

KIT - Karlsruher Institut für Technologie

LCME - Liaison Committee on Medical Education

MBSR - Mindfulness-Based Stress Reduction

MCAT - Medical College Admission Test

OSCE - Objective Structured Clinical Examination

PAW - Practical Approaches to Wellness

PD/ Priv.-Doz. – Privatdozent

P-E Fit - Person-Environment Fit

P-J Fit - Person-Job Fit

P-O Fit - Person-Organization Fit

S-O-R Framework - Stimulus Organism Response Framework

STREAM - Mind-Body Skills Training for Resilience, Effectiveness, and Mindfulness

S-V Fit - Environment's Supply and a Person's Values Fit

TAO – Therapy Assisted Online Program

TMD - Total Mood Disturbance Scale

TMS - Test für medizinische Studiengänge

VMS - Vanderbilt Medical Student

WHO - World Health Organization

WOC - Ways of Coping Checklist

## 10. Figure and Table Index

**Figure 1:** *Adapted from* Mehrabian A, Russell J A (1974) An approach to environmental psychology. The MIT Press, Cambridge, MA, US

**Figure 2:** *Adapted from* Yerkes R M, Dodson J D (1908) The relation of strength of stimulus to rapidity of habit-formation. *J. Comp. Neurol. Psychol.* 18(5): 459–482

**Figure 3:** *Adapted from* Ross R R, Altmaier E M (1994) Intervention in Occupational Stress: A Handbook of Counselling for Stress at Work. Sage Publications (CA)

**Figure 4:** *Adapted from* Mayo D, Corey S, Kelly L H et al (2017) The Role of Trauma and Stressful Life Events among Individuals at Clinical High Risk for Psychosis: A Review. *Front Psychiatry* 8: 55

**Figure 5:** Distribution of online listed stress management services at US American medical schools according to each category

**Figure 6:** *Adapted from* Drolet B C, Rodgers S (2010) A comprehensive medical student wellness program--design and implementation at Vanderbilt School of Medicine. *Acad Med* 85(1): 103–110

**Table 1:** Matheny K B, Aycock D W, Pugh J L et al (1986) Stress Coping. *The Counseling Psychologist* 14(4): 499–549

**Table 2:** Outline of online listed stress management services at US American medical schools

**Table 3:** Feedback Overview

**Table 4:** Outline of services at US American medical schools based on email responses

**Table 5:** Outline of online listed stress management services at German medical schools

**Table 6:** Outline of differences between stress management programs

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## **12. Appendix**

- A Email Inquiry to US American Medical Schools
- B Information Sheets of Programs at US American Medical Schools
- C Statement by the Ethics Committee
- D Honorary Declaration
- E Acknowledgments
- F Publication Index
- G Curriculum Vitae

**A. Email Inquiry to the US American Medical Schools**

Email Subject: Academic Research - University of Giessen, Germany: Stress Management

Dear (Name),

The Center for Psychosomatic Medicine at the University of Giessen, Germany, is currently conducting an academic research about stress management initiatives regarding medical students. This inquest is part of a medical doctoral thesis under the leadership of Professor H.B. Jurkat, PhD who initiated such a program for medical students at the University of Giessen. He is a dual national (German-American) and a former Syracuse University graduate.

Studies have shown that an increased prevalence of depression and anxiety, with definite psychological feelings of stress, exist concerning medical students in comparison to other same aged peer groups, not only in Germany but also in the United States. We researched the existence of programs, courses or any events at German and US American medical schools which focus on the topic of helping medical students cope with stress, and found a definite shortage of offers. A preliminary search has shown that your university has realized and addressed this issue.

We would be very grateful, if you could forward us a more detailed set of information and any existing evaluation about the offers at your school, and we will incorporate your institutes programs into the research.

If you are interested in the results of this research, we would be glad to send them to you. This research project is certainly of high importance, and we would like to thank you in advance for your support. If you are not the correct contact person, please let me know who is and/or forward this email.

Sincerely yours,

Lisa Blumoehr

Prof. H.B. Jurkat, PhD



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Medizinisches Zentrum für  
Psychosomatische Medizin

**Klinik für Psychosomatik  
und Psychotherapie**  
Direktor: Prof. Dr. med. J. Kruse

**International study (Germany – USA)  
on stress management courses  
for medical students**

Ihr Ansprechpartner:  
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Gießen  
Az.: J/B

***Comparison of programs and initiatives regarding stress management, including their effectiveness, for medical students in the USA and Germany***

My current research areas include health-related quality of life, stress management, and burnout-prevention. Presently, I have more than 60 publications concerning mental health in the health professions (Physicians, psychotherapists, and dentists).

<https://www.uni-giessen.de/fbz/fb11/institute/klinik/psychosomatik/forschung/stressbewaeltigung>

The Center for Psychosomatic Medicine at the University of Giessen ranks among the top departments in Germany in its field.

Being heavily involved in teaching at the medical department, I have initiated a successful stress management program for medical students "Stressbewältigung im Medizinstudium" (see link below) in 2008. The seminar consists of 8 group sessions lasting 3 hours each combining relevant themes with practical tips targeted especially towards learning strategies, supplemented by individual sessions on demand. The students learn about methods of stress management and relaxation, including autogenic training, as well as a better hold of study strategies and test anxiety. The administered evaluations have shown lower levels of depression indicating a successful implementation of the above mentioned stress management measures. Initial publications on course effectiveness have been submitted.

In extension to this, one of my medical doctoral candidates (Lisa Blumöhr) and myself are interested in how other universities in Germany and the USA have addressed these issues and how effective they have been in their efforts. Based on preliminary research, we selected all universities with stress management programs or initiatives suitable for comparison.

Results of this study will be submitted to a major English-speaking medical journal and will be supplied to you on request.

For further information we can be reached at:

PD Dr. Jurkat [harald.b.jurkat@psycho.med.uni-giessen.de](mailto:harald.b.jurkat@psycho.med.uni-giessen.de) or

Lisa Blumöhr [lisa.blumoehr@med.uni-giessen.de](mailto:lisa.blumoehr@med.uni-giessen.de)

(PD Dr. H.B. Jurkat, Dipl.-Psych.)

(Lisa Blumöhr, BA, BS)

<https://www.uni-giessen.de/fbz/fb11/studium/foerder/stress/praxiskurs-stressbewaeltigung-im-medizinstudium>



## **B. Information Sheets of Programs at US American Medical Schools**

### **B.1 Thomas Jefferson University**

#### Mindfulness Meditation

#### A Four-Week Course for First Year Medical Students

Thomas Jefferson University

Mindfulness meditation involves the cultivation of self-awareness and compassion. Mindfulness training has the potential to prevent burnout which has reached epidemic proportions among students and can result in compassion fatigue and erosion of professionalism. A 2003 study conducted at Jefferson has shown that students participating in a mindfulness-based stress reduction program demonstrated significantly reduced mood disturbance, including reductions in anxiety and fatigue, and improvements in vitality.

This current 4-week mindfulness course consists of a total of four sessions, one per week, each one and a half hours long. The course is limited to a total of 50 students.

#### Week 1:

- Defining and understanding mindfulness and the attitudinal foundations of mindfulness
- Brief discussion of the history of mindfulness and research on the potential benefits of mindfulness-based interventions
- Practice: relaxing sighs (a relaxation practice to down regulate the stress response and promote more relaxation in the body)
- Formal mindfulness practice: mindful movement and body scan meditation
- Home practice: 3 relaxing sighs anytime anywhere; body scan meditation (10 or 20 minutes with audio recordings)

## Week 2:

- Practice: Body scan meditation
- Mindful speaking and listening: dyad discussion of experience of meditation
- Group discussion of practice
- Didactic – discussion of stress and the role of perception in shaping experience
- Practice: Mindful movement and sitting meditation with awareness of breath
- Home practice: alternate body scan with sitting meditation (10 or 20 minutes with audio recordings)

## Week 3:

- Practice: Sitting meditation – awareness of breath, body and sound
- Discussion of practice and home practice
- Practice mindful speaking and listening in dyads – discussing something that is currently challenging; learning to listen mindfully
- Group discussion of mindful communication
- Practice: Mindful movement (qigong)
- Home practice: choice of formal practice – body scan, sitting meditation or movement.

## Week 4:

- Practice: Body scan meditation
- Brief practices: 3 relaxing sighs; soles of the feet; 3-minute breathing space
- Discussion of resources to continue mindfulness practice

## **B.2 Georgetown University School of Medicine, Washington, DC**

### ***Mind-Body Medicine: An Experiential Introduction***

***Georgetown University School of Medicine***

***Washington, DC***

#### ***Mind-Body Medicine Course Description***

*Mind-Body Medicine: An Experiential Introduction* is a course that is being offered to first and second year medical students, graduate physiology students, nursing students, law school students and faculty members. Each class (10 students per class) meets for 2 hours once a week for 11 weeks with two faculty members who co-facilitate the sessions. Of utmost importance is the creation of a safe environment where positive, supportive, non-judgmental interaction can take place among the students and facilitators. During the initial part of each session, students are encouraged to share personal insights and reflections and to discuss personal and professional issues that arise as they continue their journey through medical school. As students share intimate and sometimes painful aspects of their lives; supportive, collaborative, and collegial relationships are formed. As the course progresses, compassion, trust, integrity and honesty are enhanced among the members of the class.

During the second half of each session, students are presented with background information on a number of mind-body approaches including meditation, imagery, journal writing, biofeedback, autogenic training, art and movement. After having been introduced to the techniques, students are given the opportunity to practice them and discuss their experiences with members of the small group. They have an opportunity not only for individual attention and instruction, but also for sharing what they are learning about mind-body medicine and about themselves. Through mindful systematic self-observation, students often experience periods of stability, clarity, inner peace, balance and perspective; qualities that ultimately enhance professional behavior.

*Georgetown University School of Medicine  
Mind-Body Medicine Course - Level 1  
Curriculum Outline*

Session 1

- Welcoming Remarks
- Opening Meditation
- Discussion of Group Guidelines
  1. Confidentiality
  2. Punctuality
  3. Commitment
  4. I Pass Rule
  5. Home Practice: journal, meditation, exercise
- Introductions
  1. Tell us about yourself  
(family, work, health, reasons for participating in this group, previous group experience, etc)
  2. Personal goal for the group
- Experiential exercise: *Drawings*
  1. Draw yourself:
    - as you see yourself now
    - with your biggest problem
    - as you would like to be
  2. Process Drawings
  3. Collect Drawings

Session 2

- Opening Meditation
- Check-in
- Explanation of *Fight of Flight and Stress Response*
- Biofeedback (introduction of thermistors)
- Experiential exercise: *Autogenics (wearing thermistor)*
- Process Autogenics exercise

*Georgetown University School of Medicine  
Mind-Body Medicine Course - Level 1  
Curriculum Outline*

Session 3

- Opening Meditation
- Check-in
- Eating Meditation  
Process
- Introduce Mindfulness Meditation
- Experiential exercises:  
*Guided Mindfulness Meditation*
- Process *Guided Meditation exercise*

Session 4

- Opening Meditation
- Check-In
- Introduction to Imagery
- Experiential exercise:  
*Special Place Imagery*
- Process *Special Place Imagery*

Session 5

- Opening Meditation
- Check-In
- Discussion on Accessing Your Inner Wisdom
- Experiential exercise:  
*Inner Guide/Wise Self/Spirit Guide*
- Process *Inner Guide Imagery*

*Georgetown University School of Medicine  
Mind-Body Medicine Course - Level 1  
Curriculum Outline*

Session 6

- Opening Meditation
- Check-In
- Discussion on Journal Writing
- Experiential Exercise:  
*Dialogue with a Symptom, Body Part or Emotion*
- Process *Dialogue with a Symptom*

Session 7

- Opening Meditation
- Check-In
- Working with Physical Energy and Emotional States
- Experiential Exercise:  
*Shaking and Dancing*
- Process *Shaking and Dancing*

Session 8

- Opening Meditation
- Check-In
- Discussion on the Power of Forgiveness
- Experiential exercise:  
*Forgiveness Meditation*
- Process *Forgiveness Meditation*

*Georgetown University School of Medicine  
Mind-Body Medicine Course - Level 1  
Curriculum Outline*

Session 9

- Opening Meditation
- Check-In
- Introduction to Walking Meditation
- Experiential exercise:  
*Walking Meditation (Building D garden)*
- Process Walking Meditation

Session 10

- Opening Meditation
- Check-In
- Experiential exercise : *Drawings*
  1. Draw yourself
    - as you see yourself now
    - as you would like to be
    - how you are going to get there
  2. Process and compare with first set of drawings (completed in Session 1)

Session 11

- Opening meditation
- Check-In
- Experiential Exercise: *Closing Ritual*
- Closing Meditation
- Students Complete Survey and Evaluation Forms

## B.3 University of Pittsburgh



University  
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### Mindfulness for Medical Students Mini-Elective Spring 2016

**Course Dates:** TBD

**Maximum Students:** 15

**Class Year:** MS1

**Course Director:** Lee K. Wolfson, M.Ed.

Lee K. Wolfson, M.Ed. is a licensed psychologist who provides psychological services to the medical students at the University of Pittsburgh Medical School. He worked at Western Psychiatric Clinic and Institute for 21 years as a clinician. He received training in Mindfulness Based Stress Reduction from Jon Kabat-Zinn in 2005 and then taught MBSR to the medical students for 3 years. He has taught mindfulness meditation in a variety of settings.

**Contact Information:** Lee K. Wolfson, M.Ed.  
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**Registration:** Betsy Nero, Office of Medical Education  
[betsy@medschool.pitt.edu](mailto:betsy@medschool.pitt.edu)

**Description:**

This mini-elective, modeled after the Mindfulness Based Stress Reduction (MBSR) program, will give students immediate skills for stress reduction and set the foundation for life-long mindfulness and compassion. As described by founder John Kabat-Zinn, mindfulness is "paying attention on purpose, in the present moment, and nonjudgmentally." Research has shown participation in an MBSR class can lead to a reduction in CAD, hypertension, chronic pain, anxiety, headaches, depression, as well as improvements in overall quality of living. Mindfulness programs have gained impressive momentum across the world. They have become increasingly popular in helping physicians deal with burnout and job-related stress and have even been used to promote physician empathy and subsequently improve job performance. Now, at the beginning of medical training, is the perfect time to introduce mindfulness as a tool to improve not only the physician's life, but also the doctor-patient relationship.

The mini-elective consists of weekly two-hour sessions for six weeks. Each session will include a formal 30-45 minute meditation practice as well as other exercises and group discussion. Participants are asked to continue to practice on days without sessions. Participants will develop personal skills as well as a knowledge base that can be shared with future colleagues and patients who might benefit from this practice.

**Objectives:**

1. Participants will learn to practice the body scan, sitting meditation, and mindful yoga to improve their present moment awareness. They will also learn ways to incorporate mindfulness into their lives outside of these formal practices.
2. Participants will become familiar with the literature and mechanisms supporting the effects of mindfulness practice.
3. Participants may experience decreased stress, leading to better problem management and healthier lives.



4. Participants may also experience increased compassion, better listening skills, better concentration, improved sleep, better ability to cope with pain, and improved relationships, to name a few common 'side effects' of mindfulness.

**Requirements:**

1. Attend and participate in all sessions.
2. Complete formal practice (30-40 minutes) five days/week, in addition to the weekly class session.
3. Complete at-home informal exercises during some weeks. These are very short. Students will be asked to jot down a few observations each day or simply take a different approach to an everyday task.
4. Bring a yoga mat to some sessions.

**Pre-Requisites:**

An open mind and willingness to fully participate in the course and see where it takes you!

**COURSE OUTLINE**

**Mindfulness for Medical Students**

Day of week and time of day (TBD)

Class location - William Pitt Union—Room TBD

**Course Director(s):**

Lee Wolfson, M.Ed.

**Participating Faculty:**

Lee Wolfson, M.Ed., Others TBD

**Texts/Required Reading:** Optional reading materials (articles, research papers) will be given out in class.

**Session One** – Introduction and body scan. This meditation practice helps bring awareness to body sensation. Time during this session will also be spent introducing the course.

**Session Two** – Mindful yoga. This very light form of exercise is meant to introduce participants to the practice of yoga and increase body awareness.

**Session Three** – Sitting meditation. This type of meditation brings awareness to breath, body sensation, sounds, and thought.

**Session Four** – Walking meditation. Mindful walking is a practice of being present in everyday actions.

**Session Five** – Loving-kindness ("Meta") meditation. Loving-kindness is practiced to increase compassion and nonjudgmental acceptance of all people and beings, including oneself.

**Session Six** – The course will end by circling back to the body scan as the formal practice for this session.

**All sessions:** All sessions will include shorter exercises, such as breathing exercises, mindful eating, or listening exercises. All sessions will also include group reflection of progress through the course, including discussion of formal practice and informal at-home exercises.

## B.4 Florida International University Herbert Wertheim College of Medicine

### Activity Summary

#### FIU HWCOC Wellness Activities

Academic Year 2015-2016

The members of **FIT & WELL Program** and **PLC Wellness** at FIU HWCOC strive to enhance the holistic environment of the College of Medicine by promoting the well-being of HWCOC students, offering a range of instructor-led events that include a focus on physical exercises, wellness presentations, and interactive discussions. The FIT and WELL and PLC Wellness events promote physical, intellectual, and emotional growth while fostering personal and social learning and development. We view our mission as being one of health promotion (through educational outreach) and believe we play an important role in helping to create a climate within HWCOC that fosters emotional, psychological, intellectual, and interpersonal growth for our medical students.

The wellness activities align with the medical education curriculum guidelines described as Educational Program Objectives (EPOs), as well as the AAMC's Physician Competencies Reference Set (PCRS). These guidelines provide students' opportunities to primarily: (1) demonstrate the qualities required to sustain lifelong personal and professional growth (8.0 Personal and Professional Development), (2) demonstrate healthy coping mechanisms to respond to stress (8.2), (3) manage conflict between personal and professional responsibilities (8.3), and (4) practice flexibility and maturity in adjusting to change (8.4).

#### FIT & WELL PROGRAM

*Yoga (123 students)
*Tai Chi (81 students)
*Strength Conditioning (27 students)
*Basketball (138 students)
*Salsa Dance (45 students)
Meditation Series (30 students)
Aromatherapy (32 students)
Stress Management Series (55 students)
Mindfulness Workshop (25 students)
Burnout Series (35 students)
Cultivating Resiliency (29 students)
Understanding Procrastination (23 students)
Essentials of Calm Breathing (36 students)
Massage Techniques (24 students)

#### PLC WELLNESS (NEW)

Student Nutrition and Cooking Series (SNACS)
Medical Student Healthy Cooking Demos

\* These events run every week to two weeks-attendance is the sum of students who attended these events for the entire year.

#### EXCERPT FROM END OF YEAR STUDENT SURVEY

Out of the 128 students who completed the end of the year survey regarding wellness activities at HWCOC, 71% indicated that they would "extremely likely/somewhat likely" share wellness information with others, 83% indicated that they would "extremely likely/somewhat likely" incorporate wellness activities into their lifestyle, 74% indicated the impact of the exposure to wellness programming provided by HWCOC was extremely impactful/moderately impactful.

#### FIT & WELL COMMITTEE MEMBERS

**HWCOC Faculty:** Dr. Jorge Mora, Dr. Suzanne Minor, Dr. Heidi von Harscher, and Dr. Nathaly Desmarais

**HWCOC Staff:** Scarlett Aldana-Bosch and Janelle Fernandez

**PLC Wellness:** Jessica Lewis and Ileana Lindsay

**2015-2016 Student Wellness Chairs:** Ashton Sequeira, Katherine Klein, Juanita Melau, and Tyler Kalbec

### **C. Statement by the Ethics Committee**

PD Dr. H. B. Jurkat received a positive verdict by the Ethics Committee of the Justus-Liebig University's Medical Faculty. (File number / Aktenzeichen: 188/19)

## **D. Honorary Declaration**

### Erklärung zur Dissertation

„Hiermit erkläre ich, dass ich die vorliegende Arbeit selbständig und ohne unzulässige Hilfe oder Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe. Alle Textstellen, die wörtlich oder sinngemäß aus veröffentlichten oder nichtveröffentlichten Schriften entnommen sind, und alle Angaben, die auf mündlichen Auskünften beruhen, sind als solche kenntlich gemacht. Bei den von mir durchgeführten und in der Dissertation erwähnten Untersuchungen habe ich die Grundsätze guter wissenschaftlicher Praxis, wie sie in der „Satzung der Justus-Liebig-Universität Gießen zur Sicherung guter wissenschaftlicher Praxis“ niedergelegt sind, eingehalten sowie ethische, datenschutzrechtliche und tierschutzrechtliche Grundsätze befolgt. Ich versichere, dass Dritte von mir weder unmittelbar noch mittelbar geldwerte Leistungen für Arbeiten erhalten haben, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen, oder habe diese nachstehend spezifiziert. Die vorgelegte Arbeit wurde weder im Inland noch im Ausland in gleicher oder ähnlicher Form einer anderen Prüfungsbehörde zum Zweck einer Promotion oder eines anderen Prüfungsverfahrens vorgelegt. Alles aus anderen Quellen und von anderen Personen übernommene Material, das in der Arbeit verwendet wurde oder auf das direkt Bezug genommen wird, wurde als solches kenntlich gemacht. Insbesondere wurden alle Personen genannt, die direkt und indirekt an der Entstehung der vorliegenden Arbeit beteiligt waren. Mit der Überprüfung meiner Arbeit durch eine Plagiatserkennungssoftware bzw. ein internetbasiertes Softwareprogramm erkläre ich mich einverstanden.“

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Ort, Datum

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Unterschrift

## **E. Acknowledgments**

Foremost, I would like to express my sincere gratitude to my advisor Priv.-Doz. Dr. biol. hom. Harald B. Jurkat, Dipl.-Psych. B.S., for the provision of the topic as well as the continuous support of my study and research. His patience, motivation and immense knowledge has been a tremendous guidance in the pursuit of this dissertation.

My deepest appreciation also goes to all the correspondents of the contacted US American medical schools. For the avid interest in this study and their willingness to provide information, through which this work has been made possible in the first place.

Last but not least, my biggest thanks goes to my family whose love and guidance are with me in whatever I pursue. I would like to thank my parents especially for all the time and effort they put forth in proof-reading and constructing corrective suggestions.

## **F. Publication Index**

**Blumöhr, L. & Jurkat, H. (2019).** Comparison of Programs Regarding Stress Management and Specific Coping Services, Including their Effectiveness, for Medical Students in the USA and Germany. *Deutsches Kollegium für Psychomatische Medizin Kongress 2019, (Abstractband), 192.*