



MATHEMATICAL KNOWLEDGE IN STRESS MANAGEMENT: A LITERATURE REVIEW

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Abstract

Stress is one major issue associated with daily living, and its proper management is an indispensable key to proper and comfortable living. Mathematics just like stress is an integral part of daily living, with its knowledge dictating to a certain extent the flow of activities in all areas. Considering the applicability of mathematics in every aspect of living, it isn't too far-fetched to assume it also influences stress and its management process. Thus, this review was designed to look into the concept of stress, its management technique, and the role and presence of mathematics knowledge in its management. This review explored the various categories of stress management techniques, including flexibility, awareness, time management and organization, exercise, relaxation, etc. Taking account of the various techniques, the applicability of mathematics knowledge and skills in the process of stress management is then shown with its influence felt through everyday numeracy, the cognitive development and organization skills associated with the knowledge of mathematics, etc. Thus, it is shown that knowledge of mathematics is not only present but necessary in managing stress.

Key words: Mathematics, management, stress, knowledge, skills

Introduction

Mathematics is part of our everyday life and it affects the quality and standards of our life and professional orientation on a large scale. Hadanova and Nocer (2016) state that mathematical knowledge is required for effective living in contemporary society today. Taking into account its universal applicability to all aspects of living, it is only natural to conclude that the influence of mathematics and its knowledge is present when dealing with the issue of stress.

Stress is a phenomenon that is one special characteristic of life as it is present in all aspects of living. This makes it one of the most vital subjects of mental health research and complex area in psychology and sociology in the current century (Shahsavarani, Abadi&Kalkhoran, 2015). Esch and Stefano (2010), describe stress as a mechanism utilized by organisms to adjust to externally or internally challenging situations. It can be said to be the body's reaction to changes, which results in physical, emotional, and mental responses.

Once left unchecked, stress can quickly become damaging (Patal, 2013). It has the potential to negatively influence and harm all aspects of an individual's life and has been associated with a range of negative symptoms, tainting not only an individual's wellness but also their decision-making. Continued ongoing stress promotes the development of more serious mental issues, most notably anxiety and depression (Moynan, Maes, Wray & Berk, 2013).

Considering the effects of stress on man, the management of stress becomes an integral part of successful living. Stress management can be described as procedures and techniques designed to help individuals deal more effectively and healthily with their stress response.

Thus, this review was designed to explore the concept of stress, its effect, and management techniques, and the need and presence of mathematics knowledge on those management skills/techniques.

Nature and Importance of Mathematics

Mathematics as a fundamental matter of real-life covers all aspects of the world (Salout, Behzadi & Maryam, 2013). The scope of mathematics exceeds being just a school subject; it is a necessary aspect of daily living and supports all-around personal development (Mkomango et al, 2012; Hadanova & Nocer, 2016).

Though there are several definitions of mathematics, its complex nature has made it that there is no universally accepted one. Roohi (2011), defined mathematics as a branch of science concerned with numbers and their operations and characterized by calculation, computation, and solving of problems and largely deals with abstract concepts. It has historically developed through the use of abstraction and logical reasoning and is characterized by an exact, precise, systematic, and organized framework (Okafor & Anaduaka, 2013).

Mathematics is a key factor in the progress of our world. It is the fundamental basis of universal knowledge, characterized by its important role in production, science, and technology as well as in discovering the laws of events and phenomena around us (Mkomango et al, 2012). The application of mathematics to daily life is one major attribute that makes it so important, with its usage present in a different form. Skills obtained from mathematics learning have a long range of uses in daily lives, which includes things like waking up to the ringing of an alarm, telling time, deciding on the best product to purchase, etc. (Roohi, 2011).

All careers require a foundation of mathematics knowledge and skills (Salout, Behzadi & Maryam, 2013). It is applied to various fields like nature, technology, physics, chemistry, life

science, accountancy, etc. and it is the basis for scientific and industrial development. Even vocational areas like tailoring and carpentering need mathematics. Its role also extends to recreational activities like playing puzzles, crosswords, basketball, etc. (Hadanova & Nocer, 2016). Many complex systems and structures in our modern society can only be understood using mathematics.

The study of mathematics also impacts a variety of benefits on the learners, especially at a psychological and intellectual level. Okafor and Anaduaka (2013), state that the study of mathematics goes beyond acquiring computational skills; it also encourages the habits of self-reliance and problem-solving in the learner equipping them with the skillset needed to tackle real-life problems through unique procedures. Because it is a precise subject that cannot be learned through vagueness, it trains and disciplines the mind of the learner. Mathematical knowledge also promotes other psychological benefits like the habit of accuracy, and logical, analytical, and systematic thinking. It assists in better organization of ideas and accurate expression of thoughts. The successful study and understanding of mathematics can also be personally satisfying and empowering (Roohi, 2011). Mathematics is also necessary for the development of infrastructure, largely due to its influence over all forms of engineering. It is used for the construction of roads, stadiums, buildings, flyovers, dams, airports, etc.

Mathematics Knowledge and Skills

The nature of the mathematical body of knowledge is not static but ever-changing (Mkomango et al, 2012). There has been a wide variety of views of what entails mathematics knowledge. Mathematics knowledge does not imply detailed knowledge of complex sophisticated mathematical formulas and equations, etc. but rather a broad understanding and appreciation of what mathematics is capable of achieving. It involves knowing and applying basic mathematics in our everyday living (Ojose, 2011). Wedege (2010), states that mathematics knowledge is an individual's capacity to identify and understand the role that mathematics plays in our modern world, to make well-founded judgments, and to use and engage with mathematics in ways that meet the needs of that individual's life.

A mathematically knowledgeable individual can estimate and interpret data and use it to solve day-to-day problems, reason in numerical, graphical, and geometric situations, and communicate using mathematics (Ojose, 2011). An important part of mathematics knowledge is using, doing, and recognizing mathematics in a variety of situations. It includes using mathematics to deal with issues that lend themselves to a mathematical treatment.

Ernest (2005) highlighted various categories of knowledge to be derived from the study of mathematics. This includes functional numeracy which enhances basic mathematical and numeracy skills adequate for daily living and general employment, practical work-related knowledge improves the ability to solve practical problems especially those centered in industries and work environments with mathematics, advanced specialist knowledge necessary for advanced knowledge for mathematics specialists, mathematical problem posing and solving essential in deploying mathematical knowledge, skills and powers in solving mathematics problems, mathematics confidence and the appreciation of mathematics as an element of culture, history, and society.

Being knowledgeable in mathematics comes with certain skills, that are derived from it. Mathematics skills are intertwined with 21st-century skills (Gravemeijer, Stephan, Cyril, Lin & Ohtani, 2017). Mathematics skills include; critical thinking and problem solving, collaboration across networks, agility and adaptability, effective communication, accessing and analyzing information, and curiosity and imagination.

Stress: Nature and Meaning

Due to its ambiguous and broad nature, the concept of stress has over time been associated with a series of definitions. It is a major topic of interest to various professionals including those from the fields of medicine, social science, psychology, and even zoology. Hans Selye (considered to be the father of stress research), defined stress as a body's non-specific response to demand. Shashavarani et al (2015) describe the concept as a feeling of mental press and tension.

Looking further into the concept, stress can be said to be our body's response to any change, threat, or pressure put upon it, whether external or internal. Our body's reaction once faced with a threat or challenge, entails stress. Therefore, it could be said stress is any worrisome response to unexpected or expected demands of everyday living that can impact negatively on the psychological and physiological wellbeing of the individual. Thus, the American Psychiatric Association (2014) states that it influences people in every age, gender, race, and condition, and its impact is capable of being felt in both physical and psychological health.

Mostert et al, (2008) cited a categorization of the definitions of stress into three types; stimuli-based, response-based, and the stressor-strain interaction. The stimulus-based approach views stress as external factors or forces imposing on an individual in a disruptive way. The response-based approach sees stress as an individual's physiological or psychological response to intense situations. The stressor-strain interaction approach draws from the two other category-defining stress as both the stimuli from the environment and the response from the individual.

Another perspective for looking at stress is as a state triggered by an imbalance between demands, and our supposed abilities to meet those demands (Geber, 2011; Shashavarani et al, 2015). This paints the picture that events or demands are not in their nature stressful, but the individual's perception interprets them as such. This is mostly associated with situations where there will be major consequences of not meeting those demands. For instance, the inability of a man to care for his family's needs.

Even a moderate amount of stress has been linked with a lot of behavioral changes including things like loss of happiness, restlessness, irritability, and anger, and so on. It is most time the first stage towards depression UNB Writing Centre (UWC, 2011). There is also growing evidence that distress adversely affects cognitive and emotional processes such as memory, attention, and fear conditioning (Starcke et al, 2011). Leblanc (2009), states that stress also influences our decision-making, mostly leading to hyper-vigilant decision making. Such situations in life need to be managed properly among individuals for the peaceful co-existence of humans within society.

Stress Management

Stress management techniques can be referred to as self-care practices which are engagements in behaviors that help to maintain and promote physical and emotional health, thus reducing the instances of stress. Kassymova et al (2018) state stress management as a range of processes involving physiological, cognitive, behavioral, or psychological methods, usually applied in combination with each other and utilized in dealing with and abating the presence and the effects of stress.

In its most basic form, stress is managed through coping mechanisms/techniques. Coping mechanisms are rote thought patterns or behaviors that reduce or neutralize stressors, or their impact on us (Geber, 2011). It is our mind and body's natural effort designed to manage stressful situations. Individuals are known by complex coping strategies as part of the

socialization and maturation process. It differs widely from one person to another. For example, a man who cannot sustain the financial needs of his immediate home can decide to abandon his wife and children to another destination unknown to his family. This type of thought comes automatically, as a medium for reducing stress.

Leblanc (2009), highlighted a classification of coping mechanisms into three main categories; problem-focused coping, emotion-focused coping, and avoidance coping. Problem-focused coping involves addressing the problem (e.g. focusing on the next course of action rather than the current situation). Emotion-focused coping involves reducing or managing the emotional response (e.g. focusing on and venting of emotions). Avoidance coping involves avoiding or distracting oneself from the situation (e.g. immersing oneself in work to not think of problems at home). The coping mechanism of any individual is largely influenced by their locus of control.

Skills and Techniques in Stress Management

Effective stress management strategies as outlined by various authors include; flexibility, awareness, rest/relaxation, exercise, building an effective social support system, building an internal locus of control, organization/time management, alteration of external factors, nutrition, and dietary changes (UWC, 2011; Myers et al, 2015; Esch & Stefano, 2010).

Flexibility as a stress management technique is closely linked with an individual's attitude and thought process. It involves training the mind to accept change, disappointment, and even failure with genuine composure. It involves developing the mental framework to try again, or try something new, if things don't work out, this largely improves reactions to potential stress situations (UWC, 2011). Being flexible also involves being able to adapt to stressful situations that cannot be avoided or changed (Patal, 2013). It includes activities like reframing problems and viewing a stressful situation from a more positive perspective. It also involves taking a larger perspective of the stressful situation, like when stressed out, an individual will be bound to feel better if he questions whether that he would even remember the situation in a month, a year, or five years, or if it would matter by then.

Awareness involves understanding and recognizing an individual's cause and reactions to stress. As Patel (2013) noted, stress management starts with identifying the sources of it in an individual's life, as this is necessary if any improvement is to take place. Perhaps an individual is constantly stressed about not meeting deadlines, but it might be the individual procrastination tendencies rather than the job demands, that cause that stress.

Awareness also involves receiving preparatory information about the possible stressor. Leblanc (2009), showed an example of this. He stated that findings from medical studies have shown that when individuals are about to undergo stressful clinical procedures, giving them the appropriate preparatory information about the process, tends to lessen the negative reaction/stress. Preparatory information is hypothesized to work as it renders the stressor well-known, and thus enhances the common sense of an individual's command over the unpleasant incident. The efficacy of preparatory information lies not only in duly informing the individual of the contents of the imminent stressful event but also in providing information about strategies through which persons can cope with the stressor and its effect. A subset of awareness strategy to stress management is the "stress inoculation training". Giga, Cooper, and Faragher (2013) cite it as a potential method of reducing stress response and anxiety, and in enhancing performance under stress, as evidenced by various studies. It is an approach to cognitive-behavioral therapy (CBT) that involves training the individual to acquire useful coping skills, even before being exposed to stress to respond more favorably to stressful events.

It is a three-phase approach. The first phase involves conceptual education, aimed at helping individuals acquire an understanding of stress, its nature, and its effects. The next phase deals with management skill acquisition and rehearsal, aimed at developing and practicing coping skills to reduce anxiety and enhance stress response. The final phase is the application phase involving the application of acquired skills to progressively manage more stressful conditions that mirrors the actual world.

Rest/relaxation has also been cited to be another effective stress management technique. Sleep is the most basic form of rest/relaxation and it is essential as lack of sleep has been associated with an increased stress rate. Myers et al (2012), cited various studies reporting that lack of appropriate sleep contributes to stress. Adequate sleep fuels not only the mind but the body (Patal, 2013). Fatigue caused by lack of sleep will only increase stress and cause irrational thinking and decision-making.

Relaxation also includes techniques like meditation, diaphragmatic breathing, directive, and receptive imagery, progressive muscle relaxation, autogenic training, and massage therapy (Ong et al, 2004). When practiced regularly, meditation has been reported to reduce all appearance of stress, anxiety, tension, and even insomnia. Kassymova et al (2018) state that meditation cultivates mindfulness; a trait that strengthens an individual's connection with parts of the brain associated with relaxation and joy, and can act as a powerful antidote to common daily stress. Diaphragmatic/proper deep breathing releases body tensions and clears the mind, thus improving both physical and mental wellness. Regularly making time out for fun and relaxation and taking a break from life stressors will enable an individual to handle those stressors when they unavoidably come.

Exercise and physical activity are vital in subduing the effects of stress. An exercise routine helps reduce anxiety and can help the individual in dealing with stress which cannot be avoided. Myers et al, (2015) state that exercise and physical activity has been related to emotional wellbeing with studies suggesting that regular moderate physical activity may reduce stress and prevent stress-induced suppression of the immune system. Giga et al (2013) state that exercise programs can help develop continual resilience to stress, protecting individuals from its harmful physical and mental effects, with improvements in vitality and mood being associated with even a relatively mild or moderate exercise.

One exercise/relaxation routine that has been continually recommended for stress management is yoga (Ong et al, 2004). Yoga originates from India, and it is a practice focused on breathing and physical exercises, thereby combining muscle relaxation, meditation, and physical workout (Granath et al, 2006). Although there is a lack of controlled studies, yoga is widely regarded as a promising method for the management and treatment of stress-related issues.

Another stress management technique is building an effective social support system. This involves engaging in activities that promote social interactions. Leblanc (2009) states that individuals, who have access to support when faced with stressful situations, are better equipped at handling those stress, than individuals without a significant social support system. Myers et al. (2015) cited various studies that building up of a social relationship not only with family but with peers has a significant impact on stress, as individuals without a source of social support were found to be more likely to experience stress daily, as these also affect the sense of belonging. Building and maintaining an internal locus of control is another strategy towards mitigating stress. An individual's locus of control entails an individual's perception of their control over a given situation. Individuals with an internal locus of control

believe they have a large control over events happening in their lives; such individuals have been found to deal with stressful situations far more effectively (Leblanc, 2009).

Organization and time management is another notable stress management technique. Ong et al (2004), state that working under the pressure of time or a deadline, is a major source of stress. It is hard to stay calm and focused when an individual is stretched too thin and running behind. Thus adequate time management and organization can help with dealing with and avoiding stressful situations.

Another notable technique under the heading of the organization is keeping a stress journal. This can help an individual to identify the stressors in their life and find ways to deal with them (Patal, 2013). It involves keeping a daily log of stressful situations. This can also act as a form of self-therapy and can make an individual feel much better. Keeping a stress journal can over time enlighten an individual to see patterns and common themes. Common information included in a stress journal is; cause of stress, the feelings it aroused, the individual's response, and what made the person feel better.

The organization may also involve the utilization of to-do lists, analyzing schedules, responsibilities, and daily tasks, so the individual does not end up overloaded with too many tasks (Patal, 2013). Keeping schedules also helps in determining the scale of importance for tasks, so that the most necessary, and convenient one could be attended to first, that is distinguishing the "musts" from the "should".

The alteration of external factors is an approach to stress management that focuses on altering the social, political, and environmental factors, external to the individual but might be contributing to stress. There are multiple levels to this ranging from attempting to modify family dynamics that cause stress to induce societal change. Another approach to the alteration of external factors involves the organization of the environment of the individual in a manner that mitigates against the arousal of stress. Giga et al (2013), cited a similar system called the "Person-Environment Fit (PEF)", an approach that recognized the fact that individual outcomes result from the interaction of the person with his environment. The alteration of the environment includes making even the simplest of adjustments to surroundings to take control of the environment. An example of this is switching off the television if a football match makes an individual anxious.

Proper nutrition and dietary changes also need to be explored when dealing with stress. Well-nourished bodies are better prepared to cope with stress.

There are also various food substances, which continued intake has the property to increase feelings of stress. Thus, their consumption needs to be reduced. UWC (2011) outlined some of those substances/stimulants which include, caffeine, sugar, cigarettes, drugs, and alcohol.

Food intake is an essential human activity and some foods can truly be a source of pleasant feelings or sensations and stress-reducing at times (Esch & Stefano, 2010). This largely depends on the discretion of the individual, as food items like the individual's favorite food are likely to enhance the positive mood of an individual on a stressful day. On the other hand, there is also food that is scientifically proven to be capable of improving mood and hence reducing stress. A common example of this is the banana, which has been reported to create feelings of happiness after consumption. Thus, mathematics knowledge which affects everything about life can be a good source when applied to the management of stress

Mathematics Knowledge and Skills in Stress Management

Considering the applicability of mathematics knowledge and skills to all aspects of life and living, it is only natural that its influences are present in the management of stress. Knowledge of mathematics, and the skills derived from it, influences the various stress management techniques in many ways, and some of them are discussed below;

As noted earlier, knowledge of mathematics develops the mind and promotes logical thinking in individuals. Stat-Analytica (2020), states that it supports the development of critical, logical, and analytic thinking and all-around intellectual/mental development. These skills are useful if one is to be flexible and look at problems from a more positive approach. Logical reasoning and various other cognitive development associated with the knowledge of mathematics also influence an individual's decision-making ability and emotion control to a large extent (Miguel, 2020; Jasper, 2020). Its influence over decisions and emotions, will in turn influence an individual's social relationships and locus of control, which are keys to stress management.

Mathematics also trains the mind for problem-solving, through creative, analytical, critical thinking. This skill is useful to help individuals adapt or react effectively to stressful situations (flexibility or altering the external factors). As Stat-Analytica (2020), noted knowledge of mathematics provides us a broader perspective in solving real-life problems, and stress is an integral part of life problems.

The development of the mental faculty by mathematics also aids individuals in the awareness approach to stress management. As it leads to better understanding and retention of the individual's stress response and retaining and applying preparatory information to deal with stress.

The development of the mental faculty also helps in the organization's approach to stress management that involves journal keeping. The logical, creative and critical thinking ability developed by mathematics enable the individual to thoroughly assess themselves and situations, to ensure more effective journal keeping of their stress and stress situations. Mathematics also helps in finding and understanding patterns (Zorfass & Gray, 2021), which is crucial for an all-around organization. Mathematics is a successful pillar of organized life for this present modern-day.

Mathematics is crucial for time reading and time management as it is crucial for budgeting time or a task and so on. According to Williams (2020), studying mathematics allows an individual to find a more efficient way to save time. This is important as time management is one of the stress management techniques for handling stressful situations. It is a key part of planning and analyzing and scheduling tasks, preventing the mounting up of pressure and hence stress.

Time management is also used in relaxation to assign a period of relaxation daily amongst others. Plus, sleep under the heading of relaxation has been noted to improve stress management. It has been reported that an individual needs at least 8 hours of sleep daily. With the demands of the modern world, obtaining that amount of sleep all through the night might not be feasible for an individual especially for a student and lecturers, who prefers reading during night time. Being able to manage time, will allow the students and lecturers to calculate and distribute the required hours for sleep throughout the day. Like planning when and how long to take a nap during the day, to make up for a night's lack of rest.

Time is also needed for planning and doing various other relaxation techniques, like timing the breath-holding period during diaphragmatic breathing, mediation, etc. It is also essential

for developing workout/exercising routines. The effective workout usually deploys the use of time and involves systematically increasing the workload and duration of exercises overtime for more meaningful results.

Mathematics is also present in exercising in various other ways. Like, knowledge of numeracy and simple functions is needed to work out how many reps of each exercise an individual needs to do, it is needed to count the number of calories lost through a workout, etc. (Williams, 2020; Stat-Analytica, 2020).

Mathematics knowledge is also important for nutrition and dieting. Examples of its importance include informing an individual how much calorie intake is needed to stay fit, which food will give us how much calories and fat (Stat-Analytica, 2020). This guides an individual on his/her food choice and consumption. Spraul (2021) states that mathematical equations are needed by individuals to understand nutritional labels, calculate the intake of calories, determine the fat percentage in food, and in setting dietary parameters. For proper nutrition, individuals need a thorough understanding of how units of carbohydrates, protein, and fat translate into calories.

Mathematics also aids in managing the intake of substances that have been noted to increase stress rate. Like it is necessary to assess the sugar levels of an individual, estimating the amount of sugar consumed and just how much the individual could take to be considered safe. Mathematics aids in disseminating information about various food consumed, like understanding just how much caffeine a black tea possess, the amount of sugar in drinks, etc. All of this will help an individual in their assessment of intake of those stress-inducing substances.

Thus, it is beyond evident that mathematics knowledge influences the stress management abilities of an individual.

Conclusion

When it comes to relevance and applicability in daily lives, Mathematics is one of the most indispensable subjects, as its knowledge to a certain extent dictates the flow of daily activities in all areas. Stress is one of such areas, where the influence of mathematics can still be measured. Stress is a major problem in the 21st century, and it has been noted to be increasing and will only keep increasing. Due to the adverse effect of prolonged stress, various stress management techniques have been put forward and promoted. This review explored some of those techniques and the influence of mathematics knowledge over them. The influence of mathematics range from the cognitive development attributed to mathematics, to time management, and everyday numeracy. It is thus shown to be evident that mathematics is crucial and present in the process of managing stress.

Recommendations

Based on this literature, the following recommendations are made:

1. The understanding of mathematics and its applicability to daily lives should be encouraged as an integral part of any mathematics education program.
2. Stress management techniques should be taught in all settings as a precursor to healthy living in this modern day.
3. Stress management intervention programs should promote the learning of stress management from the perspective of mathematics.
4. Individuals should be educated on the importance of mathematics as a stress management tool.

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