HOW STRESS CONTRIBUTES TO WORKPLACE ERRORS AND INCIDENTS

by

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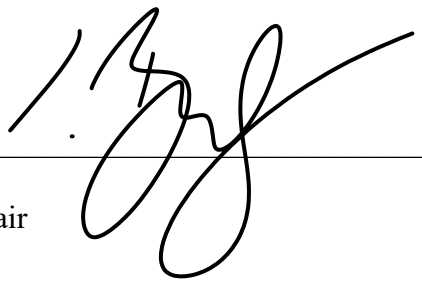

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Dedication

This study is dedicated to my beloved parents, who have been my source of inspiration and guidance. They have given me the strength to continue the path of learning and to be kind; their teachings have kept me grounded. Their constant encouragement and belief in my abilities have been the driving force behind my success.

I am also deeply grateful to my mentor, Prof. Sasa Petar, for his guidance, continuous mentoring, and expertise. His wisdom, counseling, and constructive feedback have been invaluable in shaping my research and helping me navigate through the complexities of my study. His dedication to my research growth and commitment to helping me succeed has been remarkable.

Next, I would like to express my gratitude to my friends. They have been my pillars of strength, always there to lend a listening ear and offer their support. Their friendship has provided me with the motivation and inspiration to keep pushing forward, even during the most challenging times.

Lastly, I want to express my heartfelt gratitude to my wife. Her unwavering love, understanding, sacrifices, and support have been the foundation of my strength throughout this thesis/study. She stood by my side through the late nights, the moments of self-doubt, and the countless revisions. Truly grateful!

ABSTRACT

HOW STRESS CONTRIBUTES TO

WORKPLACE ERRORS AND INCIDENTS

Ashutosh Sharma

2025

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Stress can be defined as a state of mental pressure or concern caused by a difficult, unplanned, or unpleasant situation. These situations can arise from personal, professional, or external factors. These pressures (direct/indirect) are mostly generated from human's own decisions or external factors that normally humans can't control.

Workplace incidents refer to any unexpected and undesirable events that occur within a work environment. These incidents can range from common workplace accidents like slips, trips, and falls to machinery malfunctions to conflicts between employees. Errors in reports, presentations, and operating machines/equipment can lead to serious accidents, injuries, property damage, or even instances of violence.

These incidents can be caused mainly because of four factors: human error, system error, process error, or external factors. Human error is the most variable and causative factor for incidents or errors. Errors caused by humans are mainly due to a lack of knowledge, experience, concentration, or awareness, and stress is one of the most influential factors causing them.

Stress can arise from various sources, including work, relationships, financial challenges, health issues, and major life transitions. This study utilized data from both primary and secondary sources to illustrate how stress contributes to workplace errors and incidents. Employees can significantly decrease errors and incidents in both their professional and personal lives by identifying their specific stressors and implementing effective management strategies—such as meditation, healthy eating, exercise, or other stress-reducing activities.

Managing stress involves healthy coping strategies such as exercise, relaxation techniques, maintaining a balanced diet, getting enough sleep, and, if required, seeking social or professional support without hesitation. Practicing mindfulness and engaging in activities that bring joy and relaxation can help alleviate stress, reducing errors and incidents.

In conclusion, adopting a healthy lifestyle, good time management, adaptive corporate work culture, introducing hybrid working styles, and enhancing employee performance and productivity through training sessions can help reduce stress levels. Reducing constant social media interactions and promoting work-life balance can also contribute to calmer employees and fewer errors and workplace incidents. It is important to remember that stress is not always a negative experience; a certain level of stress can be beneficial as it can motivate individuals to perform at their best.

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Chapter I:

INTRODUCTION

1.1 Introduction

From a psychological or philosophical perspective, humans are inherently prone to making mistakes, errors, and poor decisions. However, from a scientific standpoint, machines are also capable of making errors and incorrect decisions. This raises the question: who should be held accountable? In an ideal world, only humans would experience fatigue, stress, emotions, and tiredness, while machines would operate without these limitations. As a result, we tend to trust machines to make critical and logical decisions.

Yet, research has shown that machine components can also experience stress and fatigue, which can adversely affect their operations and performance. Furthermore, excessive data processing can compromise a machine's logical and critical processing abilities, leading to errors and, in some cases, incidents or accidents. This highlights the need to consider both human and machine factors when evaluating the causes of errors in the workplace.

Many organizations, industries, and businesses investigate and analyze errors and incidents to identify the root cause—in simple layman's terms, what or who failed—human, machine, process, or something beyond anyone’s control. Most of them look for quick fixes and cheaper solutions, so they focus on quick investigation and superficial remedies like putting a band-aid on an internal wound.

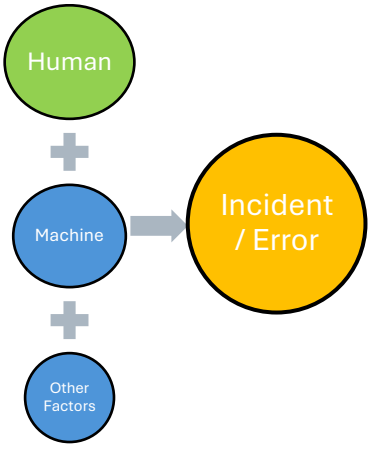

Figure 1. Sharma, A. (2024). Standard causes of incidents & errors

Organizations often need to invest adequate effort into identifying and understanding the root causes of issues that contribute to workplace errors and incidents. This oversight can lead to ineffective solutions and a persistent cycle of problems. One area that is frequently overlooked is human factors. Many organizations need to fully recognize how human behaviour, decision-making, and stress levels can impact performance. Organizations miss opportunities to enhance employee well-being and improve overall productivity by neglecting to address human factors.

The use of outdated technology is another critical factor that organizations often fail to address. Relying on old systems can hinder efficiency and increase the likelihood of errors. Organizations may be hesitant to invest in new technologies due to cost concerns or resistance to change, but this reluctance can ultimately lead to more significant risks in the workplace.

Due to limited time and resources, organizations often simplify the issue by attributing errors or incidents solely to either human error or machine malfunction. This study was initiated to identify the primary factors contributing to workplace errors and incidents, specifically focusing on human involvement in these events. The research aims to investigate whether stress is a significant factor leading to these errors and incidents.

Studying machines and design/algorithms to identify the stress-causing component is complex; however, being a human, understanding and learning the nature of humans is easier because there are so many parameters like emotional, biomarkers, logical, and analytical capabilities or metrics. Humans perform various roles, meet multiple people, and execute responsibilities and duties in their daily lives, which impact them emotionally, physically, mentally, financially, etc.

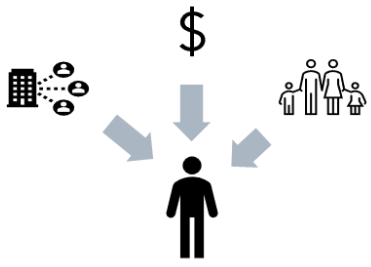

Figure 2. Sharma. A (2024). Various external factors affecting humans.

Some people are more affected by situations than others. People are going to experience different levels of anxiety when faced with similar kinds of situations, e.g., leaving for the office or preparing a presentation; it will depend on how prepared they are. Some more examples:

- People with significant debt or financial insecurity are more likely to experience tension related to money.
- Individuals from minority ethnic groups or who are LGBTQIA+ are more likely to experience anxiety related to prejudice or discrimination.
- People with disabilities or long-term health conditions are more likely to experience strain related to their health or the associated stigma.
- People from show sales, business, politicians, traders, stockbrokers, investment bankers, celebrities, and sports persons have performance apprehension.

All this anxiety, strain, worry, strain, and tension are synonyms of Stress.

To start, we will develop a thorough understanding of human anatomy, the concept of stress, and the various types of incidents and errors. We will explore methods for measuring these factors and discuss general remedies to manage them. This foundational knowledge will not only enhance our understanding of the relationship between stress and human behaviour but also aim to establish the connections among stress, human factors, and workplace errors and incidents.

The information contained within this thesis is provided as guidance only. While every reasonable care has been taken to ensure the accuracy of its contents, the author and the guides/ technical representatives listed in the acknowledgments cannot accept any responsibility for any action taken or not taken based on this information. *The author shall not be liable to any person for any loss or damage arising from using any of the information in this thesis or harm caused by their negligence.*

Humans:

A dictionary definition of Human is - **a bipedal primate mammal** (*Homo sapiens*)

The word human originally comes from the word 'humus,' which refers to the body. Human beings are anatomically similar and related to the great apes but are distinguished by a more highly developed brain and a resultant capacity for articulate speech and abstract reasoning.

Based on a discussion forum (Quora.com), the terms "human" and "human being" are generally used interchangeably to refer to a member of the species Homo sapiens. However, some subtle distinctions can be made:

- "Human" is a more general term that denotes the biological species. It emphasizes the physical, genetic, and evolutionary aspects of being a member of the Homo sapiens classification.
- "Human being" is a more holistic term that encompasses the physical, mental, and existential aspects of human nature. It suggests that the individual is not just a biological entity but a sentient being with consciousness, emotions, and the capacity for abstract thought, reasoning, and self-awareness.

In essence, "human" focuses on the objective, scientific classification, while "human being" carries more subjective, philosophical, and experiential connotations about the nature of human existence. Both terms are valid and commonly used, with "human being" perhaps having a slightly more nuanced and richer meaning.

Human evolution is the evolutionary process within the history of primates that led to the emergence of Homo sapiens as a distinct species of the hominid family that includes all the great apes. This process involved the gradual development of traits such as human bipedalism, dexterity, and complex language, as well as interbreeding with other hominins.

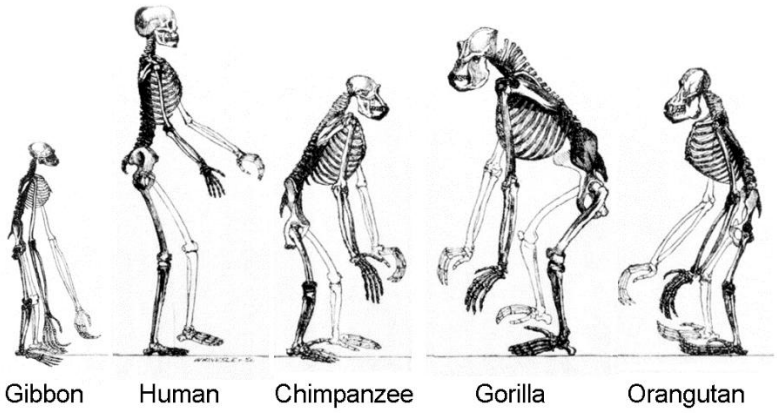

Figure 3. Vickers, T. (2007). Ape skeletons.png. Wikipedia

Homo sapiens are the main species on our earth which is the consequence of more than 7 million years of evolution. The word sapiens is Latin, which signifies ‘wise’ or ‘smart’.

Evolution of man included seven stages – Dryopithecus, Australopithecus, Ramapithecus, Homo habilis, Homo erectus, Homo neanderthalensis, and Homo sapiens.

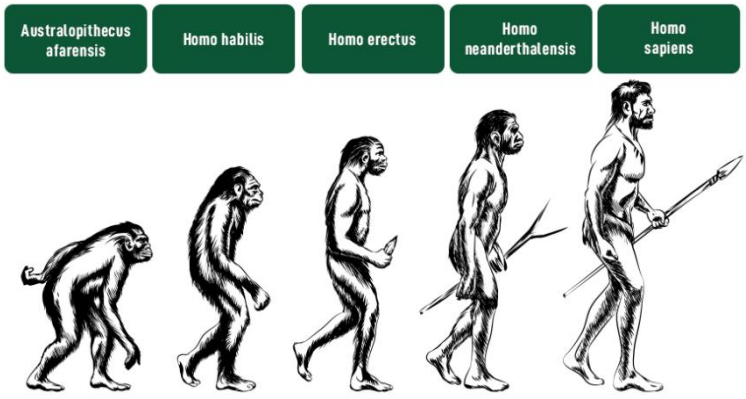

Figure 4. 2024. *Evolution of Human.* geeksforgeeks.org

According to the National Cancer Institute, USA, all living organisms have evident characteristics that differentiate them from non-living forms. The fundamental life processes include organization, metabolism, responsiveness, movement, and reproduction. In humans, the most complex form of life, additional processes such as growth, differentiation, respiration, digestion, and excretion are required.

The human body comprises interconnected systems, such as the skeletal, muscular, cardiovascular, respiratory, digestive, and nervous systems, which perform specific functions. These systems include the skeletal system, muscular system, cardiovascular system, respiratory system, digestive system, nervous system, and many others. Each system has a unique role in the functioning of the human body.

All these processes are interconnected. No organ or system in the body can work individually—they all function together in a finely regulated balance to ensure the well-being of the individual and sustain life. Unless disturbed by internal or external factors, these processes work in balance.

Brain and its Functionality:

There needs to be one ruler, decision-maker, or controller to manage a system; in humans, the "brain" is the central organ. According to Johns Hopkins Medicine (n.d.), the brain is a complex organ that regulates thoughts, memories, emotions, touch, motor skills, vision, breathing, temperature, hunger, and every process that controls our body. The brain sends and receives chemical and electrical signals throughout the body using the nervous system. Some equate it with a computer's Central Processing Unit (CPU).

Different signals control different processes, and the human brain interprets each. Some messages are kept within the brain, while others are relayed through the spine and across the body's vast network of nerves to distant extremities. The central nervous system relies on billions of neurons (nerve cells) to do this.

The brain is protected by three layers of covering called meninges. The meninges comprise the Dura mater (outermost layer), Arachnoid (thin middle layer), and Pia mater (last layer), which touches the brain; the Pia mater also holds all the veins and arteries.

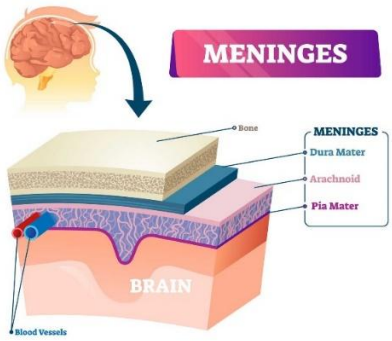

Figure 5. (n.d.) Meninges -Brain Anatomy and How the Brain Works. Hopkinsmedicine.org

At a high level, the brain can be divided into the cerebrum, brainstem, and cerebellum.

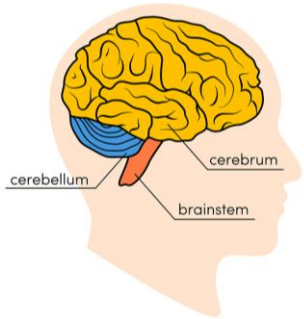

Figure 6. (n.d.) Main Parts - Brain Anatomy and How the Brain Works. Hopkinsmedicine.org

The ***cerebrum*** (front of the brain), the most significant part of the brain, initiates and coordinates movement and regulates temperature. Other cerebrum areas enable speech, judgment, thinking and reasoning, problem-solving, emotions, and learning. Other functions relate to vision, hearing, touch, and other senses. The ***cortex*** has a large surface area due to its folds and comprises about half of the brain's weight. The cerebral cortex is divided into two halves or hemispheres, and each hemisphere controls the respective sides of the body.

The ***brainstem*** (middle of the brain) connects the cerebrum with the spinal cord. The brainstem includes the midbrain, the pons, and the medulla.

The ***cerebellum*** ("little brain") is a fist-sized portion of the brain located at the back of the head, below the temporal and occipital lobes, and above the brainstem. Its function is to coordinate voluntary muscle movements and to maintain posture, balance, and equilibrium.

New studies have revealed its role in thought, emotions, and social behaviour, as well as its possible involvement in addiction, autism, and schizophrenia.

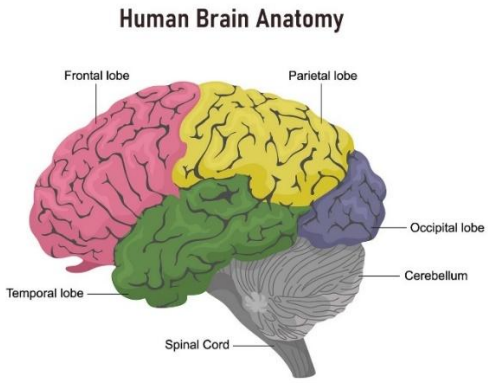

Figure 7. (n.d.) Lobes - Brain Anatomy and How the Brain Works. Hopkinsmedicine.org

Each brain hemisphere (parts of the cerebrum) has four sections called lobes: frontal, parietal, temporal, and occipital. Each lobe controls specific functions, they are:

- **Frontal lobe.** The most prominent frontal lobe of the brain is involved in personality characteristics, decision-making, movement, and recognizing smell. The Broca area of the lobe is related to speech ability.
- **Parietal lobe.** The middle part of the brain helps a person identify objects and understand spatial relationships (where one's body is compared with objects around the person). The parietal lobe is also responsible for interpreting pain and touch in the body. Wernicke's area of the lobe helps the brain understand spoken language.
- **Occipital lobe.** The occipital lobe is the back part of the brain involved with vision.
- **Temporal lobe.** Located on the sides of the brain, it is involved in short-term memory, speech, musical rhythm, and some degree of smell recognition.

Once we pass the outer structure of the brain and try to deep-dive further, we will find the key glands and structures responsible for the management & functionality of organs, memory, etc.

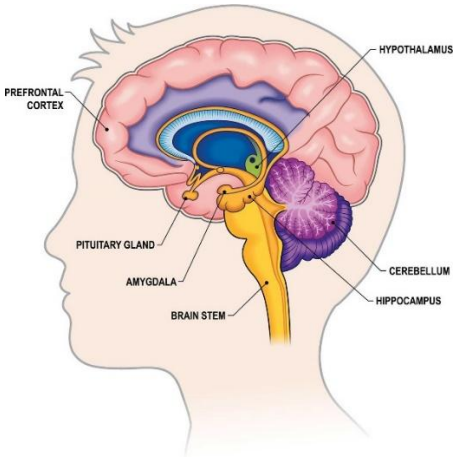

Figure 8. (n.d.) Glands - Brain Anatomy and How the Brain Works. Hopkinsmedicine.org

- **Pituitary Gland**: also known as the "master gland," is a pea-sized structure that governs the function of other glands and regulates the flow of hormones from the thyroid, adrenals, ovaries, and testicles.
- **Hypothalamus**: is responsible for sending chemical signals to control the function of the pituitary gland, which is situated above the said gland. The hypothalamus also regulates body temperature, synchronizes sleep patterns, controls hunger and thirst, and plays a role in some aspects of memory and emotion.
- **Amygdala**: is a small, almond-shaped structure. It is located under each half (hemisphere) of the brain. Included in the limbic
- system, the amygdalae regulate emotion and memory and is associated with the brain's reward system, stress, and the "fight or flight" response when someone perceives a threat.
- **Hippocampus**: is a curved seahorse-shaped organ on the underside of each temporal lobe. The hippocampus is part of a larger structure called the hippocampal formation. It supports memory, learning, navigation, and perception of space.

As per the article published in Havard Health Publishing, Dr. Kerry Ressler (chief scientific officer at McLean Hospital and professor at Harvard Medical School) has commented that animals and people clearly show that difficult situations can affect how the brain functions.

Scientists have seen changes in how the brain processes information when people experience real-life situations.

These problematic situations affect not only memory and many other brain functions, like mood and anxiety but also promote inflammation, which adversely affects heart health, says Jill Goldstein (a professor at Harvard Medical School). Thus, stress has been associated with multiple chronic diseases of the brain and heart. In addition, it can affect men and women differently, she says.

Nervous System:

As per the National Cancer Institute (n.d.), the nervous system is the body's major controlling, regulatory, and communicating system. It is the center of all mental activity, including thought, learning, and memory. The three main parts of the human nervous system are the brain, spinal cord, and nerves. Through its receptors, the nervous system helps humans stay connected to their external and internal environment. It allows humans to move, think, and feel. It even regulates thinking or non-thinking activities like digestion.

It contains the central nervous system and the peripheral nervous system. Millions of sensory receptors detect *stimuli* such as temperature, light, and sound inside and outside the body. This collected information is referred to as *sensory input*. Sensory input is converted into electrical signals called *nerve impulses* transmitted to the brain; various lobes make decisions based on the sensory input at each moment. This is *integration*.

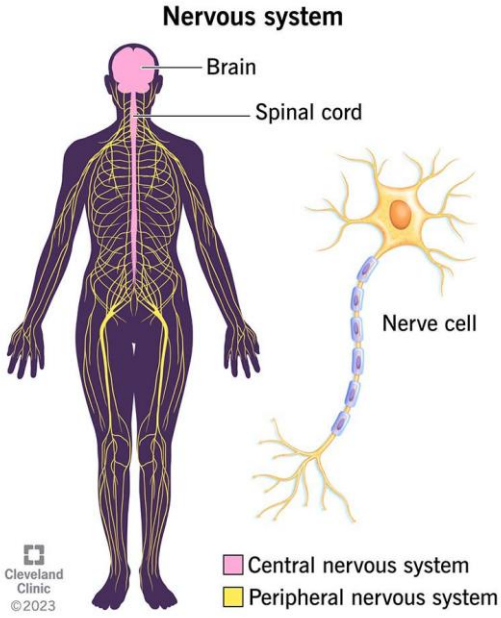

Figure 9. (2023). Nervous System. Clevelandclinic.org

Based on sensory input and integration, the nervous system responds by sending signals to muscles, causing them to contract, or to glands, causing them to produce secretions, e.g. adrenalin, cortisol etc. Muscles and glands are called *effectors* because they cause an effect in response to directions from the nervous system.

As we know, the nervous system's primary function is to exchange messages between the brain and body to inform the body what to do. These messages also regulate:

- Thoughts, memory, learning, and feelings.
- Movements (balance and coordination).
- Senses (how the brain interprets what humans can see, hear, taste, touch, and feel).
- Wound healing.
- Sleep.
- Heartbeat and breathing patterns.
- Response to stressful situations, including sweat production.
- Digestion.

- Body processes, such as puberty and aging.

The nervous system has two main parts:

- *Central nervous system (CNS)*: It comprises the brain and spinal cord, which work together to regulate how humans think, move, and feel.
- Peripheral nervous system (PNS): it is made up of a network of nerves that branches out from the spinal cord. This system relays information from the brain and spinal cord to the organs, arms, legs, fingers, and toes.

Symptoms of nervous system disorders can vary greatly depending on the specific condition. However, they may include issues with movement and coordination, memory loss, sensations of pain, numbness, or a tingling "pins and needles" feeling, changes in behaviour and mood, difficulties with cognitive functioning and reasoning, and seizures.

Some neurological issues, such as strokes, are considered medical emergencies that require prompt treatment. If humans experience signs like muscle weakness or paralysis on one side of the body, sudden vision loss, slurred speech, or confusion, it is critical to immediately contact emergency services to receive necessary and timely medical care. Also neurological conditions, including dementia, depression, headaches, migraines, and stroke.

According to Wright, P. (2024), long-term pressure on the nervous system can damage the brain and overall health. Prolonged exposure to elevated hormones can cause Inflammation and dysfunction in the brain that affect mood and memory. There is also an increased risk of developing neurological conditions, including dementia, depression, headaches, migraines, and stroke.

Cleveland Clinic (2023), refers to different classifications of depression basis the American Psychiatric Association (APA), DSM-5 (*Diagnostic and Statistical Manual of Mental Disorders-5th version)*:

- Clinical depression (major depressive disorder): this is most common and severe form, in which diagnosis of major depressive disorder means a person has felt sad, low, or worthless most days for at least two weeks while also

having other symptoms such as sleep problems, loss of interest in activities, or change in appetite.

- Persistent depressive disorder (PDD): also known as PDD dysthymia, Persistent depressive disorder is mild or moderate depression that lasts for at least two years.
- Disruptive mood dysregulation disorder (DMDD): DMDD causes chronic, intense irritability and frequent anger outbursts in children. Symptoms usually begin by the age of 10.
- Premenstrual dysphoric disorder (PMDD): With PMDD, you have premenstrual syndrome (PMS) symptoms along with mood symptoms, such as extreme irritability, anxiety or depression. These symptoms improve within a few days after your period starts, but they can be severe enough to interfere with your life.
- Depressive disorder due to another medical condition: Many medical conditions can create changes in your body that cause depression. Examples include hypothyroidism, heart disease, Parkinson's disease and cancer.

There are also specific forms of major depressive disorder, including:

- Seasonal affective disorder (seasonal depression): This is a form of major depressive disorder that typically arises during the fall and winter and goes away during the spring and summer.
- Prenatal depression and postpartum depression: Prenatal depression is depression that happens during pregnancy. Postpartum depression is depression that develops within four weeks of delivering a baby.
- Atypical depression: Symptoms of this condition, also known as major depressive disorder with atypical features, vary slightly from "typical" depression. Other key symptoms include increased appetite, rejection sensitivity, and temporary mood changes based on positive events.

Cardiovascular System:

Cleveland Clinic article explains that the cardiovascular system has a vital function — getting oxygen and nutrients to the entire body and removing waste. The *cardiovascular system* consists of the heart, a muscular pumping device, and a closed system of vessels called arteries, veins, and capillaries. Its vital role is to maintain a continuous and controlled movement of blood through the body's capillaries of every tissue and cell.

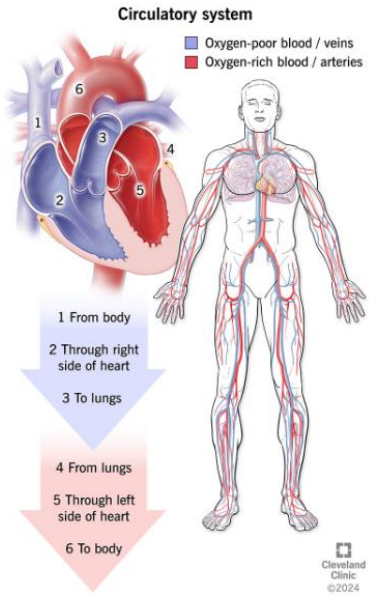

Figure 10. (2024). Cardiovascular System.Cleveland Clinic

Blood is the fluid of life, transporting oxygen from the lungs to body tissue and carbon dioxide from body tissue to the lungs. Its role is to support growth, transporting nourishment from digestion and hormones from glands throughout the body. Blood performs its ultimate transport function in microscopic capillaries. Nutrients and other essential materials pass from capillary blood into fluids surrounding the cells as waste products are removed. Substances pass through the capillary wall by diffusion, filtration, and osmosis.

Numerous control mechanisms regulate and integrate the diverse functions of the cardiovascular system to supply blood to specific body areas as needed. Heart is about the size of your fist but may be bigger if you have a heart condition. A body contains more than 60,000 miles of blood vessels. On an average heart circulates about 2,000 gallons (more than 7,500 liters) of blood every day. Based on brain signals, the heart increases and decreases the

pumping rhythm based on the requirements and situations (e.g., fight-flight, meditation, etc.) humans face, mainly during their day-to-day lives.

According to a news article by Katella, K (2024), prolonged cortisol elevations also increase blood pressure, blood sugar, cholesterol, and triglycerides. For a person living with chronic cortisol elevation, the result can be chest pain, irregular heartbeats, shortness of breath, and an increased risk of heart attack and stroke. The amygdala, an almond-shaped organ in the brain responsible for releasing adrenalin and cortisol, is known to be released when the brain perceives that a human is in a situation that is a threat, and the "fight or flight" response may be needed to evade any harm/ damage.

Respiratory System:

Respiration is an exchange of oxygen and carbon dioxide between the atmosphere and the body cells through a series of passages into and out of the lungs. After this, there is an exchange of gases between the lungs and the blood, known as *external respiration*. The blood carries gases to and from the tissue cells, facilitating the exchange of gases known as internal respiration. Finally, cells use oxygen for their specific activities, a process known as cellular metabolism or *cellular respiration*. Together, these activities make up respiration.

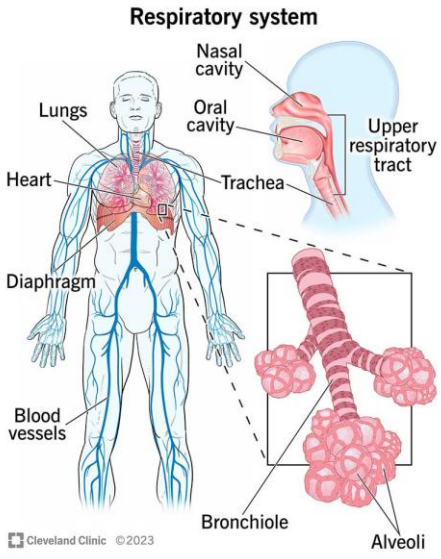

Figure 11. (2023) Respiratory System. Cleveland Clinic

The respiratory system's primary function is to pull in oxygen for the body's cells and eliminate carbon dioxide as a waste product. This action is performed during breathing in and out and through gas exchange between the tiny air sacs of the lungs (alveoli) and the blood vessels running nearby.

According to the Cleveland Clinic, the respiratory system also protects the body from dry air and potentially harmful particles. When inhaled, sinuses help regulate the temperature and humidity of the air. This air passes through the nostrils and down the airways; tiny hairs (cilia) filter out dust, germs, and other irritants to keep them from entering airways and lungs. The respiratory system traps them in mucus when irritants or germs find their way in. Then, cilia in the airways move in a wavelike motion to push the mucus out of the body when coughed or sneezed.

An additional role of the respiratory system is to help talk. The air vibrates in vocal cords, which makes sounds. Air, during breathing, moves past the olfactory nerve, which sends messages to the brain about the way something smells. The system also helps maintain the blood's pH and acidity level by lowering carbon dioxide levels from the blood, as excess carbon dioxide makes the blood acidic, resulting in an imbalance of blood's pH.

When faced with difficult situations, humans can find breathing harder, which can cause problems for people with asthma or lung disease, such as emphysema. In addition, the human body can experience hyperventilation (rapid breathing) and panic attacks. Increased frequency of smoking and vaping as part of a coping mechanism can damage the respiratory system and impact human health.

Digestive System:

As per Cleveland Clinic (2021), the human digestive system is a network of organs that helps them digest and absorb nutrients from food. It includes the gastrointestinal (GI) tract and the biliary system. The gastrointestinal (GI) tract is a series of hollow organs that are all connected, leading from the mouth, esophagus, stomach, small intestine, large intestine and anus. In contrast, the biliary system is a network of three organs (liver, gallbladder, pancreas, and bile ducts) that deliver bile and enzymes into the GI tract.

Food is broken down, bit by bit, until the molecules are small enough to be absorbed and the waste products are eliminated. Food undergoes three types of processes in the body:

- Digestion
- Absorption
- Elimination

Digestion and absorption occur in the digestive tract. After the nutrients are absorbed, they are available to all cells in the body and utilized in metabolism. The digestive system prepares nutrients for utilization by body cells through six activities or functions: ingestion, Mechanical digestion, chemical digestion, movements, absorption, and elimination.

Due to prolonged exposure to difficult situations, brain-gut communication is interrupted, resulting in more easily felt pain, bloating, and other gut discomfort like gut bacteria changes, which can influence mood. Therefore, it is essential to understand these difficult situations or, in standard terms, also known as "**Stress**".

What is Stress:

Let us begin with a definition of '*Stress*'; stress has been well-defined by the World Health Organization (WHO):

"*As a state of worry or mental tension caused by a difficult situation*."

A situation is a set of circumstances in which a human finds oneself or in other words, the situation can be a state of affairs, location, and surroundings of a place. These situations can arise from one's decisions or external factors. Based on one's past experience, knowledge, intelligence, emotional state, understanding, and smartness, one will react to a situation differently. Pedersen, M. (2024) tried to uncover the intricate interplay of psychological, neurological, and environmental factors influencing our diverse emotional reactions to a situation.

Figure 12. Salzann, S. (n.d.). Person Stressed Out Clipart

In other words, 'STRESS' can be described as a state of worry or mental tension caused by a problematic situation. Stress is a natural human response that prompts us to address challenges and threats in our lives. Everyone experiences stress to some degree; however, how one responds makes all the difference to their overall well-being. (Stress, 2023). In other words, Stress is the by-product of the body caused by interaction with any stimulus in the environment like peer pressure, highly competitive environment, job insecurity, politics, improper rewards and recognitions, etc. (Singh & GOGIA, 2014).

As per the *Centre for Studies on Human Stress* (CSHS), the term stress was borrowed from the field of physics by one of the fathers of stress research, Hans Selye. In physics, stress describes the force that produces strain on a physical body (i.e. bending a piece of metal until it snaps occurs because of the force, or stress, exerted on it). Hans Selye, in the 1920s, proposed that stress was a **non-specific** strain on the body caused by irregularities in normal body functions. This stress resulted in the release of stress hormones. He called this the "General Adaptation Syndrome" (a closer look at general adaptation syndrome, our body's short-term and long-term reactions to **stress**).

According to Higuera, V. (2018), an Adaptive Syndrome is a series of normal physiologic reactions that help the organism return to its prior state of function once the demand is discontinued and causes a change to reach functional equilibrium. General adaptation syndrome (GAS) is the three-stage process that describes the physiological changes the body goes through when under stress. Adaptation syndromes and adaptability are the fundamental mechanisms of defense, survival, and recovery from hostility.

Although humans may be aware of the physical effects of stress, they may be unaware of the different stages of stress, known as general adaptation syndrome (GAS). When humans understand the various stages of stress and how the body responds, it is easier to identify signs of prolonged stress. In his research, Hans Selye concluded that the changes caused in the body are not isolated but rather the typical stress response. Selye identified these stages as alarm, resistance, and exhaustion. Understanding these different responses and how they relate to each other may help humans cope with stress more easily and quickly.

Edward, R. (2024) describes ***General Adaptation Syndrome*** (GAS) Stages:

1. *Alarm reaction stage*:

The alarm reaction stage of general adaptation syndrome is the body's initial response to stress. The sympathetic nervous system is activated by the sudden release of hormones, commonly known as the "fight-or-flight" response, which is a physiological stress response. This natural reaction prepares the human mind to decide whether to flee or protect themselves from dangerous situations. When the sympathetic nervous system is activated, it stimulates the adrenal glands. The glands, in turn, trigger the release of certain hormones,

including adrenaline and noradrenaline. Due to the sudden release of hormones, there is an increase in heart rate, breathing rate, and blood pressure.

Physical signs of being in the alarm response stage include:

- Dilated pupils
- Increased heart rate / Rapid breathing
- Trembling
- Pale or flushed skin
- Heightened senses

According to Selye, most of the symptoms of the alarm response stage disappear or are reversed in the next stage (resistance), then reappear in the final stage of exhaustion.

2. *Resistance stage*:

After the initial shock of a stressful event and having a fight-or-flight response, the body begins to repair itself. It releases less cortisol and lowers the heart rate, and blood pressure begins to normalize. Although the body enters this recovery phase, it remains on high alert for a while. However, if the stressful situation continues for a long time or is not resolved, the body will never receive a clear signal to return to normal functioning levels. This means the body will continue to secrete the stress hormones, and the blood pressure will stay high.

Extended high-stress levels can cause instability in the immune, digestive, cardiovascular, sleep, and reproductive systems. The body can show symptoms such as:

- Feelings of fear, anger, sadness, worry, numbness, or frustration
- Irritability
- Changes in appetite, energy, desires, and interests
- Stomach problems
- Headaches
- Body pains or skin rashes

- Sleeplessness or nightmares
- Trouble concentrating or making decisions

3. *Exhaustion stage*:

This stage is the result of prolonged or chronic stress. Struggling with stress for long periods can drain physical, emotional, and mental resources to the point where the body no longer has the strength to fight stress. Enduring stressors without relief leads the body to give up and triggers emotional hopelessness. Signs of exhaustion include:

- fatigue
- burnout
- depression
- anxiety
- decreased stress tolerance

The physical effects of this stage also weaken the immune system and put humans at risk for stress-related illnesses, such as heart disease, high blood pressure, diabetes, and other chronic health conditions, including mental health disorders such as depression or anxiety.

Metalhealth.org (2021) mentions that sometimes, a small amount of stress can be beneficial, as it can help us accomplish tasks and feel more invigorated. They also emphasize that stress is the body's response to pressure. Many different situations or life events can cause stress. It is often triggered when we experience something new or unexpected that threatens our sense of self or when we feel we have little control over a situation.

When we experience stress, our body releases stress hormones that activate a fight or flight response and boost our immune system, allowing us to react to perilous situations quickly. However, prolonged or intense stress can become problematic and negatively impact our physical and mental well-being. Although stress is not typically classified as a mental health issue, it is closely linked to our mental health in several ways.

Stress can stem from various sources; human might feel stressed because of one big event (e.g. bereavement, divorce, job loss, etc) or situation in their life (eg. Near-death experience, unexpected financial issues, etc). Or it might be a build-up of lots of smaller things (e.g., running late for a meeting, social media posts/ reels, low battery of mobile, etc). Even positive life changes like moving to a larger house, getting a job promotion, or going on holiday can be stressful. When facing stress in these situations, it may be difficult to understand the reasons behind it or to open feelings to others.

This might make it harder for humans to identify what makes them feel stressed or explain it to others. Humans may experience stress if they:

- Feel under lots of pressure or not enough to do
- Face significant and frequent changes in life
- worried about something
- Do not have much or any control over the outcome of a situation
- Have responsibilities that they find overwhelming
- Experience discrimination, hate or abuse

To understand stress, we need to explore the 5Ws and 1H; this will help manage stress and make a big difference to employees' mental well-being. This can be followed by measuring the impact of stress and finding remedies to manage stress. According to Rachel Lampert, MD, a Yale Medicine cardiologist – "*Stress is sometimes underrecognized as a risk factor for heart disease*"; Katella, K. (2024)

5Ws and 1 H:

According to an article published in Harvard Health Publishing, Dr. Kerry Ressler explains that the brain is not a single unit but a collection of different parts performing distinct tasks. Researchers suggest that when one part of the brain is active, other parts may have less energy to perform their essential functions. Stress can be defined as a state of mental pressure or concern caused by a problematic, unplanned, or unpleasant situation. The stress level a human is comfortable with may be higher or lower than that of others. Stressful feelings typically happen when we feel we do not have the resources to manage the challenges we face.

While specific emotional responses, such as fear, happiness, and sadness, are generally consistent across cultures, the degree to which an individual expresses these emotions can vary significantly. This variation is influenced by factors such as social norms, upbringing, personal experiences, and individual differences in emotional regulation. Understanding these variations is crucial for a deeper comprehension of how employees react to workplace situations, potentially preventing errors or incidents due to the complexity of human emotions.

Shahsavarani, A. M. et al. (2015) explain that the Autonomic nervous system (ANS) has a central role in related mechanisms of stress in the body. The Sympathetic Nervous System (SNS) is activated as a primary response to stress and regulates many of the physiological functions of the body so the employee can adapt to their surrounding environment as much as possible. During a stress response, the hypothalamus secretes various hormones, among which is Corticotropin-Releasing Hormone (CRH), which is responsible for stimulating the pituitary gland to release the Adrenocorticotrophic hormone (ACTH) into the bloodstream and initiating the intensively regulated pathway of stress response.

Humans respond due to signals from the brain through the nervous system. When faced with stress, the system triggers a physiological response in the body through the activation of the sympathetic nervous system; to explain further, the '*Amygdala*' is the part of the brain that's most closely associated with fear, emotions, and motivation. Its name means "almond" because it is almond-shaped.

As discussed earlier, Amygdale has a role in emotional processes and acts as a controller of feelings, such as anxiety and fear, during the stress response. During stress, the hippocampus becomes extremely critical because cognitive processes like last memories can be drastically impacted and are prone to damage and atrophy. It has also been noted that there is a temporary disruption in Prefrontal cortex activities (regulation of processes of planning, attention, and problem-solving) during stress response.

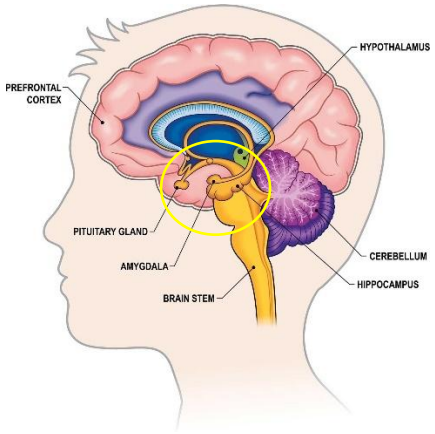

Figure 13, Johns Hopkins Medicine - Amygdala - *Brain Anatomy*

The primary role of the amygdala is to process our emotions and send a signal to the hypothalamus to communicate using the nervous system. The amygdala is part of the brain's limbic system. The limbic system consists of different parts of the brain: The hippocampus, which stores memories, and the amygdala, which processes fear, are the major players. When a human is stressed or emotional, their limbic system works overtime to help the body process the feelings. (Wendt. T, 2022)

Even though it is a tiny almond-shaped structure, the amygdala still helps humans make big decisions and influences imperative behaviours. "Fight-or-flight" is one such primitive stress response made by the amygdala. The amygdala determines how we act in a crisis, depending on the information it receives. This means that if the amygdala is overstimulated, the anxiety will outweigh the logical parts of the brain and cause panic.

Locus coeruleus, a region in the pons, plays a central role in producing the norepinephrine neurotransmitters that help in the process of messaging in SNS during the fight-or-flight response. This region of the brain receives inputs from the hypothalamus, Amygdale, and raphe nucleus, and its neural extensions go towards all parts of the brain and spinal cord.

Raphe nucleus is a region in the pons and has the central role of the 'Serotonin' neurotransmitter, which regulates the mood, especially when stress is accompanied by depression and/or anxiety. Adrenal glands are directly responsible for the production of stress hormones, the crucial one known as cortisol, secreted during stress response.

Endocrine glands of the hypothalamus, pituitary, and adrenal gland, all three glands shape the Hypothalamus-pituitary-adrenal (HPA) axis, which forms the major part of the neuroendocrine system that controls body reactions to stress and regulates many bodily processes, including digestion, autoimmune system, mood, sexual cycles, and saving and consumption of energy. HPA is also known as a 'feedback mechanism' due to its multi-stage pathway in which information is transferred by chemical messengers from one point to another point and also receives feedback in order to reinforce its previous stages and/or weaken them.

In other words, the brain diverts resources because it is in survival mode, not memory mode. This is why humans might be more forgetful when under stress or experience memory lapses during traumatic events. According to Goldstein, a professor of psychiatry and medicine at Harvard Medical School, the effect of stress on the brain and body may also differ depending on when it occurs in someone's life.

Stressful life events, which in isolation might seem less significant, combined to have a tangible impact on my mental health. It also contributes to stress when things get out of perspective – too much work, thinking too far ahead; non-interrelated events occur simultaneously – work pressure, marriage issues, parent's illness, etc.

Researchers have tried to explore the types of stress and their occurrence at various stages of an employee's life, as well as the impact of this stress on the body and emotional

health. As discussed earlier, stress has been with humankind from the start of evolution, starting with keeping family safe from predators or searching for food, etc.

Scott, E. (2023) states that stress is something that everyone experiences, but what causes stress can vary from person to person. For example, one person may get angry and overwhelmed by a serious traffic jam, while another might just turn up their music and see it as a minor inconvenience. A fight with a friend might ruin one person's day, while another might easily shrug it off. Everyone's circumstances are different, so there could be various reasons why one person's life is inherently more stressful than another's.

Scott refers to the following common topics:

- Financial Problem: According to the American Psychological Association (APA) study in which 77% of the participants have highlighted that money is the top cause of stress in their lives. Study also revealed that signs of financial stress may include:
    - Arguing with loved ones about money
    - Being afraid to open mail or answer the phone
    - Feeling guilty about spending money on non-essentials
    - Worrying and feeling anxious about money

Chronic stress related to finances can lead to various physical symptoms such as high blood pressure, headaches, upset stomach, chest pain, insomnia, and a general feeling of sickness.

- *Work*: According to the Centers for Disease Control and Prevention (CDC), employees in the USA work 8% more than they did 20 years ago, and about 13% of people work a second job. At least 40% report their jobs are stressful, and 26% report they often feel burned out by their work.
- *Personal relationships*: There are individuals in our lives who can be a source of stress, whether they are family members, intimate partners, friends, or colleagues. Toxic people exist in various aspects of our lives, and the stress caused by these relationships can impact our physical and mental well-being.

- *Parenting*: Parents often need to juggle busy schedules that involve work, household responsibilities, and raising kids. Parenting stress can result from various factors such as lower income, long working hours, being a single parent, marital or relationship issues, or raising a child with a behavioural disorder or developmental disability.
- *Daily life and busyness*: Daily inconveniences, known as day-to-day stressors, may include things like misplaced keys, running late, and forgetting to bring an important item with you when leaving the house. On the other hand, busyness is due to necessity, such as having to work a second job, guilt and not wanting to disappoint others.
- *Personality and Resources*: These can be independent sources of stress as well. If an employee is extroverted, then they have to deal with the pressure of social gatherings, less rest, etc., whereas the opposite, an introverted employee will have anxiety and discomfort at social gatherings. Perfectionists may unnecessarily bring stress onto themselves due to their exacting standards and experience more negative mental and physical health consequences compared to those who focus solely on high achievement.

Too much stress can affect our mood, body, and relationships—especially when it feels out of control. Work-related stress can also negatively impact employees' mental health, leading to an average of 24 days of work lost due to ill health. It can make us feel anxious and irritable and affect our self-esteem.

Stress is a common occurrence. While one cannot remove every single stressor from one's life, managing stress and maintaining one's health is possible. This is important because stress can cause mental fatigue, irritability, and insomnia.

Understanding the key fundamental aspects of stress, like why it happens, how it impacts, what triggers stress, who all gets impacted, when it happens, etc., will also help draft the controls and remediation plans to eliminate or deal with it entirely.

Types of stress:

Kapur (2021) explains that there are several types of stress that people can experience. These include acute stress, which is a short-term response to a specific event or situation, and chronic stress, which is a long-term response to ongoing stressors. Other types of stress include episodic acute stress, which occurs when someone experiences acute stress frequently, and traumatic stress, which is a response to a traumatic event such as a natural disaster or violent crime.

Margaret Fletcher, who is certified MBSR (Mindfulness-Based Stress Reduction) explains

"*… ability to make and maintain lifestyle choices that promote health and well-being starts with learning to manage your stress*."

She explains that stress is a state of emotional strain or tension caused by demanding circumstances. According to her there are 3 types of stress:

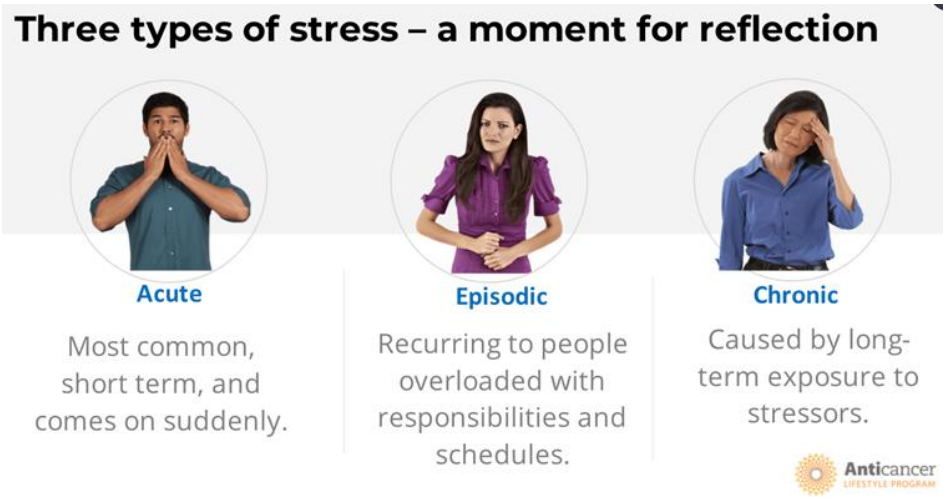

Figure 14. Fletcher, M. (n.d.). 3 Types of Stress and How the Body Responds. Anticancerlifestyle.org

- *Acute stress* is normally associated with short-term stress that may impact humans; in other words, it is stress experienced on a daily basis from minor situations. Acute stress typically happens quickly and fades once the situation or circumstance has passed.

Some types of acute stress are what some people also refer to as an adrenaline rush. They consider it as exciting in small doses, eg. Speeding car, jumping for height, etc.

- *Episodic stress* is commonly associated with situational-based stress. Those who overload their schedule, take on too many responsibilities and then find themselves unable to fulfill their commitments. Episodic stress is common in those who frequently worry about all the things that could go wrong, and who fear the loss of control. E.g. People's anxiety level shoots up as they wait for a medical report or exam result.
- *Chronic stress* is the ones where stress is for the long term and can be identified if there is a consistent sense of feeling pressured and overwhelmed over a long period; studies have shown that stress reactions lasting longer than four weeks may meet the criteria for Post Trauma Stress Disorder (PTSD). E.g. ailing parents, a child with special needs, someone who escaped a near-death experience, etc

The mind and body are deeply interconnected. Although each person experiences this relationship slightly differently, it exists for everyone. Therefore, there are other forms of stress, too, which equally govern and impact employees.

- *Emotional Stress* can result from personal or interpersonal relationships. It can be triggered by events such as the loss of a loved one, a breakup, or ongoing conflicts with family or friends. Emotional stress can lead to feelings of sadness, anxiety, and depression. Addressing emotional stress often involves seeking support from friends, family, or mental health professionals.
- *Physical Stress* is related to physical strain on the body, such as overexertion during exercise, injury, illness, or lack of sleep. Physical stress may result in fatigue, muscle tension, and a weakened immune system. It is essential to manage physical stress by maintaining a balanced lifestyle with regular exercise, sufficient rest, and a healthy diet.
- *Environmental Stress* is caused by external factors present in an employee's surroundings. This can include noise pollution, poor air quality, overcrowding, and exposure to extreme weather conditions. Although we cannot control all environmental

stressors, we can take steps to minimize exposure and create a more comfortable living and working environment, which can help reduce this type of stress.

- *Psychological Stress* is related to cognitive factors such as perception, thoughts, and attitudes. Psychological stress can result from internal pressure, unrealistic expectations, and negative self-talk, often leading to feelings of inadequacy, low self-esteem, and anxiety. Cognitive-behavioural strategies, mindfulness, and relaxation techniques are effective for managing psychological stress.
- *Psychosocial stress* may include relationship/marriage difficulties (partner, siblings, children, family, employer, co-workers, employer), lack of social support, lack of resources for adequate survival, loss of employment/investments/savings, loss of loved ones, bankruptcy, home foreclosure, and isolation. Friedman, J.W. (2013)
- *Psycho-spiritual stress* is a crisis of values, meaning, and purpose; joyless striving instead of productive, satisfying, meaningful, and fulfilling work; and misalignment within one's core spiritual beliefs. Friedman, J.W. (2013)
- *Cognitive stress* is the type of stress that comes from the way humans think and process information. It can be caused by various factors, such as work, relationships, or life changes, and may affect our thoughts, feelings, and behaviours. When an employee experiences cognitive stress, they may feel overwhelmed or out of control, and may struggle to focus or make decisions. Common symptoms of cognitive stress can include depression, anxiety, and irritability.

A stressor is a situation or event that causes stress. It can be internal or external, such as our memories, environment, or the people around us. Stressors are mostly personal; a significant source of stress for one person might cause no stress for another. Stressors encompass specific events or ongoing pressures that influence individuals, potentially compromising their well-being.

These s*tressors* elicit physical and psychological responses, whether arising from internal or external sources. Applying too many demands can pose a threat to an individual's overall well-being because of prolonged pressure and events in their lives. These stressors

can originate from various internal and external sources and lead to a complex array of physical and psychological responses in individuals.

Specific events or chronic pressures that place demands on a person or threaten the person's well-being, whereas stress is the physical and psychological response to internal or external stressors. Stress is inherent in the modern workplace, affecting employees at all levels and across various industries (Rosen et al., 2010). According to The Health Centre (2006), there are four main types of stress:

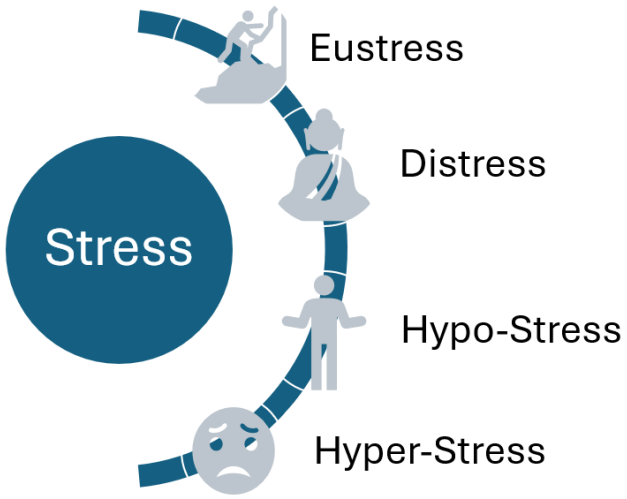

Figure 15. Sharma, A. (2024). Variation of Stress

- *Eustress* is a type of short-term stress that provides immediate strength. Eustress arises at points of increased physical activity, enthusiasm, and creativity. Eustress is a positive form of stress that motivates individuals to achieve goals, participate in challenging activities, and adapt to new experiences; it is associated with feelings of excitement, anticipation, and fulfillment. For instance, starting a new job, planning a wedding, and preparing for a competition.
- *Distress* is a negative stress brought about by constant readjustments or alterations in a routine, which creates feelings of discomfort and unfamiliarity. Emotional, social, spiritual, or physical pain or suffering that may cause a person to feel sad, afraid,

depressed, anxious, or lonely. Distress implies an external and usually temporary cause of significant physical or mental strain and stress.

- *Hypo-stress* occurs when an individual is bored or unchallenged. People who experience hypo-stress are often restless and uninspired. Someone in an unchallenging job, such as a factory worker performing the same task repeatedly, will often experience hypo-stress. The effect of hypo-stress is feelings of restlessness and a lack of inspiration.
- *Hyper-stress* occurs when an individual is pushed beyond what he or she can handle. Hyper-stress results from being overloaded or overworked or being stressed out. When someone is hyper-stressed, even little things can trigger a strong emotional response.

Identifying these symptoms early on can be crucial in supporting employees and mitigating the adverse effects of stress on their well-being and performance. Employee experience, knowledge, coping mechanisms, resilience, willpower, mental health, and even sometimes education determine how stress will affect people and in which way. Certain events may cause stress occasionally, but not every time. For instance, going food shopping with enough time and money might not cause stress. However, it could be stressful if people have other things to do, a tight budget, less time, pressure of people's expectations, the type of guest attending the event, manager's oversight, etc.

Identification and Measurement:

WHO has explained that stress makes it hard for humans to relax and can cause a range of emotions. When stressed, humans may find it difficult to concentrate. Humans may experience headaches, other body pains, an upset stomach, or trouble sleeping. Stress also impacts human appetite; either they eat more or less than usual. Stressful situations can also cause or exacerbate mental health conditions, most commonly anxiety and depression, which require access to health care.

Stress tends to be widespread during major economic crises, disease outbreaks, natural disasters, war, and community violence. Stress is an inherent part of the modern workplace, affecting employees at all levels and across various industries (Rosen et al., 2010). In recent years, there has been a growing body of research highlighting the impact of workplace stress on employee well-being, productivity, and overall performance (Ganster & Schaubroeck, 1991).

Stress symptoms can manifest in various ways, including fatigue, irritability, difficulty concentrating, muscle tension, and even physical ailments such as headaches or stomach problems. Some people seem to be more affected by stress than others. For some people, getting out of the door on time each morning can be a very stressful experience, whereas others may be less affected by a great deal of pressure.

When individuals are under significant stress, their cognitive abilities and decision-making skills may be compromised, increasing the likelihood of mistakes or accidents in the workplace. Recognizing and addressing the sources of stress in the work environment is essential for promoting a healthy and safe workplace for all employees.

Depending on the situation, the level of stress will vary, and it is dependent on the following factors:

- How comfortable one feels in certain types of situations
- What else is going on at that time
- Past experiences and how these affect the way one feels about oneself

- Available resources, such as time and money, people with a lot of debt or financial insecurity are more likely to be stressed about money
- People from minority ethnic groups or who are part of LGBTQIA+ are more likely to be stressed about prejudice or discrimination
- People with disabilities or long-term health conditions are more likely to be stressed about their health or the stigma associated with them
- People who stay with elderly parents or dependents
- People with high ambition in professional life or studies or sports etc.

When humans suffer from a mental health condition, it may be because their symptoms of stress have become persistent and have started affecting their daily functioning, including at work or at home. Chronic stress can worsen pre-existing health problems and may increase the use of alcohol, tobacco, and other substances. There are simple and complex signs through which we can identify stress:

Table: 1- Signs to identify stress

Emotional signs	Behavioural signs	Physical signs
• Anxiety / Anxious • Afraid • Apathy • Irritability • Mental fatigue • Depressed	• Sad • Avoidance of responsibilities and relationships • Extreme or self-destructive behaviour (e.g., cutting oneself) • Self-neglect • Poor judgment • Angry/aggressive	• Nausea • Indigestion / digestive disorders • Breathing irregularities • Exhaustion • Overuse of medicines • Sweating • Irregular heartbeats • Frequent illness

As explained above, everybody responds to triggers differently. Events that might be very stressful for one person can be easily manageable for the other. Measuring stress can include taking stock of the major life changes employees have been under and also how they responded to them.

There are these two components of stress that scientists ideally tend to measure:

- **Stress triggers:** the factors that cause stress. Identifying these triggers often involves self-reflection and can be documented through journaling or using specific questionnaires designed to capture life events and perceived stress levels. Stress triggers are external or internal factors that provoke a stress response. Common triggers include:
    - Major life changes (e.g., job loss, divorce)
    - Daily hassles (e.g., traffic, work deadlines)
    - Environmental stressors (e.g., noise, pollution)
- **Stress response:** how human will respond to stress triggers on an emotional, biological, or cognitive level

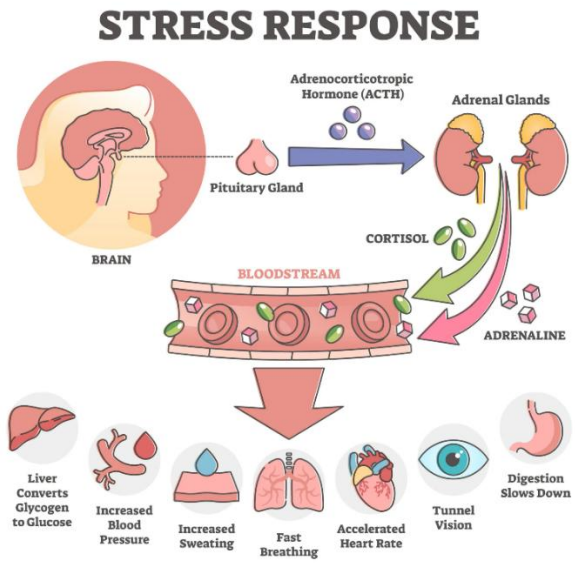

Figure 16. McLeod, S. (2023). Stress Biology. simplypsychology.org

There are multiple tools, scales, surveys, etc, to measure stress, and each of them targets various aspects of stress. Some methods of measuring stress examine the body's physiological, biological, or emotional responses to a situation. They record stress biomarkers such as heart rate and brainwaves to assess how stress affects the body. As per Ferguson, S. (2022), some of them are:

- The Trier Social Stress Test (TSST) helps study responses to acute stressors that have traditionally been studied in controlled laboratory settings. It captures responses that unfold within minutes of stressor exposure (e.g., emotional and physiological reactivity to an acute stress task). TSST involves stress tasks (e.g., giving a speech and performing mental arithmetic) in front of judges (Kirschbaum et al., 1993).
- *The Perceived Stress Scale* (PSS) is the most widely used psychological instrument for measuring stress perception. It measures the degree to which situations in one's life are appraised as stressful. The items were designed to tap into how unpredictable, uncontrollable, and overloaded respondents find their lives.
- *Heart rate variability* (HRV) analysis is a common way to measure stress. It involves recording the variation in time between consecutive heartbeats. In other words, it doesn't just look at how fast the heart is beating but how the time-period between heartbeats changes.
- *Brainwaves – Electroencephalography* (EEG) measures brainwaves. Research suggests that brainwaves can be an accurate way to measure stress response. An imbalance in alpha brainwave activity on different sides of the brain could be a potential biomarker for stress.
- *Hormonal testing*: Two hormones associated with stress are adrenalin and cortisol. When humans are stressed, their bodies produce adrenalin to give them energy to handle their stressors, and these hormones may make them feel restless when anxious.
- *Cortisol Levels*: Cortisol, a hormone released during stress, can be measured through blood, saliva, or urine tests. Elevated cortisol levels are indicative of stress and can lead to various health issues if persistently high

- *Behavioural Coding*: Observations of behaviour can also indicate stress levels, such as changes in social interactions or work performance.
- *Digital Biomarkers*: Recent advancements allow for real-time tracking of physiological responses to stress through mobile apps and wearable technology, which can provide continuous data on stress levels as they fluctuate throughout the day.

Crosswell, A. D., & Lockwood, K. G. (2020) have mentioned some steps to measure stress accurately:

- *Identify the Type of Stress*: Determine whether you are focusing on acute (short-term) or chronic (long-term) stress and tailor your measurement approach accordingly.
- *Choose Appropriate Tools*: To capture a comprehensive view of stress, utilize a combination of physiological measures (like cortisol and HRV) and self-report questionnaires.
- *Consider Timing*: The timing of measurements can affect results. For example, cortisol levels vary throughout the day, so measuring at consistent times is crucial for accuracy.
- *Use Validated Scales*: Ensure that the questionnaires and measures you use are validated for reliability and accuracy in assessing stress.
- *Analyze Data Holistically*: Integrate findings from various methods to build a complete picture of an individual's stress levels and responses, which can inform interventions or coping strategies

By employing these methods and considerations, you can effectively measure stress triggers and responses, leading to a better understanding of how stress impacts health and well-being.

Impact of Stress:

Elle Markman, said

“The stress response is natural and expected. It is the body's way of gearing up for whatever life throws your way and building resilience. Too much stress for too long, though, can have the opposite effect, wearing you down and contributing to physical and mental health concerns.”. Edwards, R. (2024)

Stress affects both the mind and the body. A small amount of stress can be beneficial and help employees carry out daily activities, but excessive stress can lead to physical and mental health issues. Understanding how to cope with stress can help organizations support employees' mental and physical well-being and help them feel less overwhelmed.

Stress significantly impacts human health, affecting both physical and mental well-being. It can be categorized into acute stress, which is short-term, and chronic stress, which persists over a more extended period. Examining the causes and consequences of workplace stress will help introduce potential preventive measures and provide valuable insights for employers.

Friedman, Will Joel (2013) explains that stress can significantly impact physical and mental health. Physically, it can lead to headaches, muscle tension, digestive problems, and a weakened immune system. Mentally, it can cause anxiety, depression, irritability, difficulty concentrating, and sleep disturbances. Long-term stress increases the risk of chronic conditions like heart disease and mental health disorders. Proper stress management is crucial for overall well-being.

Certain hormones, known as gonadal hormones, are secreted in large amounts during pregnancy, fetal development, and puberty and depleted during menopause. These hormones may play a role in how stress affects an individual. For example, a reduction in estradiol, a gonadal hormone, during the menopausal transition may alter the brain's response to stress. As we discussed earlier, the nervous system is the command center for human’s entire body. It helps humans think, learn, move, and remember. This vast network of nerves connects to all organs, muscles, and glands. Unexpected events that lead to Stress, like an infection, injury, or underlying condition, can affect the nervous system.

Scott, E. (2023); many employees face heightened stress levels when they are overwhelmed with tasks and time pressures. This stress can be exacerbated by a lack of control over one's work, unclear job expectations, and poor management. In some cases, stress can lead to physical symptoms such as high blood pressure and chest pains, but these symptoms should subside as stress levels decrease.

Stress at the workplace can also decrease productivity. Employees may struggle to concentrate on tasks, experience difficulties meeting deadlines, and manage their workload effectively. (Jones et al., 1988). Preventing workplace incidents requires a proactive approach that includes implementing safety training, risk assessments, safety policies, equipment maintenance, and promoting a culture of open communication and reporting.

One prevalent source of stress is role ambiguity and role conflict. When employees are unclear about their job responsibilities and performance expectations or experience conflicting demands from different stakeholders, they can experience heightened levels of anxiety and stress. As the research discusses, this sense of uncertainty and contradiction can undermine an employee's sense of control and contribute to burnout. (Singh & GOGIA, 2014).

Laura Keys Campbell, from Geisinger Medical Center, states that some physical signs your fight-or-flight response has kicked in include:

- Rapid breathing and heart rate
- Heightened senses and awareness
- Tense muscles
- Pale or flushed skin
- Cold or clammy hands
- Dilated pupils
- Dizziness
- Nausea

Campbell, K.L. (2023) shares nine effects of stress on the body:

1. *Elevated blood pressure:* It is normal for the blood pressure to spike temporarily when the fight-or-flight response is activated. Nevertheless, when stress becomes chronic, it could lead to long-term high blood pressure, which increases the risk of heart disease.

2. *Weakened immune system:* This is probably due to cortisol's effect on your immune system. It temporarily inhibits the body's ability to fight off infections by decreasing the body's supply of white blood cells, resulting in frequent colds and flu, mainly after a stressful project.

3. *Chronic inflammation:* Another impact of excess cortisol for a long period can cause the immune system to overreact in the form of inflammation. Inflammation is a critical part of the healing process of the body responding to intruders like viruses and bacteria; however, when no intruders are present, but the body is still sending out inflammatory signals, it can lead to chronic inflammation. Chronic inflammation has been linked to several health conditions including:
    - Arthritis
    - Diabetes
    - Heart disease
    - Crohn's disease, ulcerative colitis and irritable bowel syndrome (IBS)
    - Alzheimer's and dementia
    - Cancer

4. Not all chronic stress automatically leads to these conditions, but it can increase the probability or make symptoms worse if you already have something like arthritis or IBS.

5. *Headaches:* Muscles tense up during the fight-or-flight response, and chronic stress can cause tension headaches or trigger migraines in people who are prone to them.

6. *Anxiety, depression or mood changes:* Beyond the physical effects, stress can also have a big impact on your mental health. Unmanaged stress can trigger anxiety, depression, fatigue, difficulty concentrating, and irritability, leading to unhealthy coping mechanisms like drug and alcohol abuse.

7. *Weight gain:* Cortisol can cause cravings for foods rich in fat, sugar, and salt, like cheeseburgers or cakes. The body looks for quick doses of energy to prepare for whatever perceived threat it is going to face. Over time, reaching for these comfort foods during stressful situations could become unhealthy, leading to weight gain.

8. *Difficulty sleeping:* An increased adrenaline and cortisol suppresses the melatonin prepared by the body to fall asleep, which results in a lack of sleep. Sleep deprivation makes humans more likely to get stressed out.

9. *Decreased sex drive:* As other things occupy the brain function during periods of high stress, it is perfectly normal for sex drive to get impacted. This is typically only temporary and should resolve as you cope with the stress.

10. *Changes to your menstrual cycle:* Stress also impacts the flow and frequency of periods; sometimes, they are late, heavier, or shorter than usual. Irregular menstrual cycles are due to the impact of hormones during chronic stress situations. Medical support and guidance should be taken whenever these kinds of irregularities are noticed, and do acknowledge any long-term stress.

An article in Forbes.com emphasizes that symptoms of short-term stress include tensed muscles and increased sweating, heart rate, breathing rate, and blood pressure. Steven Pratt, M.D., senior medical director at Magellan Healthcare in Arizona, adds that people may also feel:

- As though they are on an emotional rollercoaster at work.
- Panic about work deadlines or loss of interest
- Irritable or apathetic
- Trouble concentrating

- Aches and pains
- Social withdrawal

Long-term stress can lead to headaches, digestive issues, sleep disorders, depression, worsened asthma, and anxiety.

Edwards, R. (2024) explains that General Adaptation Syndrome (GAS) is not a medical condition that can be identified with the help of a diagnosis. Instead, it is the process your body goes through automatically when it experiences stress. However, if the body is experiencing chronic stress that is negatively affecting life, help must be sought.

Physical conditions that may be triggered by long-term stress include:

- Arthritis
- Headaches
- Heart disease / Heart attack
- Hypertension
- Inflammatory bowel disease (IBD)
- Insomnia
- Memory impairment
- Metabolic syndrome
- Muscle tension
- Obesity
- Pain
- Peptic ulcer
- Pregnancy complications, such as small birth weight and preterm labor
- Stroke
- Type 2 diabetes

Mental health conditions that have symptoms related to experiencing stress over extended periods include:

- Disorders*:*
    - *Anxiety disorders*: Jones, H. (2023) explains that when worry becomes invasive and persistent, it leads to Generalized Anxiety Disorder (GAD). Employees with GAD do not simply have rational worries based on work or family; they worry regardless of outside stressors, exaggerate the perceived level of risk, and cannot rationalize away the worry.
    - *Panic Disorder*: Herndon, R. J. (2023) explains that panic disorder involves recurrent and frequent panic attacks without a clear cause. These attacks involve a sudden onset of fear or a sense of loss of control and are accompanied by a variety of physical symptoms like rapid heartbeat, sweating, nausea, and trouble breathing.
    - *Phobia-related disorders*: According to Pugle, M. (2023), a phobia is an excessive, persistent, and irrational fear of something and is a type of anxiety disorder. It can be directed toward objects, places, activities, situations, animals, or people.
- *Depression*: According to WHO (2023), depressive disorder (also known as depression) is a common mental disorder. It involves a depressed mood or loss of pleasure or interest in activities for long periods of time. A depressive episode is different from regular mood fluctuations.
- *Post-traumatic stress disorder* (PTSD): According to the National Health Service (NHS), PTSD is a mental health condition caused by very stressful, frightening, or distressing events. In other words, it is a psychiatric disorder that may occur in people who have experienced or witnessed a traumatic event, series of events, or set of circumstances.

- *Obsessive-compulsive disorder* (OCD) is a disorder in which people have recurring, unwanted thoughts, ideas, or sensations (obsessions). They feel driven to do something repetitively (compulsions) to get rid of the thoughts. The repetitive behaviours, such as hand washing/cleaning, checking on things, and mental acts like (counting) or other activities, can significantly interfere with a person's daily activities and social interactions. (APA, 2022)

According to Leka, Stavroula. Griffiths, Amanda and Cox, Tom (2003). Stressed workers are also more likely to be unhealthy, poorly motivated, less productive, and unsafe at work. Therefore, it is crucial to recognize the signs and symptoms of stress to manage and reduce its impact effectively. Common signs of stress include irritability, difficulty concentrating, fatigue, changes in appetite or sleep patterns, and increased reliance on unhealthy coping mechanisms such as substance abuse.

Remedies for Stress:

Managing stress involves adopting healthy coping strategies such as exercise, relaxation techniques, maintaining a balanced diet, getting enough sleep, and seeking social support. In addition, practicing mindfulness and engaging in activities that bring joy and relaxation can help alleviate stress. Per the Business Weekly article on Coping with Stress, it is essential to record situations, events, and people that make someone feel negative emotionally, physically, or mentally. This tracking helps to deal with negative emotions and avoid them if they cannot be faced.

Forbes magazine mentioned in its article that there are seven ways of managing stress. Employing techniques to stay physically and mentally healthy can alleviate stress and keep it at bay. Try these tips to tamp down workplace stress:

1. **Identify stressors.** Write down what stresses an individual during the workday and how they responded. E.g., morning traffic, coffee queue, too many meetings, poor food, etc. Whatever it is, jot it all down, then take time to reflect on what can be an alternative response to each situation in a healthier way.
2. **Practice relaxation techniques.** Meditation, mindfulness and grounding techniques, such as deep breathing exercises, can help calm the mind and body. Self-affirmation,

calming or joyful pictures, and a journal are also helpful in writing away any negative thoughts.

3. **Set aside time:** Make time to do things that one enjoys, such as spending quality time with friends and family and exploring new or existing hobbies. Taking some time for socializing, relaxation, painting or singing is essential. Employees could try setting aside a couple hours a week for some quality "me time" away from work.
4. **Step away from work.** Allow yourself to recharge by turning off notifications and not thinking about work while on vacation. Working wiser means prioritizing your work, concentrating on the tasks that make a real difference, and leaving the least important tasks to last. Working smarter, means accepting that one will not have time for everything.
5. **Maintain a regular exercise routine.** Setting aside 30 to 45 minutes for a walk during the workday will help with new energy and, often, new insights.
6. **Improve sleeping habits.** According to the National Heart, Lung, and Blood Institute (NHLBI), adults should aim for seven to eight hours of sleep. Sleep deficiency can cause impaired daily functioning, productivity, focus, and judgment, as well as frustration, crankiness, and worry, which can exacerbate workplace strain.
7. **See a therapist.** Talking with a therapist about a specific work situation can help address the impact of work stress on mental health, also act as an outlet for release of frustrations, and provide productive and healthy coping mechanisms.

Kubala, J. and Jennings, K. (2023). Add few more ways to manage stress:

8. **Minimize phone use and screen time**: While smartphones, computers, and tablets are often necessary, using them too often may increase stress levels. Studies have linked excessive smartphone use with increased stress levels and mental health disorders. Spending too much time in front of screens is associated with lower psychological well-being, lack of sleep, and increased stress levels in humans.

9. **Reduce caffeine intake:** Caffeine is a chemical found in coffee, tea, chocolate, and energy drinks that stimulates the central nervous system. Consuming too much caffeine leads to sleep deprivation and jitteriness, which may worsen anxiety.

10. **Create boundaries and learn to say NO**: Humans cannot control all. Overloading with work or tasks will increase your stress load and reduce self-care or recovery time. Simple NO can help reduce stress and protect your mental. In addition, you should also define boundaries — especially with people who add to your stress levels.

11. **Avoid procrastination:** Stay on top of your priorities; avoid unnecessarily and voluntarily delaying or postponing tasks despite knowing that doing so could have negative consequences. It is also true that you may be more likely to procrastinate in times of stress as a coping mechanism.

12. **Human touch** may have a calming effect and help you better cope with stress. Studies have shown that positive physical contact may help relieve stress and loneliness.

13. **Spend time in nature**: Green spaces such as parks and forests and immersing in nature are healthy ways to manage stress. Spending as little as 10 minutes in a natural setting may help improve psychological and physiological markers of mental well-being, including perceived stress and happiness, in young people.

14. **Consider supplements**: Several vitamins and minerals play an essential role in body's stress response and mood regulation. A deficiency in one or more nutrients may affect mental health and ability to cope with stress. Some studies show that certain dietary supplements may help reduce stress and improve mood.

By promoting and implementing these preventive measures, employees can work towards creating a safe and secure work environment, reducing the likelihood of workplace incidents and increasing self-well-being.

Friedman, J. W. (2013), explains another way to manage stress is Ketamine therapy. This relatively new treatment option for stress and anxiety has shown promising results in clinical studies. It is administered intravenously, often in a series of low-dose infusions over the course of several weeks or months. Ketamine works by modulating the activity of certain

neurotransmitters in the brain, particularly glutamate, which is involved in the regulation of mood and behaviour.

Stress mitigation techniques can help you cope with GAS. Examples you might want to explore include:

- Diaphragmatic breathing
- Progressive muscle relaxation
- Mindfulness

- Diaphragmatic breathing
- Progressive muscle relaxation

- Physical activity

Tangri, A. (2022), explains that meditation is a psychological discipline that helps reach in a state of consciousness that allows humans to become more aware of their bodies and minds. It allows you to concentrate on a single point, such as your breath, body, or mantra. It is the most effective technique for stress relaxation, mental clarity, and pain treatment. Every one of us is filled with various emotions in our daily lives. They are an inextricable element of all living things. Emotions include both happy and bad feelings. Anxiety, depression, wrath, and hostility are examples of pleasant emotions, while happiness and life satisfaction (subjective wellness) are examples of unpleasant emotions.

Workplace Incidents

Safety is the state of being "safe," the condition of being protected from harm or other danger. It is a state in which measures are taken to control hazards and conditions that could cause physical, psychological, or material harm to protect the health and well-being of individuals and the community.

An event is something that happens or is regarded as happening; an occurrence, especially one of some importance. (Dictonary.com

An *incident* is an unintentional event that may not result in damage, harm, or injury. However, if an unintentional event results in damage, injury, or harm, it is called an *accident*.

A *workplace* is a location where someone works for their employer or themselves, or, in other words, a place of employment. Such a place can range from a home office to a large office building or factory. All accidents are incidents, but not all incidents are accidents. This needs to be understood clearly, as it not only helps in identifying the root cause but also impacts the scope of the investigation and correct drafting of the mitigation.

Workplace incidents refer to any unexpected and undesirable events in a work environment. They can range from slips, trips, and falls to more severe incidents like machinery accidents or chemical spills, fires, and conflicts between employees. Workplace incidents can result in physical harm to employees, damage to property, and financial losses for organizations.

As per Nemmers, P. (2023), Incidents are often defined as unplanned events, such as near-miss injuries, safety breaches, property damage, or minor bumps or bruises. In most cases, an incident does not significantly harm a person. An example of a near-miss may include a team member avoiding a forklift when the driver backed up suddenly. (National Association of Safety Professionals)

According to OSHA, an incident is any unexpected occurrence that does not result in harm but has the potential to cause an accident or an event that could lead to injury or damage. NEBOSH defines an incident as an unplanned event that could have but did not cause harm, injury, or damage.

Similarly, according to OSHA, an accident is an unexpected event that results in injury, illness, or damage to property. However, in NEBOSH's view, an accident is an unplanned, undesirable event that can cause harm to people or property. An accident is an event, but all events are not accidents.

Riker, W. H. (1958) explains that the cause of an event consists, it is commonly said, of a necessary and sufficient condition for its occurrence. He adds that the notion of an event is a subjectively sliced-up segment of motion and action. A situation can either be at the start or end of an event; one situation can serve as an initial or terminal situation of infinite events. All contributive factors and the involvement of humans in these situations can help predict the outcome of an event, which can be positive or negative.

Falcon, A. (2006). explains that Aristotle made it clear that there are many kinds of causes, classifying them as efficient, material, final, and formal. He also added accidental causes. His word for causes, aitia (ἀιτία), has as root meaning "the things responsible for" something. "Every Event Has A Cause" is a principle of universal causality. Events have many contributing causes. Aristotle recognizes four different explanatory roles that a thing can play.

Things that directly lead to another event are called 'Causes'. For every situation an employee faces, they make a choice based on their life experience and learning from parents, school, or college. Sometimes, these are easy choices, and sometimes, they get more complex. These choices determine whether they will have good or bad consequences. Some causes occurred immediately before the event began, while others existed for several years before they caused the event. This idea of making choices and experiencing the effects of these choices is known as ***cause and effect***.

Prior, J. (2023), elaborates that cause and effect refers to the relationship between events or actions where one event, the cause, leads to another event, the effect. As formulated in 1687, Newton's third law of motion, "For every action, there is an equal and opposite reaction." This scientific principle applies to cause and effect, stating that every action has a reaction that is equal in magnitude and opposite in direction. However, it is not necessary that the effect will be the opposite, but there will be a reaction, e.g., evaporation will cause cloud formation, and the effect will be rain.

"Cause and affect" is not correct and is not used. "Affect" should not be confused with "effect". "Affect" is primarily used as a verb to describe the way something influences or impacts another thing. "Effect" is predominantly used in the noun form and refers to the outcome or result of a particular cause or action. Therefore, it is always "cause and effect" because, in this context, the cause is why something happens, and the effect is the outcome of what happened. (Prior, J. 2023)

Cause and effect are important concepts that help us understand the relationship between events and their outcomes. Whether in personal, historical, scientific, or natural contexts, the concept of cause and effect helps analyze the factors contributing to the outcome and help make better future decisions. Analysing cause-effects helps in identifying and eliminating problems and defects in processes. By systematically investigating the causes and their effects on the system, sustainable improvements can be achieved.

It is essential, to understand the fundamental root causes of these incidents and the role employees play in them. Various underlying contributing aspects relate to employees viz. intricate interplay of psychological, neurological, and environmental factors influencing their diverse emotional reactions.

5Ws and 1H

An incident refers to an unintentional event that occurs without resulting in harm, injury, or damage. These events can range from minor occurrences of exposure to potential hazards that may have the potential to cause harm to employees willingly exposing themselves to such hazards. When examining the intricacies of incidents, it becomes apparent that four fundamental components can lead to an incident, either independently or in conjunction. These components include situation (presence of hazards), human, processes, and external factors.

Figure 17. Sharma, A. (2024). Factors that cause incidents

These components play a vital role in shaping our understanding of how incidents occur and how they can be prevented. It is also essential to know the interrelationships between these components.

1st factor - Situation:

Workplace **situations** can expose employees to conditions (physical, chemical, biological, ergonomic, psychological, etc) that have the potential to cause harm or injury. These circumstances may arise from external factors, workplace design, location, nature of work, scope of duties or from the choices made by employees themselves. Furthermore, the

increasing prevalence of virtual work environments and the use of technology, such as smartphones and social media, has introduced new sources of harm.

To explain the topic, let us understand this with an example: Consider a metal fabricating factory will have various unsafe conditions, viz. unsafe physical surroundings, protruding objects, cutting blades, moving machinery/ vehicles, etc., including conditions such as poor ventilation, excessive noise, or ergonomic issues, etc. all these can induce situations that can harm employees. Furthermore, if employees choose to work in such a condition without prior knowledge or experience and ignore safety practices, they expose themselves to unnecessary risk due to their decision.

It would be unfair to say that hazards are only located in manufacturing industries, chemical industries, or construction sites; hazards and unsafe locations are also present in our everyday workplaces like back offices, banking branches, etc. The nature of these hazards or unsafe conditions is different at these locations, and undoubtedly, the level of exposure or impact at these workplaces will be different when compared to industry v/s back-office.

Safety hazards at the workplace are all too common. Some examples include:

- *Wet floors*: A dirty or wet office environment may invite pathogens, leading to slips and illnesses.
- *Cords crossing walkways*: These increases the trip hazards leading to injury or muscle cramps
- *Blocked exits*: Exit routes must be accessible and unobstructed. No equipment or material should block an exit route, as it creates entrapment.
- *Uneven floor surfaces / torn carpets*: These conditions are hazards that can compromise the safety or health of employees walking on them.
- *Unhygienic situations*: Unsanitary premises expose personnel to illness or mortal wounds. Animal droppings, spills, mold, dust, asbestos, bacteria, and viruses can also contaminate the air.

In some cases, the work itself can be unsafe situation. For instance,

- *Height works* – Roofing, climbing ladders, and scaffolding are dangerous work activities, and there is always the risk of falls.
- *Electrical works* – installations of cables, grid power works, etc. can lead to electrocution, burns, or fires.
- *Machinery works* – have various hazards from moving parts, sharp objects, hot surfaces, etc.
- *Chemical works* – various uses of chemicals can lead to internal organ damage, skin burns, breathing issues, loss of eyesight, etc.
- *Biological work* – can cause contagious diseases, bacteria, and other sources that can cause infections.
- Ergonomic situations – physical stress, awkward body positions, repeated movements, physical overexertion, etc., lead to fatigue in the short term and worn-out muscles, tendons, ligaments, and nerves in the long term. Some lead to musculoskeletal disorders.

What causes these situations:

- *Poor Design*: Equipment or workspaces designed without considering safety aspects.
- *Wear and Tear*: Machinery and tools can deteriorate over time, leading to potential hazards.
- *Inadequate Maintenance*: Not regularly inspecting and maintaining equipment can result in malfunctions.
- *Environmental Factors*: Situations like poor lighting, excessive noise, or inadequate ventilation can pose risks.
- *Improper Storage*: Hazardous materials or tools not stored correctly can lead to spills, falls, or other dangers.
- *Inadequate Policies*: Not having or not updating safety guidelines to current standards.

- *Economic Constraints*: Cutting corners to save costs might result in compromised safety.
- *Lack of Emergency Preparedness*: Not having plans or equipment in place for emergencies like spills, etc.
- *Organizational Culture*: A work culture that does not prioritize safety can lead to systemic unsafe situations.

2nd factor - Humans:

Considering the **human** (employee) factor, as per Pic. 15 above, it is essential to recognize that employees' reactions to a situation can vary due to their diverse experiences, knowledge, intelligence, emotional states, understanding, and individual differences. Humans are fallible and prone to errors and mistakes. Feeling tired and unwell can worsen the situation, causing poor decision-making and judgment. Overconfidence can sometimes lead to employees ignoring safety regulations or bypassing safe work procedures.

Human error is not an explanation for failure, but instead demands an explanation; and that effective countermeasures start not with individual human beings who themselves were at the receiving end of much latent trouble (Reason, 1997), but rather with the error-producing conditions present in their working environment

"*To err is human, to forgive divine*" – Alexander Pope (Donaldson et al., L. T. (Eds.). (2000).)

In 2024, Pedersen delved into the intricate interplay of psychological, neurological, and environmental factors contributing to the vast array of emotional responses to different situations. The said research sheds light on the complexities of human behaviour in the workplace and the various influences that shape our reactions. Understanding these influences can help organizations create a more supportive and empathetic work environment, fostering better employee communication and collaboration.

According to Sadeghniiat-Haghighi and Yazdi's research, human factors pertaining to environmental, organizational, and job-related elements can affect individual behaviour in the workplace. These factors include job-related tasks and workload, daily work patterns, the

organizational environment (e.g., workplace design, culture, team dynamics, communication, resources), and individual characteristics (e.g., capability, competence, attitudes, risk tolerance, psychological state)

According to Mishra, T. (2024), human factors causing accidents encompasses all the elements contributing to a workplace accident that can be directly attributed to an operator, worker, or other personnel. Humans are involved throughout an organization's life cycle, from management to production to ordering raw materials, inventory/dispatch, marketing, etc. Incidents may stem from the behaviour of all team members, not just those directly involved in the activity.

According to the Health and Safety Executive (2021), these human factors can often affect workers subtly, gradually impacting their psychological safety and health. While psychological safety may not be overtly evident, multiple internal and external factors can affect employees' work and physical state, such as organizational stress, mental health issues, financial concerns, bullying, and substance misuse. Additionally, large-scale life-changing events, like pandemics, conflicts, or political upheaval, can also be considered human factors that can influence one's work style, psychological state, productivity, and overall safety at the workplace.

Various rules and acts, like The Health and Safety at Work, etc., place responsibility on all persons at work, including employees. Everyone is responsible for creating and maintaining a safe working environment. Employees must cooperate with their employers and supervisors in participating in and promoting health welfare and safety activities. And should not endanger themselves or others from their behaviour or act.

Scott, K. (2024) elaborates that some failures can have an immediate impact on health and safety; however, others can have an indirect impact. Employees do not intend to make errors deliberately; they may misinterpret a situation and act inappropriately, or they may, for different reasons, regularly cut corners. Delayed failures can occur if there are issues such as; failures in health and safety management, poor design of plant and equipment, ineffective training or ineffective communications.

Mishra, T. (2024) also endorses the idea that humans are fallible and prone to errors and mistakes. Fatigue and sickness can further exacerbate the problem, leading to bad decisions or poor judgment. In other cases, overconfidence can result in a worker disregarding safety rules or circumventing safe work practices.

Some human factors that commonly contribute to workplace accidents include:

- Memory lapses (including forgetting a step in the work process or a safety measure)
- Impaired judgment
- Inattention or distraction
- Negligence of basic safety rules
- Lack of experience
- Skill level inadequate for the task performed
- Arrogance or overconfidence

Following are some contributors/actions taken by humans which result in incidents at workplace:

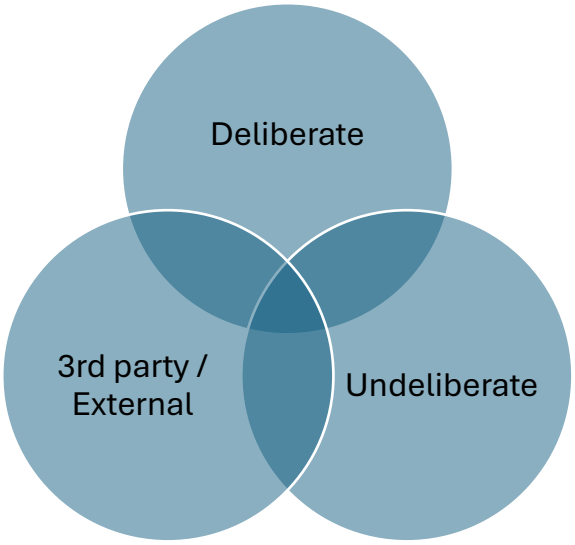

Figure 18. Sharma, A. (2024) - Human's contribution to incidents

- *Deliberate*: Human factors causing accidents encompass all the elements contributing to a workplace accident that can be directly attributed to an operator, worker, or other personnel. These factors can include willful violations of safety rules, overconfidence, as well as inattention, fatigue, and intoxication. Some examples:
    - *Hasty Decisions*: Acting before thinking can lead employees to make hazardous decisions or try to take shortcuts.
    - *Indifference*: unwilling to take an interest in the task or perform their assigned duties and responsibilities.
    - *Poor habits*: poor hygiene, cluttered floor/workstation, loose clothing, etc.
    - *Overconfidence*: Display behaviour that is too cocky and risk-taking and shows oneself as superior.
    - *Curiosity*: Employees do something unplanned or other than standard procedures to experience a thrill.
- *Undeliberate*: Those who made mistakes should neither be blamed nor punished, it argues, instead, to look at the system. These actions were not instigated by the employees purposely; however, they may occur due to the following reasons:
    - *Over cautious*: Employees who are overcautious and try to be perfect
    - *New joiners*: They are unaware of new or minute details of the tasks
    - *Lack of instruction or handover*: Incidents occur when the instructions are not shared or communicated correctly.
    - *Mood*: Causes a person to become irrational and to disregard common sense or sometimes drive towards negligence resulting in failure to observe basic safety rules of instructions or to maintain equipment
- *3rd party / external*: Some factors are not in employees' hands, but they still get entangled in errors and incidents:

- *Old/outdated system*: Employees working on an old/ outdated system which can fail or cause errors unexpectedly
- *Poorly designed procedure*: If the instructions are not correct, then even skilled employees can make mistakes
- *External factors*: Sometimes unexpected things/ conditions also lead to errors/incidents like power failure or earthquake/ lighting, which distract employees and can result in an incident or error.

3rd factor – process:

Scott, K. (2024) explains that humans have a role in the product's life cycle, from design to operations to maintenance and management of the whole organization. Incidents may not just be associated with the behaviour of the individuals directly involved in the activity but also result from behaviour throughout the system.

Management can hire the best-suited employee and provide the best possible and safe workplace, but if they do not introduce adequate **processes or systems**, unintended events will result. A good process or system is a series of actions or steps taken to achieve a particular end. Processes are all the related activities or parts inside a system that work together to make it function.

Multiple processes and systems are necessary to keep a workplace organized and functioning smoothly. These include physical systems such as the Heating, Ventilation, and Air Conditioning (HVAC) system, computers, lighting, and generators, as well as processes like evacuation procedures, emergency response plans, and access protocols. If these systems are not maintained, if processes are not properly designed, or if employees are not sufficiently informed, incidents are likely to occur.

Incidents related to processes can occur during any phase of operations: startup, shutdown, process upsets and malfunctions, maintenance activities (e.g., cleaning), product transfer and handling (e.g., loading/unloading equipment), and emergency response activities

(e.g., firefighting). In a common back office workplace, these can happen while cleaning the workplace, cafeteria, repairing light fixtures, air conditioning, painting the office, etc.

Common causes of process incidents are human error, equipment malfunctioning, and failure to follow proper procedures. Here are few more:

- Lack of management commitment to process safety
- Inadequate training in process safety for employees
- Insufficient process hazard analysis
- Inadequate design and operation of equipment or systems.
- Poor maintenance practices, such as failure to properly maintain equipment or systems.
- Mismanagement of safety hazards, such as not addressing known safety issues at the appropriate time.
- Lack of knowledge and experience in handling hazardous materials
- Lack of proper tools in place
- Human error, such as forgetting to turn off a valve or leaving a pump running.

Proper maintenance of these systems and careful design of the processes involved are crucial. Additionally, effective communication with employees is essential to ensure that they fully understand their roles and responsibilities within these systems and processes. Failure to adequately maintain these systems, design effective processes, or communicate with employees can lead to incidents and disruptions in the workplace.

Safe and well-designed processes are a systematic approach to preventing and mitigating workplace incidents. Management should encompass a range of strategies, policies, and practices to safeguard personnel and the workplace from potential harm/catastrophe.

4th factor – External factors:

Organizations put a lot of effort into selecting the best human resources, deploying the best systems, and drafting the most effective processes to ensure the workplace is safe and conducive to maximum productivity and growth. Management attempts to reduce the severity of stress symptoms before they lead to serious health problems (Murphy & Sauter, 2003). This can include regular safety training, proper equipment maintenance, and creating a culture of open communication and reporting. However, these all can fail due to power grid failures, network interruptions due to cyber-attacks, riots, earthquakes, floods, etc., which are considered ***external factors***.

The environment and the people around us significantly influence our thoughts, actions, and decisions. The power of social influence, peer pressure, environmental cues, and media influence cannot be underestimated. It is important to recognize that external factors can come in many forms, including natural disasters like earthquakes, hurricanes, or floods, as well as man-made events such as cyber-attacks, industrial accidents, or acts of terrorism.

The impact of these external factors can be significant, affecting not only a business's day-to-day operations but also the well-being of its employees. Employers and organizations must have plans in place to address both the immediate and long-term effects of these events on their workforce. This includes providing support for employees' mental health and physical well-being during and after an incident to minimize the risk of long-term consequences such as PTSD or other mental health conditions.

External factors which can play a part in causing incidents:

- *Regulatory Policy changes*: There are incidents where, organizations follow old rules and regulations to by machines or equipment that are unsafe, leading to incidents.
- *Economical factors*: Employees or organizations facing financial challenges are more prone to take shortcuts and also ignore safety or precautions which can increase expense, eg. Employee may not repair their car to avoid frequent expenses or buy a helmet while riding a bike; an organization may not buy new protective equipment for employees

- *Relationship factor*: Personal relationships are essential to an employee's life. Aling parents or family members, child education, divorce, quarrels with neighbours over parking spots or occupying excess space, etc., all these issues impact emotional imbalance.
- *Environmental factors*: Weather impacts employees' emotional, physical, and mental well-being. Too much heat or cold can cause body fatigue and health effects, and gloomy weather can affect emotions.
- *Technological factors*: Technology is a massive part of today's workforce. It is constantly updating and changing, making it challenging for employees to keep up and sometimes impact their performance compared to young joiners.
- *Social Factors*: Public opinion and societal expectations are largely external factors that force employees to reevaluate their social circle and status. Employees often try to create a false image to show a higher status, leading to unsafe actions and, at times, conduct unethical acts.

Types of Incidents:

Workplace injuries can happen in any industry, including office settings and construction sites. These incidents can vary from minor cuts and bruises to severe accidents resulting in long-term disabilities. According to the Association of Workers' Compensation Boards of Canada, 227,271 workers reported lost time due to work-related injuries from 2000 to 2021, highlighting the prevalence of workplace accidents.

According to Malik, I. (2023), organizations can create a safer environment for all employees by understanding and addressing these types of incidents. Identifying and being aware of prevalent workplace injuries is crucial, as it allows us to take proactive measures to prevent them. By recognizing potential hazards, we can implement safety protocols, provide proper training, and equip employees with the necessary tools to avoid accidents. Hazard recognition training can help employees understand and identify potential hazards.

McElroy, S. (2023), incidents or accidents can take place anywhere, and more serious incidents can have a long-term physical and emotional impact on those affected while also having significant financial implications for the business itself. As an employer focused on enhancing workplace safety or an employee interested in safeguarding your well-being, this article offers valuable insights and practical tips for preventing common workplace injuries.

Several types of accidents are commonly reported in the workplace. The specific types and frequency can vary depending on the industry and work environment. Here are some of the most common types of accidents in the workplace:

- **Slips, trips and falls**

  According to the Health and Safety Executive, an average of two employees dies every year because of a slip, trip or fall on the same level. Slips usually happen when there is a lack of friction between the footwear and the floor surface, often due to wet or polished floors. Trips occur when a person unexpectedly catches their foot on an object, which can be due to clutter, poor lighting, or uneven surfaces.

  Falls can result from slips or trips and can happen when working at heights without proper protection. Very often, negligent employees leave file drawers open; they are too engrossed in their phones to see the floor difference or steps, resulting in a fall. Loose electrical cords and wires can also pose a significant risk in the workplace. These incidents can cause injuries ranging from minor cuts or bruises to more severe issues like fractures, sprains, or even life-threatening head injuries.

- **Fire-Related Incidents**

  Various factors, including flammable materials, electrical malfunctions, or unsafe handling and storage of chemicals, can cause workplace fires. Fire incidents can lead to severe burns or respiratory damage, and they can rapidly spread, causing widespread damage to property and posing a significant risk to human life.

  Explosions, often due to a build-up of gases or volatile chemicals, can have devastating effects, causing severe injuries or fatalities.

- **Falling Objects**

  Falling objects pose a significant hazard in workplaces where materials and goods are stored or placed/lifted at heights, and they fall during lifting processes or tumble from elevated work areas due to vibrations or moving objects, putting workers below at risk. There can be other reasons, such as overloading, damaged shelves, improper stacking, inadequate securing of materials, or failure to use proper lifting techniques and equipment. The consequences can range from minor injuries like cuts and bruises to more severe head traumas and even fatalities.

- **Cuts and Lacerations**

  Cuts and lacerations are injuries caused when skin breaks in contact with an external object. These scenarios are prevalent in kitchens, construction sites, workplaces with many drawers or sharp edges, and workplaces where tools or machinery are used. These injuries can be caused by various factors, including, lack of concentration, improper use of tools, failure to wear appropriate protective gear, lack of training, or poor maintenance of cutting equipment. The severity can range from minor cuts requiring basic first aid to deep lacerations requiring medical attention.

- **Electrical**

  Electrical incidents involve contact with electrical sources such as exposed wires, electrical outlets, equipment, etc., resulting in injuries such as shocks or burns. These incidents can occur in various settings, including workstations, workshop areas, construction sites, and industrial facilities. The severity of electrical injuries can range from minor shocks or burns to severe burns, internal injuries, or even fatalities due to electrocution.

- **Vehicle-Related Incidents**

  This category includes accidents involving vehicles or equipment used at the workplace, like forklifts, material movement vehicles, golf carts, etc. Injuries can include fractures and lacerations, often resulting from improper training or unsafe driving practices.

- **Overexertion and Muscle Strains**

  These incidents can lead to serious musculoskeletal injuries, commonly resulting from repetitive lifting or awkward postures. To explain further, Overexertion injuries occur when an individual engages in excessive physical effort while lifting, pushing, pulling, or throwing objects. These injuries are often caused by improper lifting techniques, attempting to move objects that are too heavy, or not having enough rest breaks. These are also known as Repetitive Strain Injuries (RSI), which are musculoskeletal disorders arising from repetitive motions or awkward postures for extended periods. Strains, sprains, muscle tears, and back injuries are not only painful but can also lead to long-term health issues and affect a person's ability to work and body structure.

- **Exposure to Harmful Substances**

  Exposure to harmful substances such as asbestos or carbon monoxide can cause severe health issues, including respiratory disorders and other long-term health effects. The causes of exposure are often due to inhalation, skin contact, or ingestion, inadequate ventilation, improper handling of hazardous materials, or lack of personal protective equipment. Exposure can result in various health issues ranging from respiratory problems and skin irritation to more severe conditions like chronic lung diseases or cancer.

- **Caught-in/between Objects:**

  Caught-in/between-objects incidents involve individuals becoming trapped, squeezed, or crushed between stationary or moving objects, such as machinery, equipment, or tools. They are ubiquitous in workplaces with lots of doors or drawers, manufacturing, construction, and industrial workplaces. These incidents can lead to fractures, amputations, or even fatalities.

- **Struck Against Objects:**

  Struck Against Objects accidents occur when an individual accidentally runs into or is forcefully pushed against stationary objects such as walls, doors, cabinets, or machinery. This type of accident is common across various workplaces, including offices, warehouses, and construction sites. The impact can vary in severity, from minor bruises or cuts to more serious injuries such as fractures or concussions.

- **Violence at the Workplace**

  Violence at the Workplace refers to physical altercations or attacks within a work environment and can involve confrontations between employees or assaults by outsiders such as customers or intruders. Various factors, including workplace stress, personal conflicts, or external criminal intent can prompt this kind of incident.

According to Safereach.com, An incident is generally defined as any unexpected event that disrupts or has the potential to disrupt the normal operations of an organization. This definition includes both physical and digital events. Incidents can be divided into different categories depending on their cause and area of influence:

- *Technical incidents*: These may include hardware and software failures, network outages, data loss, or cyber attacks. Technical incidents are particularly critical for companies with a high level of IT dependency, as they can paralyze the entire business operation..

- *Physical incidents*: Disruptions can arise from a variety of sources, including fires, floods, earthquakes, and other natural disasters. Additionally, human errors leading to physical damage can also cause significant disruptions. For instance, a fire in a data center has the potential to completely devastate the IT infrastructure.

- *Human incidents*: These events are the result of human actions, including deliberate damage, sabotage, terrorist activities, or internal wrongful behaviour. Additionally, staff absences due to illness or strikes can also fall under the category of human incidents.

- *Social and political incidents*: Political upheavals, terrorist attacks, and pandemics are examples of critical events that can have widespread repercussions on public safety, societal order, and business operations.

An incident can be any unexpected situation that disrupts an organization's normal operation. Recognizing and managing incidents are essential components of emergency management.

Identification and measurement

Understanding and identifying these components is crucial for effectively managing and preventing incidents in various settings, be it in the workplace, public areas, or everyday life. Therefore, it is important to know how to identify and measure these incidents. A proactive approach, including prompt response and investigation following workplace incidents, can help identify root causes and prevent future occurrences, ensuring a safe and productive work environment.

According to OSHA, all incidents must be investigated promptly to identify the root causes and contributing factors. The depth of the investigation will depend on the seriousness or potential severity of the incidents. Experienced employees should be tasked with conducting an initial investigation to identify the root causes and which individual or combination of the factors led to this incident. Addressing underlying or root causes is necessary to truly understand why an incident occurred, to develop truly effective corrective actions, and to minimize or eliminate serious consequences from similar future incidents.

As per an article on www.ehsdb.com, incident measurement and identification are essential components of effective safety management systems. They involve systematically collecting and analyzing data related to incidents, which can include accidents, near misses, and other unplanned events. Understanding these incidents helps organizations prevent future occurrences and improve overall safety performance.

Conducting an incident analysis provides employers with a systematic approach to identifying and controlling the underlying or root causes of all incidents in order to prevent their recurrence. This also involves gathering information by collecting physical evidence,

conducting interviews, and reviewing records to create an accurate timeline of events. This is followed by conducting a root cause analysis to identify underlying flaws in procedures or policies. Finally, patterns are identified, and corrective and preventive actions are taken to address risks and improve safety.

Pirzadeh P. et al. (2021) did a detailed study and summarized that various investigation models can typically be grouped into three types: sequential, epidemiological, and systemic. Based on these models, approximately 36 incident and accident investigation techniques can easily be applied to low-risk to various high-risk industries.

Decades of research have provided numerous models and methodologies to choose from. Some examples of systemic techniques used mainly by the academic domain and by practitioners and some sequential and linear techniques commonly used because they are less resource intensive and more accessible to apply such as:

- *The "5 Why" Method*
- *Man, Technology and Organization (MTO) Analysis*
- *Functional Resonance Accident Model (FRAM)*
- *Human Factors Analysis and Classification System (HFACS)*
- *Systems Theoretic Accident Modeling and Processes (STAMP)*
- *AcciMap*
- *Safety Occurrence Analysis Methodology (SOAM)*
- *Accident Evolution and Barrier Function Method (AEB)*
- *Safety Function Analysis (SFA)*
- *Tripod Delta*

There are some out-of-the-box solutions; these methodologies are fairly common and well-respected by many organizations.

- Tap RooT
- REASON
- Kelvin TOP-SET

According to CCOHS, effective incident measurement and identification are vital for enhancing workplace safety. By employing data collection methods, KPIs, and investigation techniques; organizations can better understand incidents, identify root causes, and implement corrective actions to prevent future occurrences. Some of the practical methods for Incident Measurement and Identification are as follows:

1. **Data Collectio**n
    - Gather quantitative and qualitative data from various sources, including incident reports, audits, surveys, interviews, and observations.
    - Ensure that data collection is consistent, accurate, and timely to facilitate effective analysis.
2. Use of Key Performance Indicators (KPIs)
    - Implement KPIs to measure the effectiveness of incident management processes. Common KPIs include the number of incidents, average time to resolve incidents, and the rate of incident recurrence.
    - These metrics help identify trends, diagnose problems, and set benchmarks for safety performance.
3. Accident Investigation Techniques
    - Employ various accident investigation techniques to analyze incidents. Techniques can be categorized into:
        - Sequential Models: These focus on the chronological order of events leading to an incident.
        - Epidemiological Models: These analyze patterns and frequencies of incidents across populations.
        - *Systemic Models*: These consider the complex interactions within sociotechnical systems, addressing both immediate and latent factors contributing to incidents.

4. Root Cause Analysis (RCA)
    - Conduct root cause analysis to identify underlying causes of incidents rather than just addressing symptoms. This can involve methods like the "5 Whys" or Fishbone diagrams to trace back through the chain of events that led to the incident.
5. Graphical Illustrations
    - Utilize graphical methods, such as event sequence diagrams or causal factor charts, to visualize the relationships between different factors involved in incidents. This aids in communication and helps identify gaps in understanding.
6. Integration of Techniques
    - Consider integrating multiple investigation techniques to capture different aspects of incidents. This approach allows for a more comprehensive understanding of the factors at play and can lead to more effective preventive measures.

The incident impact refers to the extent of the negative consequences of an incident on the organization, its customers, stakeholders, and reputation. It is important to measure incident impact in order to determine the urgency, resources, and strategy of the incident response, as well as potential legal, regulatory, and financial implications. Incident impact can be measured in terms of availability (such as downtime or degraded service), confidentiality (such as compromised or exposed sensitive or personal data), integrity (such as corrupted or altered data or functionality), scope (such as the number of systems, users, or customers affected), and cost (such as lost revenue, recovery expenses, or fines).

Measurement is as crucial as identifying the root cause of an incident. Key Performance Indicators (KPIs) for the Incident Management process suggest that metrics should be defined early in the implementation process to assess performance and establish measurable targets.

These metrics can include:

- Number of incidents detected during a specific period of time
- Number of incidents resolved
- Amount of time it took to resolve the incidents
- Number of problems resulted from the detected incidents

Occupational Health and Safety Administration (OSHA) and Environmental Health and Safety (ESH) Services have set some standards that are essential to ensure compliance and safety best practices in the workplace. These organizations have established safety standards that serve as benchmarks for companies willing to create secure work environments. 10 key safety metrics that contribute to the reduction of work-related incidents:

1) *Lost Time Incident Rate* (LTIR) is a safety metric used to measure the number of work-related incidents per 100 full-time employees. To calculate LTIR, multiply the number of lost time incidents by 200,000, and then divide the result by the total hours worked during the measurement period. This formula provides the LTIR rate for 100 employees working 40 hours a week for 50 weeks.

2) *Total Recordable Incident Rate* (TRIR) is a safety metric that includes all work-related safety incidents that result in death, lost time, days of restricted work, transfer to another job, medical treatment beyond first aid or loss of consciousness. To calculate TRIR, multiply the total number of reportable incidents by 200,000. Then, divide the result by the total hours worked during the measurement period.

3) *Near Miss Rate* (NMR) is a safety metric that is an unplanned event that could have but did not cause injury, illness or damage.

4) *Days Away, Restricted or Transferred* (DART) is a safety metric that measures the number of incidents resulting in days away from work, job restrictions or transfers to other duties. Organizations can calculate the so-called DART rate by multiplying all DART incidents by 200,000 and then dividing them by the total hours worked during the measurement period.

5) *Injury Frequency Rate* (IFR) is a safety metric that indicates the number of injuries over a set number of hours worked, usually per million hours.

6) *Injury Severity Rate* (ISR) is a safety metric that measures the gravity of injuries, typically by calculating the total number of lost days due to injury per million hours worked.

7) *Lost Workday Incident Rate* (LWIR) is a safety metric that focuses on incidents resulting in missed workdays. The LWIR only counts days beyond the day of the incident, using a formula similar to that of LTIR.

8) *Training Completion Rate* (TCR) is a metric that tracks the percentage of required safety and health training programs completed by employees.

9) *Toolbox Talks* (Attendance count) are informal safety meetings about specific, current job-site issues.

10) *Safety Audits Submitted* is a metric that refers to the number or status of safety audits that have been submitted or completed.

The International Labour Organization estimates that every year, 2.3 million workers get injuries in the workplace. While some of these injuries are relatively minor, others can cause long-term damage, leading to extended absences from work and, in some cases, permanent disability. Therefore, calculating the impact of an incident is also an important step in determining the actual cost to the company. Most of the time, assessors make the mistake of only considering the direct cost of the incident and miss out on indirect cost which also impacts the organization.

Direct costs include repairing or replacing the workstation, medical fees/ compensation, regulatory fines, replacement costs, salvage costs, etc. However, indirect costs generally go unnoticed, including lost productivity, excess supervision time and administrative costs, recruiting, hiring, and training replacement workers, loss of business and goodwill, etc. These indirect costs may vary from case to case, making the total cost of a workplace injury challenging to assess fully

Workplace incidents cost businesses hundreds of thousands of dollars per year in terms of sickness pay, lost productivity, and in arising personal injury claims. There are several ways to prevent incidents at the workplace. Some examples include (but are not limited to):

- Conduct risk assessments
- Maintain and inspect machinery
- Provide regular training
- Provide appropriate Personal Protective Equipment (PPE)
- Maintain good housekeeping
- Display Signages – warning/advisory etc
- Report and record incident/ near miss

How to prevent Incidents:

Lindberg, A. et. al. (2010) studied that one of the most effective ways to prevent accidents in the workplace is through thorough training. By providing employees with the knowledge and skills they need to identify and mitigate potential hazards, businesses can significantly reduce the risk of incidents. This, coupled with other measures such as discouraging risky behaviour, implementing control measures tailored to specific hazards, regularly reviewing and updating policies and procedures, conducting regular inspections of equipment and tools, ensuring adequate supervision, consulting with employees for their expertise in risk management, adopting a proactive risk management approach, and offering comprehensive support for employees' physical and mental well-being, will help in efficient investigation and prevention of incidents.

After understanding the key factors that cause incidents and the ways organizations can identify and measure them, organizations must understand the remediation measures that can help them eliminate or reduce the occurrence of these incidents. Due to the nature of the work, if occurrence cannot be reduced, then at least the impact from these incidents can be reduced.

According to Drupsteen, L. et al. (2013), reducing/eliminating incidents requires a comprehensive and proactive approach that addresses both immediate and underlying causes. By implementing the strategies and techniques outlined in this guide, organizations can create a safer workplace, reduce costs, and promote a positive organizational culture. This means that there is room for improvement, and a good management system promotes continuous improvement. learning from incidents and near misses is crucial to sustaining incident prevention efforts over the long term.

Stemn, E. et. al. (2017). preventing incidents is crucial for ensuring workplace safety, reducing costs, and promoting a positive organizational culture. Effective incident prevention requires a comprehensive approach that addresses both immediate and underlying causes. This guide outlines key strategies and techniques for preventing incidents in the workplace, empowering you, the organizational leaders, safety managers, and employees responsible for workplace safety, to take charge and make a difference.

1) *Incident Reporting and Investigation*:

Macrae, C. (2015) explains that incident reporting is viewed as a process of social and participative learning rather than as a mechanism of data collection and analysis. At their core, incident reporting systems provide an infrastructure for detecting emerging risks, investigating and explaining serious incidents and harmful events, and understanding and improving practices and systems. Management should:

- Encourage Incident Reporting
    - Establish clear and easy-to-use incident reporting procedures
    - Foster a culture of trust and transparency where employees feel comfortable reporting incidents and near misses
    - Provide training on incident reporting to all employees
- Conduct Thorough Investigations
    - Assemble a team with relevant expertise to investigate incidents

    - Use techniques like root cause analysis, fault tree analysis, and change analysis to identify contributing factors
    - Analyze data to identify trends and patterns
- Implement Corrective Actions:
    - Address root causes and underlying factors, not just immediate causes
    - Implement short-term, medium-term, and long-term solutions
    - Communicate findings and lessons learned to all employees

2) *Hazard Identification and Risk Assessment*:

Learning from incidents (LFI) refers to the ability of a business to obtain valuable experiences and understanding from past incidents and transfer them into practices and behaviours that prevent future events, contributing to the overall improvement in safety (Jacobsson et al., 2011). Management should:

- Conduct Regular Hazard Assessments
    - Involve employees in the hazard identification process
    - Use techniques like job hazard analysis, hazard and operability studies (HAZOP), and what-if analysis
    - Prioritize hazards based on risk
- Implement Hierarchy of Controls
    - Eliminate hazards whenever possible
    - Implement engineering controls to isolate people from hazards
    - Use administrative controls and personal protective equipment as a last resort
- Monitor and Review Controls
    - Regularly inspect and maintain controls to ensure effectiveness
    - Involve employees in the monitoring process

- Update controls as needed based on changes in processes or new information

3) *Safety Management Systems:*

Robson, L. et.al. (2007) explicitly ascribe that Safety Management System's basic source i.e. the Plan-Do-Check-Act model of continuous quality improvement made famous by W. Edwards Deming (Tortorella, 1995).

- Develop a Safety Policy
  - Establish clear goals and objectives for the safety management system
  - Communicate the policy to all employees and stakeholders
  - Ensure the policy is aligned with organizational values and objectives
- Assign Roles and Responsibilities
  - Clearly define safety roles and responsibilities for all employees
  - Provide training and resources to support employees in their safety responsibilities
  - Hold employees accountable for safety performance
- Implement Safety Procedures and Standards
  - Develop and implement procedures for critical tasks and processes
  - Ensure procedures are clear, concise, and easy to follow
  - Regularly review and update procedures based on feedback and lessons learned
- Conduct Safety Training
  - Provide comprehensive safety training to all employees
  - Tailor training to specific job roles and hazards
  - Ensure qualified instructors deliver training and includes hands-on practice

- Monitor Safety Performance
    - Establish key performance indicators (KPIs) to measure safety performance
    - Regularly audit the safety management system to identify strengths and areas for improvement
    - Communicate safety performance data to all employees and stakeholders

4) *Contractor and Supplier Management*:

Awasthy, P. & Hazra, J. (2015) explains that Workplace safety is one of the essential elements for the successful operation of a business, and suppliers play a crucial role. Improved collaboration and interaction between organizations and their suppliers will help improve the system safety.

- Prequalify Contractors and Suppliers
    - Establish prequalification criteria that include safety performance
    - Conduct due diligence to verify safety performance and compliance
    - Ensure contractors and suppliers have appropriate safety policies, procedures, and training in place
- Communicate Safety Requirements
    - Clearly communicate safety requirements and expectations to contractors and suppliers
    - Provide training and resources to support contractors and suppliers in meeting safety requirements
    - Monitor contractor and supplier safety performance and provide feedback
- Coordinate Safety Activities
    - Establish a process for coordinating safety activities between the organization, contractors, and suppliers
    - Ensure clear communication and coordination of safety information and resources

- Conduct joint safety meetings and inspections

5) *Employee Engagement and Participation*:

According to Markos, S. & Sridevi, S. (2010), engagement is affected by many factors, including emotional and rational factors relating to work and the overall work experience. They also quoted that Perrin's Global Workforce Study (2003) uses the definition "employees' willingness and ability to help their company succeed, largely by providing discretionary effort on a sustainable basis."

- Involve employees in safety decision-making and problem-solving
- Recognize and reward employees for their safety contributions
- Provide opportunities for employees to raise safety concerns and suggestions

- Promote Safety Communication
  - Establish effective channels for safety communication, such as safety meetings, toolbox talks, and safety alerts
  - Ensure safety communication is clear, concise, and tailored to the audience
  - Encourage two-way communication and feedback
- Foster a Positive Safety Culture
  - Demonstrate visible leadership commitment to safety
  - Promote a just culture that encourages reporting and learning from incidents
  - Recognize and celebrate safety achievements and milestones

6) *Continuous Improvement*:

Granerud, L. & Rocha, S. (2011), studied continuous improvement performance helps in handling health and safety issues. Continuous improvement, when connected to the integration of health and safety in other managerial areas, as well as to the employment of learning new processes and techniques, provides better results.

- Learn from Incidents and Near Misses
    - Investigate incidents and near misses to identify root causes and contributing factors
    - Share lessons learned across the organization to prevent similar incidents from occurring
    - Incorporate lessons learned into safety management system improvements
- Conduct Regular Reviews and Audits
    - Regularly review the effectiveness of the safety management system
    - Conduct internal and external audits to identify strengths and areas for improvement
    - Develop and implement action plans to address audit findings
- Continuously Improve Safety Performance
    - Set ambitious yet achievable safety performance goals
    - Regularly monitor progress toward goals and adjust strategies as needed
    - Recognize and celebrate safety achievements and milestones

Based on the above, we understand that to prevent incidents/accidents in the workplace, organizations can implement various strategies such as discouraging risky behaviour, implementing control measures tailored to specific hazards, regularly reviewing and updating policies and procedures, providing thorough training to employees, conducting regular inspections of equipment and tools, ensuring adequate supervision, consulting with employees for their expertise in risk management, adopting a proactive risk management approach, offering comprehensive support for employees' physical and mental well-being, and utilizing effective online tools/software.

Preventing incidents requires a comprehensive and proactive approach that addresses immediate and underlying causes. By implementing the strategies and techniques outlined in this guide, organizations can create a safer workplace, reduce costs, and promote a positive organizational culture. Continuous improvement and learning from incidents and near misses are key to sustaining incident prevention efforts over the long term.

Errors

We know that we cannot eliminate them entirely: Heisenberg‘s uncertainty principle assures us of that, and in practice, the errors are much larger than that principle would predict. We strive to reduce errors as far as possible, but at the end of an investigation, we try to estimate the uncertainty that those errors will inevitably produce in the final result. Hofer, T. & Hayward, R. (2000), elaborates that an error is an unintentional deviation from truth or accuracy. Errors are usually mistakes or lapses that occur during repetitive tasks, such as pressing the wrong button or missing a step in a procedure. Other errors are mistakes in judgment, the difference between an observed or calculated value and an actual value, quality, or state of the erring; happened due to ignorance, deficiency, or by accident; a deficiency or imperfection in structure or function.

These are more common in new or unexpected tasks or in complex systems or procedures or when workers have not received adequate training. Human errors are mainly caused by a lack of knowledge, experience, concentration, or awareness of surroundings; this research aims to understand if stress is one of the most influential factors. According to Mishra, T. (2024), human factors causing accidents is a term that encompasses all the elements contributing to a workplace accident that can be directly attributed to an operator, worker, or other personnel. Human error is the most variable and causative factor.

According to Frese, M. & Altmann, A. (1989), when actions that were potentially avoidable and violated some rules can be referred to as errors. Every error violates an individual's goal. They also referred to Norman (1984), who pointed out that there are two types of errors: slips, which result from wrong plans but right intentions, and mistakes, in which intentions were wrong but the plan conformed to the intention.

Figure 19. Hasanthi (2016). Error versus Mistake. Pediaa.com

Errors and mistakes are terms often used interchangeably in everyday language, but they have distinct meanings in the context of psychology, safety management, and organizational behaviour. Understanding the differences between these concepts is crucial for improving performance, enhancing safety, and fostering a culture of continuous learning. To elaborate on Norman's point, deleting a file due to the press of a few keys is known as a slip/error; deleting the file and later realizing that it was needed is known as a mistake.

5W and 1H

According to Reason J. (2000), the problem of human error can be understood from two perspectives: the person approach and the system approach. Each approach has its own model of error causation, leading to different philosophies of error management. Recognizing these differences is essential for effectively dealing with the constant risk of mistakes in clinical practice.

- *Person approach*: Traditionally, this approach focuses on the unsafe acts, such as errors and procedural violations, of individuals at the front line. Blaming individuals is emotionally more satisfying than targeting institutions. It sees these unsafe acts as mainly resulting from abnormal mental processes like forgetfulness, inattention, poor

motivation, carelessness, negligence, and recklessness. Consequently, the related preventive measures mainly aim to minimize undesired variability in human behaviour.

- *System approach*: The fundamental idea behind the system approach is that humans are prone to making mistakes, and errors are likely to happen, even in the most well-run organizations. Mistakes are viewed as outcomes rather than causes, stemming not so much from human nature but from systemic factors earlier in the process. When an adverse event occurs, the critical concern is not who made the mistake but how and why the defenses did not work.

According to research by Sadeghniiat-Haghighi, K., & Yazdi, Z. (2015), prolonged screen use can lead to eye strain, tiredness, and, ultimately, body fatigue, impairing mental alertness and contributing to dangerous errors. Similarly, the Health and Safety Executive (HSE) has noted that "*Fatigue is a result of prolonged mental or physical exertion; it can affect people's performance and impair their mental alertness, which leads to dangerous errors*."

Technological factors, combined with the challenges of virtual work environments, such as the lack of face-to-face interaction and the blurring of work-life boundaries, can create significant stress for employees. Error management has two components: limiting the incidence of dangerous errors and—since this will never be wholly effective—creating systems that can better tolerate errors and contain their damaging effects.

Proponents of the person-focused approach believe that directing management resources toward making individuals less error-prone or deviant is the key to addressing workplace issues. However, adherents of the system approach advocate for a comprehensive management program that targets multiple elements: the individual, the team, the task, the work environment, and the overall organization. This broader, systemic approach recognizes that workplace safety and performance are shaped by the complex interplay of various factors, including physical, organizational, and human elements.

Chicago, M. A. et al. (2013) many errors originate from the natural process of cognitive and behavioural adaptations, which develop the correct behavioural skills. Familiar sources of error include human error (e.g. inaccurate measurements), systematic errors (resulting from flaws in the experiment design), random errors (unpredictable factors affecting the results), and environmental errors (changes in surroundings). Understanding the why is essential when it comes to the occurrence of errors:

- **Cognitive Overload**: When individuals are overwhelmed with information or tasks, they may struggle to process everything accurately, leading to errors.
- **Lack of Training**: Insufficient training can result in employees not having the necessary skills or knowledge to perform their tasks correctly.
- **Environmental Factors**: Poor working conditions, such as inadequate lighting or noise, can distract individuals and increase the likelihood of errors.
- **Communication Breakdowns**: Miscommunication between team members can lead to misunderstandings and mistakes, especially in collaborative environments.

Gill, T. (2023), explains that errors are inevitable in the dynamic environment of the modern workplace. These errors, ranging from minor oversights to significant blunders, can have far-reaching consequences, including financial losses, reputational damage, and even safety hazards. These errors can be classified into different categories, such as slips, lapses, and mistakes, each having distinct characteristics and causes.

It is crucial to understand what constitutes human error and its common causes in the workplace even before organizations start planning to reduce errors. Human error refers to the mistakes made by employees during the execution of tasks. The common causes of human error in the workplace include lack of training, inadequate resources, poor work environment, and psychological stress. The following will help understand the leading causes of errors in the workplace in detail:

- Lack of Training and Knowledge

  Insufficient training or inadequate knowledge can lead to employees making mistakes due to a lack of understanding of proper procedures or protocols. This is especially true when new technologies, processes, or tasks are introduced without proper training.

- Cognitive Overload and Multitasking

  Trying to process too much information or juggling multiple tasks simultaneously can lead to cognitive overload, resulting in errors due to lapses in attention or memory. Multitasking has been shown to reduce productivity by up to 40%.

- Fatigue and Stress

  Stress and fatigue can significantly affect cognitive abilities, leading to reduced focus, slower reactions, and impaired decision-making. 52% of employees make more mistakes when they are stressed, based on research.

- Poor Communication and Coordination

  Inadequate communication between team members or departments can lead to misunderstandings and errors. Unclear instructions, lack of feedback, and poor coordination can all contribute to mistakes.

- Inadequate Resources and Poor Work Environment

  Working with insufficient resources or in a poor work environment can increase the likelihood of errors. Factors such as lack of proper tools, equipment, or workspace can lead to frustration and mistakes.

- Negligence and Disregard for Procedures

  Sometimes, errors can be caused by a deliberate disregard for established processes or rules. This type of error is known as negligence and can have serious consequences, especially in high-risk industries.

- Faulty Memory and Cognitive Biases

  Relying on memory alone to complete tasks can lead to errors, particularly in complex or high-stakes situations. Cognitive biases, such as confirmation bias or anchoring bias, can also contribute to poor decision-making and mistakes.

High-reliability organizations, which operate in hazardous conditions yet experience fewer adverse events than expected, offer valuable models for building a resilient system. Such a system is imbued with inherent "safety health," equipping it to withstand operational dangers while achieving its objectives. By considering the interconnected nature of these factors, organizations can develop more effective and sustainable strategies to address workplace stress, errors, and incidents.

Types of Errors and Mistakes

Edkins, G. (2016) mentions that by improving the quality of workplace health and safety investigations will not only help understand the role of human factors but also what kind of errors lead to workplace incidents and errors. A better understanding will provide insight into practical error management strategies designed to tolerate the errors individuals will ultimately make.

1. **Human Errors**: Gaunt, W. (2024), human error is a generic term that involves all those instances where a planned activity fails to achieve its intended outcome. Individuals make errors due to cognitive limitations, lack of experience, or fatigue. Human errors can occur in any setting, including workplaces, healthcare, and aviation. They can lead to significant consequences, especially in high-stakes environments.

    - *Action error* – An action error occurs when an employee carries out an action incorrectly, such as, when the task is highly repetitive. Eg.

        1. Slips of Action: Slips of action happen when one's actions differ from what one intended. They often happen because one is not paying sufficient attention to the task at hand.

2. Lapses of memory: A memory lapse occurs when you forget to do something you do in routine and familiar tasks. This is also known as a lapse in short-term memory.

- *Thinking errors* - occur when an employee correctly carries out the wrong task because of a knowledge gap or unclear instructions.

    1. Rule-based mistakes: This kind of mistake hinges on how a rule is applied. A mistake can be made if a good rule (one that has been successfully used in the past) is applied to the wrong situation or if the wrong rule has been applied.

    2. Knowledge-based mistakes occur when an employee does not fully understand a task and uses limited knowledge to carry it out incorrectly.

2. **Systemic Errors**: These errors arise from flaws in processes, systems, or organizational structures. For example, inadequate training programs, poor communication, or lack of resources can create conditions that lead to errors. Systemic errors highlight the importance of addressing organizational factors to reduce the likelihood of mistakes. Systematic error is one form of bias.

3. **Active Errors**: These are errors that occur at the point of operation and have immediate consequences. For example, a nurse administering the wrong medication to a patient is an active error. These errors are often visible and can be addressed quickly.

4. **Latent Errors**: These are hidden problems within a system that can contribute to incidents over time. Latent errors may include inadequate safety protocols or insufficient supervision. They often go unnoticed until they result in a significant incident.

5. **Random Errors**: These errors occur due to chance. There is always some variability when a measurement is made. Random error may be caused by slight fluctuations in an instrument, the environment, or the way a measurement is read that do not cause the same error every time. To address random error, scientists utilized replication. Replication is repeating a measurement many times and taking the average.

6. **Instrumental Errors:** These occur when the instruments being used are inaccurate. For example, a balance that does not work, a pH meter that reads 0.5 off, or a calculator that rounds incorrectly would be sources of instrument error.
7. **Environmental Errors:** These occur when an environmental factor, such as an uncommon event, leads to an error. For example, if you are trying to measure the mass of an apple on a scale, and your classroom is windy, the wind may cause the scale to read incorrectly.
8. **Procedural Errors:** These occur when different procedures are used to answer the same question and provide slightly different answers. If two people are rounding, and one rounds down and the other rounds up, this is a procedural error.
9. **Transcriptional Errors:** These occur when data is recorded or written down incorrectly. For example, when a phone number may be copied incorrectly, or skipped while being copied in a data sheet.
10. **Estimation Errors:** These occur when reading measurements on some instruments. For example, when reading a ruler, you may read the length of a pencil as 11.4 centimeters (cm), while your friend may read it as 11.3 cm.

The key to overcoming errors at work is a culture of compassion, where people can share without fear of judgment or blame. View mistakes as opportunities for future growth, employees do not feel ashamed or alienated. By learning from the experience, employees are less likely to make similar errors in the future. Therefore identifying these errors before they occur is essential. To develop a remediation plan it is crucial to measure these errors to map the root cause and common factors.

Identification and Measurement

Employees must check their documents thoroughly and methodically before they are finalized or distributed to identify document errors. You can utilize various methods and tools to help with this process, such as reading your documents aloud or backward to spot spelling, grammar, or punctuation errors.

Wood, D. S. et al. (2002) explains the stages proposed by Card, Moran, and Newell (1983) (CMN) which an employee undergo; they are

1) *Error:* Employee makes a mistake.

2) *Detection*: The Employee becomes aware of the error.

3) *Reset*: resets the editor to allow correction.

4) *Correction*: The employee undoes the effects of the error.

5) *Resumption*: The employee resumes error-free activity.

Wood, D. S. et al. (2002) continues to elaborate that accurate error detection and identification were assumed to occur after an error was committed. Sellen and Norman (1992) point out that error identification is not always easy or obvious for users. They recommend that designers and modelers consider error identification separately from detection to better focus on how interfaces can support detection and identification.

Applying style guides, checklists, or rubrics to adhere to your documents' format and style requirements is beneficial. Lastly, employees can ask colleagues or supervisors to review their documents and provide feedback or suggestions. Additionally, employees can use built-in tools, such as spell checkers and grammar checkers, or other software tools, such as Grammarly, to detect and correct errors automatically. Employee can also compare their documents with the sources, instructions, or templates to ensure accuracy and consistency.

Fitzgerald, A. (2023). Human error in the workplace can have severe consequences for cybersecurity and business continuity. Identifying errors in the workplace is crucial for maintaining safety, efficiency, and productivity. Here are several effective strategies to help identify errors:

1. *Encourage Open Communication*

   Fostering an environment where employees feel safe to report mistakes without fear of punishment is essential. Open discussions about errors can lead to a better understanding of the issues. Managers should lead empathetically, asking employees to share what happened and listening carefully to their perspectives. This approach can create a culture of trust and encourage employees to bring forward potential issues before they escalate into significant problems.

2. *Conduct Regular Audits and Reviews*

   Regular audits of processes and procedures can help identify areas prone to errors. By systematically reviewing workflows, managers can pinpoint inefficiencies or common mistakes. This can involve checking compliance with established protocols and assessing whether employees follow standard operating procedures (SOPs) correctly. Audits can also reveal error trends, allowing organizations to address systemic issues.

3. *Implement Performance Metrics*

   Establishing key performance indicators (KPIs) related to error rates can help organizations monitor performance over time. Tracking metrics such as the frequency of errors in specific tasks or departments can highlight areas needing improvement. Reviewing these metrics allows managers to identify patterns and take corrective actions when necessary.

4. *Utilize Technology and Tools*

   Employing technology, such as automated systems and software tools, can significantly reduce human error. For instance, using checklists, reminders, and automated alerts can help ensure that critical steps are not overlooked. Additionally, data analytics tools can analyze performance data to identify error-prone areas and suggest improvements.

5. *Conduct Root Cause Analysis*

   When errors occur, conducting a root cause analysis can help identify the underlying issues contributing to the mistake. This involves asking "why" multiple times to drill

down to the root cause rather than just addressing the symptoms of the problem. Understanding the root causes allows organizations to implement more effective corrective actions and prevent recurrence.

6. *Encourage Peer Reviews and Feedback*

   Implementing a system for peer reviews can help catch errors before they escalate. Encouraging team members to review each other's work fosters collaboration and can lead to the identification of mistakes that one person might overlook. Regular feedback sessions can also help employees learn from each other's experiences and improve overall performance.

7. *Provide Ongoing Training and Development*

   Regular training sessions can help employees stay updated on best practices and reinforce the importance of accuracy in their work. Training should not only be provided for new hires but also as continuous professional development for existing employees. This can include workshops, seminars, or online courses tailored to specific roles and responsibilities.

8. *Monitor Work Environment and Conditions*

   The physical and psychological work environment can significantly impact error rates. Noise, lighting, and ergonomics can affect concentration and performance. Regularly assessing and improving the work environment can help reduce distractions and fatigue, which are common contributors to errors.

Goodliffe, C. (2023). Identifying errors in the workplace is a multifaceted process that requires a proactive approach. By fostering open communication, conducting regular audits, utilizing technology, and providing continuous training, organizations can create an environment conducive to error identification and prevention. Ultimately, this improves safety, efficiency, and overall organizational performance.

Impact of Errors

In the dynamic environment of the modern workplace, human error is inevitable. Errors in the workplace can have far-reaching consequences, affecting not only the immediate tasks at hand but also the overall organizational climate, employee morale, and financial performance. Understanding the impact of these errors is crucial for developing effective strategies to mitigate their occurrence and foster a culture of continuous improvement. These errors, ranging from minor oversights to significant blunders, can have far-reaching consequences, including financial losses, reputational damage, and even safety hazards, to elaborate :

- **Safety Incidents**: In high-risk industries, such as healthcare or aviation, errors can lead to accidents, injuries, or fatalities. The most immediate and devastating consequence of human errors in health and safety is the physical harm to someone or a group of people. As per a blog by Collazo, G. human error is responsible for up to 90% of workplace accidents. Reducing human error can be essential for optimizing the efficiency of your business and keeping your employees happy, healthy, and safe.
- **Financial Losses**: Mistakes can result in costly repercussions, including legal liabilities, lost productivity, and damage to reputation. Human errors can also lead to very sizable financial losses due to medical expenses, compensation claims, and increased insurance premiums. Costs can also be incurred from damaged equipment or infrastructure. (Gaunt, W. 2024)
- **Decreased Morale**: Fischer, I. (2021) A culture that penalizes mistakes can lead to fear and anxiety, discouraging employees from taking initiative or suggesting improvements. Conversely, organizations that foster a culture of learning from errors can enhance employee engagement. This positive approach encourages a growth mindset, where employees see errors as opportunities for learning rather than failures.
- **Reputational Damage**: Repeated errors can significantly damage an organization’s reputation. When mistakes become public knowledge, they can erode trust among clients, stakeholders, and the general public. Over time, this reputational damage can

have long-lasting effects, making it challenging for the organization to recover and regain trust in the marketplace.

- **Productivity Loss**: Workplace errors often lead to decreased productivity. When mistakes occur, processes may be halted, requiring rework or additional resources to correct the issue. This disruption can lead to delays in project timelines and affect overall operational efficiency. Productivity losses not only impact immediate outputs but can also damage client relationships and the organization's reputation.
- **Learning Opportunities**: While errors often have negative consequences, they can also serve as valuable learning opportunities. Analysing mistakes can provide insights into underlying processes and systems that need improvement. (Fischer, I. 2021)

Strategies for Mitigating Errors

Errors in the workplace have a multifaceted impact, affecting safety, finances, productivity, reputation, and employee morale. Organizations must recognize the significance of these impacts and implement strategies to minimize errors while fostering a culture of learning and improvement. By addressing the root causes of errors and promoting open communication, organizations can create a safer, more productive work environment that ultimately benefits everyone involved. Fitzerald, A. (2023). Some of the ways organizations can manage errors at the workplace are:

1. **Training and Education**: Comprehensive and ongoing education help employees develop the necessary skills and knowledge to perform their tasks effectively. These training sessions should serve as a reminder about critical processes, provide details on any new processes, and introduce the team to the company’s most significant risks and how the entire company can work to mitigate them.
2. **Standard Operating Procedures (SOPs)**: Developing clear and accessible SOPs can help reduce performance variability and guide employees. Checklists and process docs should be available to all employees and serve to double-check that they are following proper procedures.
3. **Encouraging a Just Culture**: Fostering an environment where employees feel safe to report errors and mistakes without fear of punishment encourages learning and

improvement. Rather than discouraging or punishing employees for mistakes, encourage them to speak up and point out organizational problems that may have contributed to mistakes.

4. **Regular Feedback and Communication**: Communication is vital in preventing errors. Establishing open lines of communication and providing regular feedback can help identify potential issues before they escalate into significant problems.
5. **Implementing Technology**: Utilizing technology, such as checklists, automation, and decision-support systems, can help reduce the likelihood of errors and improve overall accuracy. Data loss can have a catastrophic impact on business operations, so it’s important to invest in regular data backups.
6. **Implement Routine Monitoring and Evaluation**: Regularly monitor and evaluate the effectiveness of various processes, identify areas where errors are more likely to occur, identify the underlying causes, and implement corrective actions to prevent recurrence.
7. **Encouraging Mental and Physical Well-being**: Encourage programs that focus on employees' mental and physical well-being, helping them stay focused and alert during work hours. This can be achieved if employees maintain a healthy work-life balance to prevent burnout and errors arising from fatigue and stress.

1.2 Research Problem

According to Facchini et al. (2020), Human Error Probability (HEP) is a critical element in the chain of events that could lead to system accidents. Despite the efforts of recent studies to evaluate human reliability, many of the limitations and problems have not yet been solved.

The correlation between human incidents and errors is a critical area of focus in workplace safety and management. Human errors are often cited as a primary cause of incidents, with studies indicating that up to 90% of workplace accidents can be attributed to human error. Understanding this relationship and the primary root cause that ultimately transforms or results in an error or incident is essential for developing effective strategies to minimize risks and enhance safety protocols.

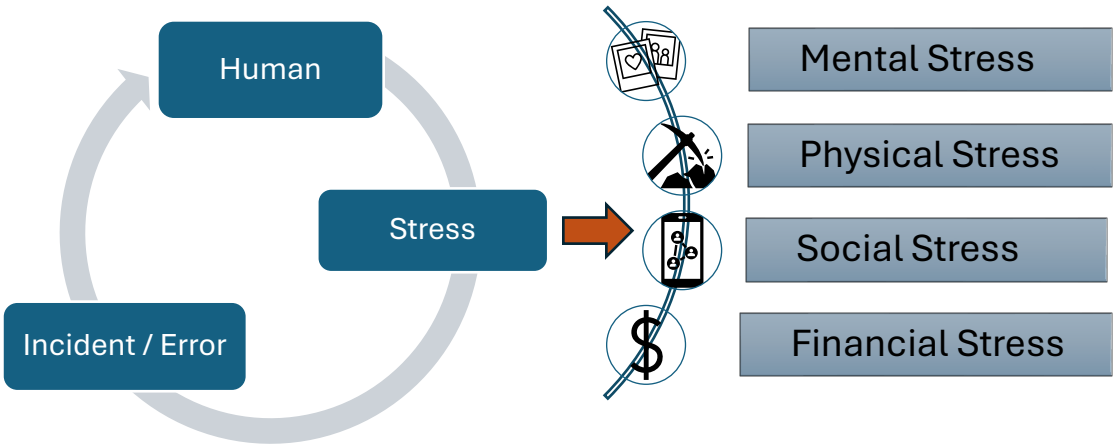

Figure. 20. Sharma, A. (2024). Factors contributing to stress.

Despite the comprehensive analysis of factors contributing to stress, mainly focusing on social media, relationships, and economic conditions, there is a notable gap in exploring the cumulative effects of these factors.

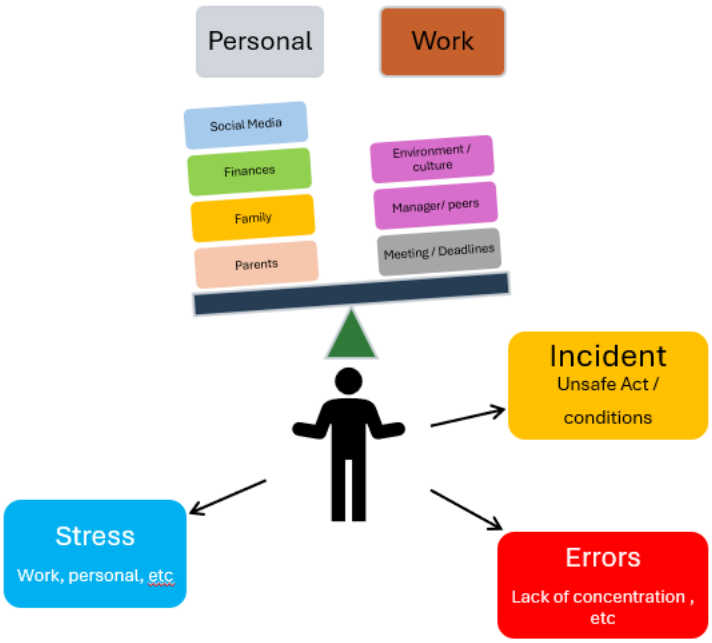

Figure 21. Sharma, A.(2024). Impact on human from work and personal life

Dynamics in both personal and professional spheres remain insufficiently explored, in addition to the chemistry between social media usage, economic anxiety, and relational. Specifically, the literature seems to lack a holistic approach that examines how these stressors interact and potentially exacerbate each other, leading to a compounded impact on an individual's mental health and job performance and failing to co-relate its contribution to workplace errors and incidents.

There are various sources of stress, including work, relationships, financial difficulties, health problems, and significant life changes. Depending on their unique circumstances and coping mechanisms, people may experience and respond to stress differently. Some individuals may thrive under pressure, while others may become overwhelmed and struggle to cope. (Poon et al., 2013).

According to Kelvintopset.com, while the connection between stress and workplace incidents may not always be obvious, elevated stress levels can definitely impact employee well-being and performance, increasing the risk of accidents and mishaps. Recognizing psychological and physical hazards is vital, as human error is often at the root.

Significant independent research has been done on the impact of stress on humans, including the impact of an increase in incidents and errors on organizational productivity and employee performance. There are scientific and academic data to validate the impact of factors that lead to incidents like unsafe acts/conditions, and researchers have also identified the common causes of errors, like lack of concentration, etc. (Habib, K.E., et. al, 2001).

The problem statement for this study is to understand and identify the primary factor in all workplace errors and incidents. If there is a lack of awareness, employees will not be able to understand why they are making multiple errors and/or being involved in incidents, mainly at the workplace.

Purpose of research:

Vicker, J. (2020) defines human error as any unintended action or decision leading to undesirable outcomes. This includes mistakes made during routine tasks, lapses in judgment, and deviations from established procedures. The link between human error and workplace incidents is well-documented. Errors can lead to various adverse outcomes, including fatalities, financial loss, decreased productivity, etc.

Figure. 22 Sharma, A. (2024). Factors impacting human

Gaunt, W. (2024), several factors contribute to human error in the workplace, including, inadequate training, cognitive overload, poor communication, environmental factors. Workplace incidents can range from accidents and injuries to property damage or even violence. Common workplace incidents include slips, trips, falls, machinery malfunctions, fires, and employee conflicts. (Bui et al.,2021).

Ganster, DC et al. (1991). Workplace incidents can be caused by a variety of factors, such as Human error, system error, process error, and external factors. Stress acts as an important contributing factor in creating an environment where accidents and errors are more likely to occur.

Reason, J. (1995) mentions that people do not act in isolation; circumstances shape their behaviour. The same holds true for workplace errors and violations. The type of task has a significant impact on the likelihood of an unsafe act, the awareness and knowledge of workers, and the specific conditions in the workplace.

The challenge with most of these earlier studies is that they focus on or are limited to identifying the cause of workplace errors or incidents. The common element identified is “Human.” Human error is often cited as a cause of accidents, when all other factors have been eliminated. (Salminen, S. 2012)

Dekker, S. (2001), while the relationship between human factors, incidents, and errors is well-established, there remains a gap in fully comprehending the complex interactions and systemic issues that contribute to adverse workplace outcomes. Traditionally, the focus has been on identifying and mitigating individual errors, often through blame-based approaches. However, this narrow perspective fails to address the underlying factors that actually impact human behaviour or body and create conditions conducive to errors or ultimately leading to incidents.

The Limitations of the "Old View" (superficial/easy reasons)

The "Old View" of human error attributes incidents primarily to humans' unreliable nature, assuming that systems are inherently safe. This perspective suggests that the solution lies in eliminating "error-prone" individuals and enforcing strict procedures to minimize

deviations. However, this approach oversimplifies the issue and fails to recognize the complex interplay between humans, stress, and contributing factors.

Need for a New Approach (understand underlying reasons)

A new perspective is necessary to bridge the gap in understanding the critical factor that triggers the disruption of the harmony between human and workplace. The "New View" acknowledges that a construal of critical factors impacting the brain's complex workings governing humans' overall thinking and behaviour. This also helps contradict the old view, where the root cause was only humans or their work conditions.

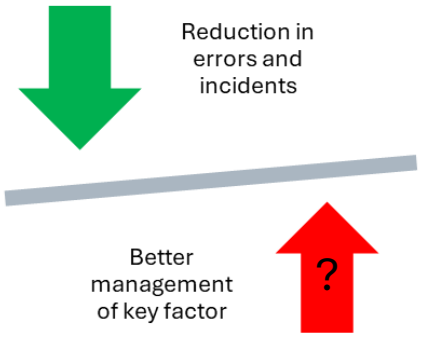

Figure 23. Sharma, A. (2024). Relationship between remedy and errors

This study will not only help identify the key factor, but once it’s identified, it will help employees acknowledge the signs and symptoms and introduce strategies to manage this factor and reduce its occurrence and impact; in return, there will be a reduction in errors and incidents, resulting in an increase in the organization's productivity.

Significance of the study

The critical aspect of the study is to understand the interrelationship between employees and their mental state, which leads them to make errors or get caught in an incident at the workplace. To explain more about this association, this study will emphasize the fundamentals of the human body, its functions, daily stressors in an employee's life, and how these cause errors and incidents at the workplace.

According to Sadeghniiat-Haghighi and Yazdi's research, employee behaviour is influenced by a variety of factors, including environmental conditions, cognitive load, emotional state, and organizational culture. These factors can create conditions that either facilitate or hinder effective performance. For instance, high-stress environments may lead to lapses in attention, while poorly designed workspaces can increase the likelihood of slips.

Understanding these influences allows organizations to anticipate potential errors before they occur. The environment plays a crucial role in an employee’s life, including their personal relationships, work pressure, financial issues, weather, geopolitical issues, social media trends, etc.

Shu, X. et al. (2022) shared their study via the following Schematic diagram of the model, which explains that mental, physiological, and technological factors directly influence employees and result in human errors. However, environmental and cultural factors are the indirect influencing factors. The influencing paths are environment-mental-human errors, environment-physiological-human errors, culture-physiological-human errors, and culture-technology-human errors. Organizational factors can affect human errors directly or indirectly through cultural factors. Following is the model they created based on their research.

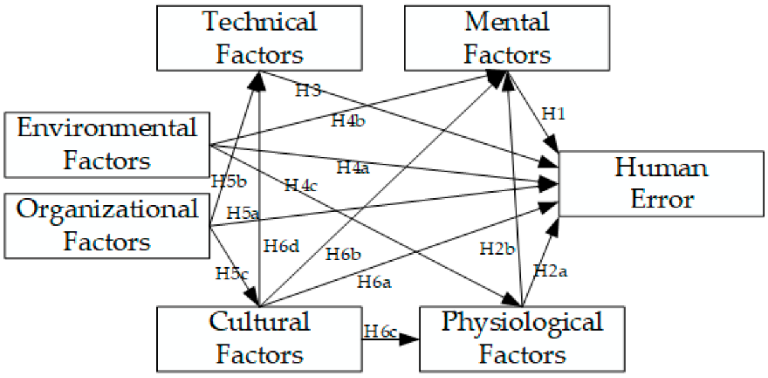

Figure 24. Shu, X. et al. (2022). Schematic diagram of the model of Human errors. Influencing Factors of Human Errors in Metro Construction Based on Structural Equation Modeling (SEM)

Everyone experiences stress to some degree; however, how one responds makes all the difference to their overall well-being. (Stress, 2023). Once we have identified various factors that play a significant role and have a crucial impact on employee behaviour, it is equally important to understand why. The answer lies in the human brain, a small almond-shaped organ named the amygdala, which triggers “flight or fight” responses when a human is faced with an unpleasant/life-threatening situation. The amygdala sends the signal using the sensory system (nervous system) to various parts to be prepared to trigger an action; the heart provides the oxygenated blood for those parts to function.

Stress is the by-product of the body caused by interaction with any stimulus in the environment like peer pressure, highly competitive environment, job insecurity, politics, improper rewards and recognitions, etc. (Singh & GOGIA, 2014). The brain’s Pituitary gland regulates the flow of hormones, which govern employees' moods at work or home. When employees face unpleasant, strangulating, or pressured situations, they either become too aggressive, feel too hot, or start perspiring, which is caused by the hypothalamus gland. Due to the various activities inside the brain and the concentration of energy and hormonal changes, there is a direct/indirect impact on the hippocampus gland, which is a curved seahorse-shaped organ on the underside of each temporal lobe. The hippocampus supports memory, learning, navigation, and perception of space. (Wendt. T, 2022)

Employee error is often mistakenly perceived as random or accidental; however, this perspective overlooks the underlying patterns and factors contributing to these errors. Human error is based on standard behaviour that can be predicted, identified, and managed. By recognizing that errors are not random occurrences, employers and managers can take proactive steps to understand and mitigate their causes.

Understanding the interplay between human behaviour, errors, and incidents is crucial for enhancing safety, improving organizational performance, and fostering a culture of continuous improvement. However, it also brings about a host of benefits. The significance of studying this relationship can be categorized into several key areas:

- **Identifying Root Causes of Incidents**

  Dekker, S. (2001). Studying the relationship between human actions and incidents allows organizations to identify the root causes of errors rather than merely attributing incidents to human failings. Traditional approaches often blame individuals for mistakes, leading to a culture of fear and avoidance of reporting errors. In contrast, a deeper analysis reveals that human errors are often symptoms of systemic organizational issues, such as inadequate training, poor communication, or flawed processes. By understanding these underlying factors, organizations can implement more effective interventions that address the root causes of incidents, ultimately leading to safer work environments and reduced accident rates.

- **Enhancing Safety Culture**

  Understanding the relationship between human behaviour and errors can significantly enhance an organization's safety culture. A workplace culture that doesn't prioritize safety or encourages cutting corners can actually contribute to human error. Employees may feel pressured to meet deadlines at the expense of following safety protocols. However, when employees feel safe to report errors and near misses without fear of punishment, it fosters an environment of transparency and learning. This openness then encourages the identification of potential hazards and the implementation of preventive measures. Research shows that organizations with strong safety cultures experience fewer incidents and better overall performance. By studying this relationship,

organizations can develop strategies to cultivate a positive safety culture, promoting proactive risk management and continuous improvement. (national-claims.co.uk, 2023).

- **Improving Training and Development**

  Salminen, S. (2012) explains that analysing the factors contributing to human errors can inform the development of targeted training programs, carelessness and inadequate training can increase the risk of human error. Understanding the types of errors can help organizations design training that addresses specific needs. For instance, training may enhance situational awareness of what can go wrong, refine decision-making skills, and ensure adherence to safety protocols. This ultimately enhances their ability to respond effectively in high-pressure situations.

- **Designing Error-Tolerant Systems**

  According to Wood, D.S. et.al. (2002), studying the relationship between human behaviour and errors can guide the design of systems more resilient to human fallibility. By recognizing that errors are inevitable, organizations can implement error-tolerant designs that minimize the consequences of mistakes. This includes developing user-friendly interfaces, simplifying processes, and incorporating fail-safes that allow for recovery from errors. For example, in aviation, understanding the human factors contributing to errors has improved cockpit designs and enhanced training protocols, resulting in safer flight operations.

- **Facilitating Continuous Improvement**

  Shi, X. et al. (2022) explains that the relationship between humans, errors, and incidents is a dynamic one that requires ongoing evaluation and adaptation. By studying this relationship, organizations can identify trends and patterns in errors and incidents, allowing for continuous improvement in safety practices and operational efficiency. Regularly analyzing incidents and near misses provides valuable data for informed decision-making and resource allocation. This proactive approach enhances safety and contributes to overall organizational effectiveness and resilience.

- **Reducing Financial and Reputational Risks**

  Human errors can lead to significant financial losses and reputational damage for organizations. By understanding the factors that contribute to these errors, organizations can implement measures to reduce the likelihood of incidents, thereby minimizing associated costs. This includes direct costs such as medical expenses and compensation claims, as well as indirect costs related to lost productivity and damaged reputation. Organizations that prioritize understanding the relationship between human behaviour, errors, and incidents are better positioned to protect their financial interests and maintain stakeholder trust. (national-claims.co.uk, 2023)

Research Purpose & Question

The primary goal of this study is to examine the causes that lead to workplace errors and incidents and understand the underlying factors, such as stress on employees, and how they contribute to workplace errors and incidents. Furthermore, stress can impair an individual's ability to communicate and collaborate effectively with their colleagues, increasing the risk of miscommunication and misunderstandings that can result in workplace conflicts.

Research Question

How does stress impact employees and contribute to workplace errors or incidents, which can range from typo errors, to errors related to sharing wrong information, or slips, trips, falls?

Overarching research Sub questions:

a) What type of scenarios/causes led to stress in employees?

b) What are the common errors or incidents at the workplace?

c) Do employees make errors, and what is the root cause?

d) How can stress management and self-discipline reduce stress among employees?

Hypothesis

Stress can have a negative impact on an individual's cognitive abilities, such as memory, attention, and decision-making. This can lead to an increased likelihood of employees making errors and getting involved in incidents at the workplace.

Null hypotheses. Hypotheses were used to answer the research questions of the study.

The two null hypotheses of the study follow.

- H01: Employees will not agree that stress management can reduce workplace incidents and errors
- H02: Not more than 30% of employees will accept that ‘leaving them alone’ can help de-stress.
- H03: Not more than 30% of employees who forgot to save their work will agree to be tired

Therefore, future research should aim to understand the synergistic effects of various stress factors and develop multidimensional intervention strategies to bridge these gaps. Such strategies should be nuanced, considering the diverse needs and circumstances of the workforce. They should aim to foster an environment that supports both productivity and well-being by reducing stress and ultimately lowering the frequency of errors and incidents.

CHAPTER II:

REVIEW OF LITERATURE

Theoretical Framework

What the world thinks about: HUMAN FAILURE

This all started with study done by Henrich, H. (1941), according to him, although human failure in some form is the cause of many accidents, yet even the accident-prone can have fewer accidents if the environment in which they work is reasonably safe. Many unsafe practices are continued because they are often unrecognized. Therefore there should be a detailed study of the cause of each accident.

Wróbel K.(2021), adds that even before human failure can be investigated, it must be understood that there are differences in taxonomy related to how humans can induce the occurrence of an incident or accident. Among the most widely used terms in this context in most of the industries like maritime etc, are *human error, human factor, human action,* and *human element*. These have different definitions depending on the framework applied, and are sometimes used interchangeably.

Bhandari et al. (2016) found that different emotional states of construction workers can impact their hazard recognition skills. They also mentioned that the recent discovery explained that an emotional state impacts risk perception and examined the connection between emotion and hazard recognition. Shi, X. et al. (2022) referred to Cable and Edwards research which mentions nine main mental factors that cause human errors: paralysis, fluke, shortcut, forced, getaway, bravado psychology, panic psychology, and rebellious psychology errors.

Dekker, S. (2002) states that human factors in the modern world are basically have two different views on human error and human contribution to accidents. One view, recently dubbed "*the old view*" American Medical Association (AMA), 1998, Reason, 2000, sees human error as a cause of failure.

In the old view of human error:

- Human error is the cause of most accidents.
- The engineered systems in which people work are made to be basically safe; their success is intrinsic. The chief threat to safety comes from the inherent unreliability of people.
- Progress in safety can be made by protecting these systems from unreliable humans through selection, proceduralization, automation, training, and discipline.

The other view, also called "*the new view*," sees human error not as a cause but as a symptom of failure American Medical Association (AMA), 1998; Hoffman & Woods, 2000; Rasmussen & Batstone, 1989; reason, 2000, Woods et al., 1994. In the new view of human error:

- Human error is a symptom of trouble deeper inside the system.
- Safety is not inherent in systems. The systems themselves are contradictions between multiple goals that people must pursue simultaneously. People have to create safety.
- Human error is systematically connected to features of people tools, tasks, and operating environment. Progress on safety comes from understanding and influencing these connections.

The new view of human error represents a substantial movement across the fields of human factors and organizational safety Reason, 1997, Rochlin, 1999 and encourages the investigation of factors that easily disappear behind the label "human error".

Wróbel K.(2021), human errors are referred to as acts that are judged by somebody to deviate from some reference act but can also be interpreted as a departure from acceptable or desirable practice on the part of an individual that can result in unacceptable or undesirable results. Some authors clearly distinguish between human factors and human errors (or failures) in a way that the former can induce the latter's occurrence. This can be interpreted as, human factors belong to latent causes of accidents and errors are the active ones.

Tangi, A. (2022) explored the concept of psychological well-being and life satisfaction in order to establish a healthy nation and a future generation with solid mental health. This study uses hierarchical regression modelling to examine the influence of psychological well-being variables on a subject's happiness. A questionnaire-based approach, along with interviews and sources linked to psychological well-being issues, measures traits such as overall health, energy, self-acceptance, academic stress, self-control, and positive relationships. Stress and self-control are found to be negatively connected to happiness, even though they are not significantly related.

Human response is due to the signals received from the brain through the nervous system. When faced with stress, the brain triggers a physiological response in the body through the activation of the sympathetic nervous system. According to Cleveland Clinic, the '*Amygdala*' is a small, almond-shaped structure inside our brain that forms part of a more extensive network called the *limbic system*. The amygdala is a paired structure (the two are considered one brain area) inside the temporal lobe. The primary role of the amygdala is to process our emotions, send a signal to the hypothalamus to communicate using nervous systems, and release stress hormones like cortisol and adrenaline. This happens within seconds when our brain recognizes a difficult situation. (Amygdala, 2023)

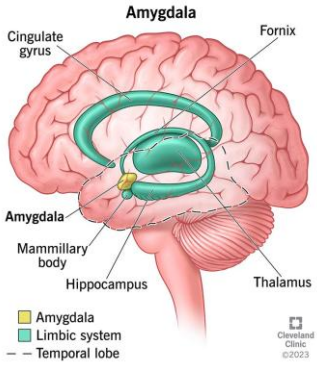

Figure 25. (2023). Amygdala and Limbic system. Cleveland Clinic

Adrenalin and cortisol are associated with stress. When employees are stressed, their bodies produce adrenalin to give them the energy to handle their stressors. Adrenalin and Cortisol are part of the fight-or-flight response, and this is why employees might feel restless when anxious. Cortisol is a hormone produced by the adrenal gland. Neither cortisol nor adrenalin is "bad," but when cortisol is chronically high, it can harm employee's health. Cortisol is also involved in regulating blood sugar levels, inflammation, and metabolism rate. Therefore, excess cortisol can harm employees; some side effects are:

- Acne
- Difficulty concentrating
- Fatigue
- Headache
- High blood pressure
- Irritability
- Mood problems
- Muscle weakness
- Weight gain

Lab tests can assess employees' cortisol levels via urine or blood samples. Organizations can purchase health care plans or encourage employees to purchase home cortisol testing kits, which usually involve testing cortisol through urine, mainly for staff who are always too anxious.

The amygdala is a small integral part of the overall autonomic nervous system (ANS). The ANS includes the sympathetic nervous system, which is overall responsible for the fight-or-flight response, and the parasympathetic nervous system, which takes charge when humans are relaxed. A study in 2020 found that alpha asymmetry, an imbalance in alpha brainwave activity on different sides of the brain, could be a potential measure of stress.

The above explains how and why humans respond; let us understand what triggers this response, i.e., the external environment. A workplace refers to the physical or virtual space where individuals carry out their employment activities, such as an office, restaurant, factory, store, or any other location where work is performed. In recent years, a growing body of research has highlighted the impact of workplace stress on employee well-being, productivity, and overall performance (Ganster & Schaubroeck, 1991).

At a workplace, individuals interact with each other and use equipment/tools within the environment to fulfill their job responsibilities (Landy et al., 1994). Based on the nature of the workplace, there are various types of hazards available, ranging from sharp edges, heavy loads, heat, cold, chemicals, eye strains, muscular or ergonomic impacts, etc. Identifying all potential references is important to understand the human contribution to an incident, regardless of root causes, latent errors, active errors, etc.

In the current time and age, the continual use of social media has become a substantial source of distraction and mental and physical stress, to name a few – jealousy, fear of missing out, eye strain, headaches, etc., for employees. It can lead to comparison, fear of missing out, constant connectivity expectations, and a blurring of work-life boundaries. (Nahrgang et al., 2011).

Furthermore, the available literature also indicates that high levels of stress can contribute to decreased job satisfaction and morale among employees, ultimately affecting retention rates and the overall organizational climate. Organizations are increasingly recognizing the importance of addressing workplace stress to create a healthier and more productive work environment, thereby enhancing employee well-being and performance. (Goetzel et al., 2018).

According to Murphy & Sauter (2006), The impact of job stress from new human resource practices and work systems has not been thoroughly studied. While individual techniques like muscle relaxation and meditation have effectively reduced stress, interventions involving job or organizational changes are generally preferred as they directly address the sources of work stress. However, research has not consistently found that these interventions lower worker stress levels, and the reasons for this are unclear.

What the world thinks about: STRESS

As mentioned at the start of this study, the definition of '*Stress*', by the World Health Organization (WHO) is:

"*As a state of worry or mental tension caused by a difficult situation*."

Stress is a natural response that helps us address challenges and threats. It is a common experience, but how we respond is crucial for our well-being. It is completely normal to feel stressed when faced with challenges and obstacles. We all experience it at some point in our lives. However, how we respond to stress can significantly impact our mental and emotional well-being. Remember, help is always available, if needed; do not consider yourself alone. (Stress, 2023)

Davis, K and Newstrom, JW (1985) explain that stress is a condition of strain on one's emotions, thought processes, and physical condition. When it is excessive, it can threaten one's ability to cope with the environment, "stress" is the general term applied to the pressures people feel in life. As a result of these pressures, employees develop various symptoms of stress that can harm their job performance.

Kapur (2021) explains that there are several types of stress that people can experience. These include acute stress, which is a short-term response to a specific event or situation, and chronic stress, which is a long-term response to ongoing stressors. Other types of stress include episodic acute stress, which occurs when someone experiences acute stress frequently, and traumatic stress, which is a response to a traumatic event such as a natural disaster or violent crime.

Causes of stress in employee's life can be diverse and multifaceted (Landy et al., 1994). Some common causes of stress in an employee's life include high workloads, tight deadlines, insufficient resources, lack of control over job tasks or decisions, poor interpersonal relationships, organizational changes, role ambiguity or conflict, and work-life imbalance. These stressors can vary from individual to individual and can be influenced by internal and external factors. Some internal factors may include personality traits, coping mechanisms, and individual resilience levels, while external factors may include organizational culture, leadership styles, job demands, and the overall work environment.

External factors may include economic conditions and technological advancements, viz., excessive use of social media and its tools.

As per Wooll, Maggie (2022), a stressor is a situation or event that causes us to feel stressed. These stressors can be internal or external, e.g. our reminiscences, surroundings, or the people we know. Stressors can be very personal; in other words, one source may impact/cause stress to an individual in a significant way compared to others. Studies have shown that stress can impair cognitive function, increase distraction, and decrease attention to detail, all of which can contribute to errors and incidents in the workplace (Park & Kim, 2013).

There are various stressors that can affect employees' well-being and job performance. According to Colligan, T. W., & Higgins, E. M. (2006), some factors that cause increased stress at the workplace include toxic work environment, workload, lack of participation and control in the workplace, monotonous or unpleasant tasks, role ambiguity or conflict, lack of recognition at work, inequity, poor interpersonal relationships, poor working conditions, poor leadership and communication, and conflicting home situations, personal relationships, family demands, social media addiction, etc.

According to Leka, Stavroula. Griffiths, A. & Cox, T. (2003). Stressed workers are also more likely to be unhealthy, poorly motivated, less productive, and unsafe at work. Workplace incidents are caused by four factors: human error, system error, process error, and external factors. Human error is the most variable and causative factor for incidents or errors. Errors caused by humans are mainly due to lack of knowledge, experience, concentration, or awareness of surroundings; stress is one of the most influential factors in causing so.

 # Internal Factors

Work-related stress may lead to injuries and psychological disorders. The National Institute for Occupational Safety and Health (NIOSH) has identified psychological disorders as one of the ten leading work-related diseases and injuries during the 1980s (Sauter, Murphy, & Hurrell, 1990). In addition to psychological disorders, workplace stress has been linked to physical health issues such as cardiovascular diseases, musculoskeletal disorders, and weakened immune systems. These health implications not only lead to increased

absenteeism but can also result in reduced productivity and performance when employees are present in the workplace (Ganster & Schaubroeck, 1991).

Landy (1994) explains that a framework, strategy, and recommendations for enhancing stress management skills and the psychological well-being of individuals in occupational environments or workplaces are required. Central to the strategy is attention to work design variables, such as control, uncertainty, conflict, and task demands, surveillance of psychological disorders in the workplace, education of managers and workers concerning psychological well-being and stress in the workplace, and treatment of individuals in distress. (Landy, F. 1994).

Ashraf, N., & Javed, T. (2014) reviewed Somani and Gupta's (2012) research and found that many organizations try to keep employees' motivational levels high to ensure efficient delivery of their daily work. Organizations rely on employees' motivation and productivity to maintain their supply of goods or services and a positive image. They also mentioned that in present times, social networking plays the role of a daily diary in everyone's life. Companies can oversee employee's social networking activities to monitor their performance and progress using various tools. Ashraf, N., & Javed, T. (2014) tried to explain the same theory by referencing Jim Flynn (2011) work, who concluded that social networking affects employee performance by increasing their knowledge, abilities, motivational level, and close association with the organization.

Cao X et al. (2016) researched that social media can provide benefits such as increased connectivity, access to information, and opportunities for networking and collaboration; in addition, the authors propose that social media can foster employees' social capital and subsequently facilitate knowledge transfer. Both social capital and knowledge transfer help promote work performance. Expressly, the authors adopt the shared vision, network ties, and trust to represent, respectively, the cognitive, structural, and relational dimensions of social capital. Even a quasi-natural field experiment conducted by Qi Song et al. (2019) provides a similar output that the use of a work-oriented social media tool (DingTalk) and socialization-oriented social media tool (WeChat) are complementary resources that generate synergies to improve team and employee performance.

However, on the other hand, excessive use of social media can contribute to stress and negative impacts on employee well-being. Excessive use of social media can lead to distractions, decreased productivity, and feelings of comparison and inadequacy. Priyadarshini, C. (2020) research data demonstrates that employees of IT companies who used social media experienced a lack of sleep, backache, eye strain, feelings of envy, lack of depth in relationships, the tendency to seek approvals, not meeting deadlines, compromise with the work quality and distraction from work.

Chen, X. (2024) explains, after analysing employee performance, that it is generally based on how efficiently employees perform their duties and the value or benefits created by employees for their enterprises or teams in the process of work; however, if there is a decline in performance due to stress, then there will be an impact on the productivity of the organization. Any un-favourable changes in internal benefits or policy viz. salary design, work appraisal, working hours, work attitude, etc., will affect employee performance.

The physical environment and human behaviour influence safety in the workplace. Human behaviour plays a significant role in workplace accidents and injuries due to risky behaviour, signal detection failures, and a lack of proactive safety measures. Although predictors of safety-related behaviour have been identified, there are still unresolved issues regarding safety performance in organizations. (Ford & Tetrick, 2008).

 # External Factors

Economic factors can be a significant source of stress for individuals. Financial instability, job insecurity, and economic downturns can create a sense of uncertainty, ability to meet basic needs for themselves and their families, better living prospects, and anxiety may lead to stress. Economic attitude refers to how a person makes decisions in determining economic choices that are considered appropriate to their abilities. The economic attitude also determines a person’s productive behaviour.

Hariyono, H. (2021) highlights that economic attitude is a response that influences the choice of actions according to the mind by considering the advantages and disadvantages of meeting various kinds of needs faced utilizing moving limited needs. He also mentions the

work done by Cesarini, Johannesson, Lichtenstein, Sandewall, and Wallace (2010) that showed genetic characteristics and environmental factors contribute about 20 percent of individual variations in determining economic attitudes. Economic factors also get triggered due to the influence of peers, friends, or relatives or to maintain a false/higher life status.

Another critical factor that triggers stress is ‘relationships’, which can be explained as a connection between two interacting partners (de Tormes Eby, 2012). These interacting partners can be at home (e.g., Family members, friends, etc.) or at the workplace (colleagues, managers, etc.). The impact of relationships on an individual's stress levels cannot be played down, whether at home or the workplace. Supportive and positive relationships at home can act as a buffer against workplace stress, providing emotional support, guidance, and a sense of belonging or vice versa in case of workplace.

Alastair Henry & Cecilia Thorsen. (2021) explains that negative or strained communication within a relationship at work or home can aggravate stress levels, leading to decreased job satisfaction and higher levels of anxiety. They also explored the ways in which everyday communication lures substantial personal influence and how the model recognizes the decisive role of an individual’s decision-making or action they take. Conflicts at home or work that involve a lack of support from elders or supervisors can create a hostile and emotionally taxing environment to live or work in. Furthermore, strained relationships can hinder effective communication and collaboration, ultimately impacting productivity and job performance.

Sussman, M. B. et al. (2013) found that the relationship between managers and employees affected employee performance and productivity. A positive relationship with a manager is strongly associated with increased motivation and performance, while a negative relationship is associated with poor performance. An overall negative impact and high level of employee dissatisfaction were found due to the current bureaucratic management style adopted by managers in their organization. Thus, it makes employees less productive and reduces their work performance. Additionally, research has shown that employees’ perception of their relationship with managers significantly influences job performance.

The third crucial factor that triggers stress is the virtual environment/world, i.e., social media. The increasing reliance on social media platforms has introduced a new dimension of

stress in people's lives. The constant comparison, fear of missing out, and pressure to maintain an idealized online persona can contribute to heightened levels of stress and negatively impact one's mental health (DeLongis et al., 1988).

Cao, X., et al. (2016) research offers empirical evidence regarding how social media influences work performance through social capital and knowledge transfer. The authors quantify the benefits of social media for organizations, encouraging managers to implement them in the workplace with high expectations.

Labban, A., & Bizzi, L. (2020) empirical study shows that using social media before starting of work, it fosters positive emotions like happiness and attentiveness, leading to beneficial behaviours such as networking with colleagues. However, when employees use social media while working, they experience negative emotions such as fatigue and guilt, which lead to engagement in counterproductive work behaviours..

The continual use of social media has become a substantial source of stress for employees. Individuals may feel pressure to constantly be connected and engaged on social media, leading to a sense of always being "on" and unable to disconnect and truly relax. (Nahrgang et al., 2011). This can lead to increased feelings of stress and anxiety as individuals strive to keep up with the demands and expectations of the online world. Furthermore, the negative impacts of cyberbullying and online harassment can also contribute to elevated stress levels among individuals who are targeted. Additionally, the potential for cyber incivility in the workplace adds another layer of stress (Giumetti et al., 2012).

What the world thinks about: Workplace errors and incidents:

Reason, J. (1995) mentions that people do not act in isolation; circumstances shape their behaviour. The same is valid for workplace errors and violations. The nature of the task heavily influences the likelihood of an unsafe act being committed, workers' level of awareness and knowledge, and the local workplace conditions.

Fogarty, G. & Shaw, A. (2010), traditionally, to prevent errors and accidents at the workplace and to demonstrate occupational health and safety interventions have primarily centered on controlling the physical work environment and work procedures for employees. Some examples of this include documents detailing the safest way to complete tasks, procedures for handing over unfinished tasks to colleagues, stringent safety guidelines for operating a machine, and requirements and locations for wearing personal protective equipment.

Liao P. et al. (2018) tried to prove that in theoretical and empirical studies, the most causal factor in accidents was human error by workers. They also tried to explain that construction accidents can be minimized in the construction industry if human error can be effectively reduced. Further, they referred to previous studies that revealed that an effective workplace environment could eliminate factors like facilities, work methods statements, processes, equipment, tools, products, new technologies, and work organization that lead to human error. The occurrence of accidents can be controlled.

Manchi, G. B. et al. (2013). tried to explain in their study that the cognition function of the human mind is a very complex system, and it is not easy to understand it completely. They referred to various research that was carried out in this field. However, the most accepted theory to the present time is the emerging model of cognition from Reason’s 1990 Genetic Error-Modeling System (GEMS) and Baars 1992b Global Workspace (GW) Theory. The model explains the interaction between the human mind and the environment and assists in understanding the occurrence of human error.

Dr Scott Shappell and Dr Doug Wiegmann developed the Human Factors Analysis and Classification System (HFACS). The system is a broad human error framework (figure below) that was initially used by the US Air Force to explore and investigate human factors in aviation. HFACS is heavily based on James Reason's Swiss cheese model (Reason 1990), and its framework prepares an instrument to assist in the investigation process, target-oriented training, and error prevention efforts. Investigators can methodically identify active and underlying organizational failures that build up into an accident. HFACS aims to understand the underlying causal factors and not to attribute blame. (HFACS, Skybrary.areo)

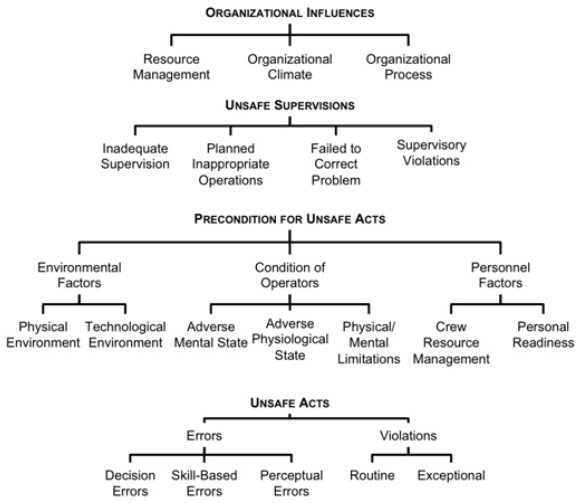

Figure 26: (n.d.) Human Factors Analysis and Classification System. Skybrary.aero

Saavedra Rionda I. et al. (2021) explain that burnout is a syndrome involving emotional exhaustion, depersonalization, and a decrease in self-fulfillment caused by constant involvement in emotionally demanding situations. Further, they elaborate that the pervasiveness of burnout syndrome among test subjects fluctuates between 20% - 60%, suggesting a considerable negative impact not only on their work performance but also on their well-being. Burnout syndrome is mainly associated with work-related aspects, and relevant ones are: (a) overwork, (b) lack of control over the tasks, (c) insufficient recognition, (d) feelings of unfairness, (e) structural errors, (f) conflict of values.

Reason, J (1995). brings up very different aspects that cause workplace errors or incidents and even accidents, that is, latent failures and organizational errors arising in the upper echelons of the organization structure. He highlights through a model that describes two interrelated causal sequences: (a) an active failure pathway in top-level decisions and proceeds and (b) a latent failure pathway in organizational processes and deficiencies in the system.

With the improvement of technology, usage of smartphones and social media has impacted sleep patterns and continued use of screens (phones or monitors) leads to eye strains and tiredness, ultimately leading to body fatigue. According to the Health Safety Executive:

"*Fatigue is a result of prolonged mental or physical exertion; it can affect people's performance and impair their mental alertness, which leads to dangerous errors*." (hse.gov.uk)

Sadeghniiat-Haghighi, K., & Yazdi, Z. (2015) have also mentioned in their research that fatigue is the end result of the integration of multiple factors such as time awake, time of day, and workload. Fatigue has also been identified as a workplace hazard and can be associated with the safety and health of the employee.

Workplace incidents refer to any unexpected and undesirable events that occur within a work environment (Nemmers, P. 2023). These incidents can range from accidents and injuries to property damage or even instances of violence. Common workplace incidents include slips, trips, and falls, machinery malfunctions, fires, and conflicts between employees. Incidents are mainly caused by system failure, external factors, process failures, or human errors. Whenever an employee endures an unfavorable or undesired situation, irrespective of the reasons, the amygdala releases the hormones that cause an employee to react in a manner resulting in either harming themselves or others around them and/or damaging property. These unfavorable/undesired situations are also known as 'stressors.' (Wooll, M. 2022).

Based on the various literature reviews, the following three can elaborate on why incidents can manifest in various forms and have differing impacts on employees and the organization as a whole:

1. *Errors in Judgment*: Stress can lead to impaired decision-making abilities, causing employees to make errors in judgment. These errors may range from small mistakes in day-to-day tasks to more significant errors with far-reaching consequences. (Richardsen et al., 2019)
2. *Diminished Attention to Detail*: Under stress, individuals may struggle to maintain their usual attention to detail. This can result in overlooked errors, omissions, and oversights in work tasks and projects. (Sullivan & Bhagat, 1992)
3. *Interpersonal Conflicts*: Heightened stress levels can contribute to increased tension and conflict among colleagues. This can lead to a hostile work environment, hinder collaboration, and impact overall (Steffy et al., 1986) team dynamics.

2.3 Gap remains to be studied

As per Chen, X. (2024) employees' personal competence, emotional commitment, basic compensation and benefits, organization management, organizational commitment, and work design are the main influencing factors. Despite this comprehensive analysis of factors that influence employee performance, there is still a gap in understanding the contribution of stress, mainly due to social media, relationships, and economic conditions. There is also a notable gap in exploring the cumulative effects of these factors. The interplay between social media usage, economic anxiety, and relational dynamics in both personal and professional spheres remains insufficiently explored.

Specifically, the literature seems to lack a holistic approach that examines how these stressors interact and potentially exacerbate each other, leading to a compounded impact on an individual's mental health and job performance and failing to co-relate its contribution to workplace errors and incidents.

Roll, L. C. et al. (2019) research highlights the gap in the inconsistency in definitions and frameworks used to study stress. For instance, studies often define stress in varying ways—some emphasize psychological aspects, while others focus on physiological responses. This lack of uniformity complicates comparisons across studies and undermines the ability to draw generalizable conclusions about how stress influences human behaviour and error rates. Additionally, frameworks such as Lazarus' cognitive appraisal theory have been applied inconsistently, leading to varying interpretations of how stress affects performance and decision-making.

Shahsavarani, A. M. et al (2015) emphasis that there is still ambiguity in definitions and measurement and one of the primary issues in the literature is the lack of consensus on definitions of stress, errors, and incidents. Studies often utilize varying definitions and measurement tools, leading to inconsistencies in findings. For instance, stress can be conceptualized as either a psychological state or a physiological response, which complicates its assessment and relationship with human error. This ambiguity results in difficulties when attempting to generalize findings across different studies and contexts.

This requires further exploration into comprehensive, organization-level interventions that can address the challenges posed by social media and the broader spectrum of stressors that contribute to workplace errors and incidents. These strategies could include promoting a culture of work-life balance, offering support for mental health challenges, and creating policies that encourage positive social media use without encroaching on personal freedoms or privacy.

Therefore, to bridge these gaps, future research should aim to understand the synergistic effects of various stress factors and develop multidimensional intervention strategies. Such strategies should be nuanced, considering the diverse needs and circumstances of the workforce, and should aim to foster an environment that supports both productivity and well-being by reducing stress and ultimately lowering the frequency of errors and incidents.

According to Card, R.F. (2005), many studies have overemphasized Individual Responsibility for errors without adequately considering systemic factors that contribute to incidents. From the moral responsibility when an error occurs, blaming an individual does little to make the system safer and prevent someone else from committing the same error. This blame-centric approach can lead to a culture of fear where employees are reluctant to report errors or near misses, fearing punitive actions rather than viewing the real root cause of the error and opportunities for improvement.

Abdul Hamid et al. (2016) did a lot of work identifying the factors that lead to stress in the workplace, and which has been highlighted in ‘explored section’ of the below picture. However, the relationship between stress and workplace errors and incidents is yet to be determined, which is the proposed research's aim.

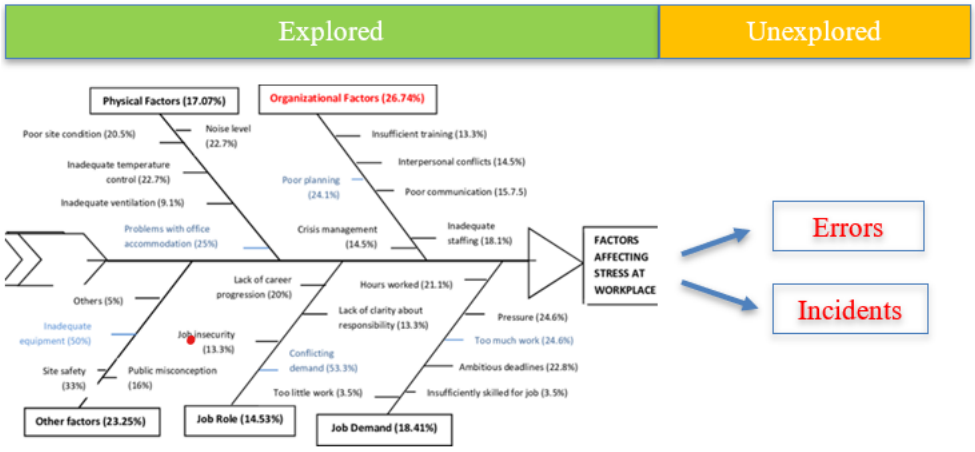

Figure 27. Sharma, A. (2024) -Explored and Unexplored factors, inspired from Hamid. A. (2016) Explored Section

Furthermore, while these cited studies provide significant insights into the components and contributors of workplace errors, accidents, and general worker well-being in various industries like the healthcare industry, construction industry, manufacturing, and even armed services, they do not collectively cover a large sum of workers/ employees which work in financial industry and have less exposure to unsafe environment when compared to construction or manufacturing industry employees.

Barbayannis, G. et al. (2022) while many studies highlight the negative impacts of stress on the performance of an employee and their error rates, there is a notable lack of research focusing on effective interventions to mitigate these effects. Although some studies suggest coping strategies or organizational changes to address stress, there is insufficient empirical evidence demonstrating that stress causes errors and which interventions are most effective in reducing it. This gap limits practical applications for organizations seeking to enhance employee well-being and performance.

Deng Y. et al. (2022) talk about the lack of longitudinal studies; according to them most existing research focuses on cross-sectional data, providing only a snapshot of the relationship between stress and errors at a specific point-in time. This limitation restricts the understanding of how stressors accumulate over time and their long-term effects on employee performance and well-being. Longitudinal studies are needed to capture the dynamic nature of stress and its cumulative impact on human error rates

Catino, M., & Patriotta, G. (2013), although the literature review demonstrates that the research has been primarily focused on physiological safety, cognitive errors, environmental factors, and organizational policies. However, there appears to be a gap in directly addressing how mental health, burnout, peer pressure, deadlines, and family issues build up stress in employees, which makes employees knowingly or unknowingly overlook safety protocols, adapt shortcuts, and manipulate tactics, resulting in errors and incidents at the workplace.

Burnout has been acknowledged and excepted as one of the broader spectrum of mental health conditions, there are others such as anxiety, depression, and stress-related disorders that can equally affect workplace safety statistics, is not deeply explored. Another notable gap is in exploring comprehensive, proactive strategies that integrate mental health support with existing safety frameworks. This includes but is not limited to training supervisors and coworkers to recognize signs of mental health struggles, providing access to mental health professionals as part of occupational health services, and creating a workplace culture that encourages seeking help without stigma.

The evolving nature of work, such as the increase in remote work and the use of digital communication tools, introduces new challenges and stressors that can impact mental well-being and, by extension, safety, and error rates. Research into these areas seems scant, indicating a need for studies that consider the changing landscape of work and its impact on workers' health and safety. Lastly, given the individual differences in susceptibility to mental health conditions and their manifestation, personalized approaches to occupational health and safety that consider these differences could be explored further. This could involve tailoring interventions to suit individual needs better, potentially increasing their effectiveness in preventing workplace errors and accidents.

Alborzkouh, P. et al. (2015) research found that the impact of stress on errors varies significantly across different populations and settings. For instance, while some studies indicate that high levels of stress correlate with increased error rates among healthcare professionals, others find no significant relationship among different occupational groups. This inconsistency raises questions about the generalizability of findings and

suggests that more nuanced approaches are necessary to understand how specific contexts influence the stress-error relationship.

Deng, Y. et al. (2022) explains some literature addresses the role of coping mechanisms in mitigating stress-related errors, there is limited exploration of effective interventions that organizations can implement. Many studies highlight the detrimental effects of stress but fail to provide actionable strategies for managing it within workplace settings. This gap limits practical applications for organizations seeking to enhance employee well-being and reduce error rates.

Wood, D. S. et al. (2002) explain techniques proposed by Card, Moran, and Newell (1983) (CMN) in which they noted that there is weakness in the CMN stages is that their Reset stage may not always be possible or necessary. It assumes that users can easily back up both mentally and within a task, to enable error correction. This is not always possible or desired. Despite these weaknesses, CMN describes a valuable approach to error modelling that is structured around specific user mental-stages.

Moreover, while the literature review highlights that researchers and authors have put significant efforts into identifying the negative aspects of social media on employee well-being and productivity, it stops short of delving into potential strategies that organizations can employ to mitigate these effects. Chen, X., et al. (2022).

The existing literature on the relationship between stress and human factors, particularly in the context of errors and incidents, reveals several gaps that need to be addressed. While numerous studies have explored various dimensions of stress and its impact on human behaviour, a comprehensive understanding of how these elements interconnect remains elusive. This review synthesizes key findings from the literature while highlighting the critical gaps that hinder a more nuanced understanding of this relationship

2.4 Summary

The literature review comprehensively explores various factors that contribute to stress, errors, and incidents in the workplace, highlighting the multifaceted nature of these issues. It identifies three primary sources of stress: role ambiguity and role conflict, the impact of technology and virtual environments, notably social media, on mental health and productivity, and the prevalence of burnout due to emotional exhaustion and a lack of control or recognition at work.

Additionally, the review discusses the significant role of human error in workplace accidents, underlining the importance of creating an effective workplace environment to minimize these errors and accidents. It references several models and theories, including the Human Factors Analysis and Classification System and Reason's Swiss cheese model, to explain the interaction between human cognition and environmental factors in the occurrence of errors.

The gaps identified in the literature concerning the linkage between stress and human factors underscore the need for more comprehensive research that considers contextual influences, diverse populations, longitudinal perspectives, effective interventions, and coping mechanisms. Addressing these gaps will enhance our understanding of how stress impacts human behaviour and error rates, ultimately contributing to improved workplace safety and employee well-being. Future research should aim for a holistic approach that integrates these elements to provide actionable insights for organizations seeking to manage stress effectively and reduce incidents related to human errors.

The literature also acknowledges the role of technology in causing physical fatigue through the prolonged use of screens, contributing to workplace hazards that can lead to errors and impact overall health and safety. Through a blend of theoretical and empirical studies, the review reveals a complex interplay between individual, organizational, and technological factors in shaping workplace well-being and safety. In summary, the sources highlight various factors that contribute to stress in the workplace, including job burnout, technostress, sleep restriction, and deprivation, long work hours, role ambiguity and conflict,

and l ck of control or recognition. Overall, work-related stress is a multifaceted issue that can significantly negatively impact cognitive performance, job satisfaction, and overall well-being.

The existing literature on the relationship between stress, incidents, and errors reveals significant gaps and challenges that need to be addressed. Ambiguities in definitions, an overemphasis on individual responsibility, neglect of contextual factors, lack of longitudinal studies, inconsistent findings across populations, and limited focus on coping mechanisms all contribute to a fragmented understanding of this complex interplay. Future research should aim for a more holistic approach that considers systemic influences while providing practical strategies for organizations to manage stress effectively and reduce human error rates.

CHAPTER III:

METHODOLOGY

The relevant literature was identified and screened as follows: A systematic desktop search was conducted using various online search engines viz. Google Scholar, Science direct, PubMed, ResearchGate, etc. This study is systematically and scientifically organized. The validity of the same is determined by a systematic approach to data gathering and analysis methodically, with the use of both primary & secondary data, hence the study is descriptive in nature.

Sampling methods and size

Considering the nature of the topic, restrictions due to data privacy, and employees' hesitation to share their personal information and related issues, only a small representative part is studied, and the conclusions are drawn on that basis for a larger group of employees or the whole population. Hence, this research uses a sampling method for collecting data. Random sampling is used to collect the data for this research. As far as the present study is concerned, the maximum population selected is from working employees.
The sample size was 110 and were considered for the data analysis.

Data Collection Method

For the present study, the universe comprises people who have worked or are currently employed. The sample size was 110 respondents. The primary data was collected using a well-crafted questionnaire and circulated using an online survey tool restricting multiple uses of the same link. This helped in ensuring no repeat entries were made. Secondary data is based on other indirect research on either stress and human performance or human and incident and errors; in addition, some statistics from my workplace were also considered.

Questionnaire

The essential facet of the current study was determined through the no. of incidents which were reported at my current workplace of employment. Based on the preliminary analysis of the incidents and accidents, it was identified that 58% of the incidents reported were Slips, trips, and falls. Post reviewing the root cause analysis reports of these incidents and accidents it was noticed that mostly the employee, contractual staff or customers were either on phone, rushing for the next task/ meeting, or they were distracted which led them to make errors eg. Stepping to early from the escalator, pushed the door instead of pull or vice-versa, didn't notice the warning signage eg. Wet floor, floor difference, etc.

The above led to the foundation of the study to understand the underlying causes of incidents/ errors rather than just human error or external factors, etc. A well-crafted questionnaire was created to cover the essential aspects to understand the main factor which caused humans to make an error or to get involved in an incident at their workplace.

Primary Data

Primary data refers to those data that were collected firsthand by the researcher. The field survey method was used to collect the primary data through a well-designed questionnaire in this research work. The researcher used multiple-choice questions based on the daily routine of humans to accumulate primary data. To accomplish the research objectives, the primary data were collected from currently employed or employed individuals. One notable aspect was that the participants completed the survey with enthusiasm and emotion, demonstrating positive feelings.

Secondary Data

In the early phases, secondary data provides researchers with information on the activities, scope, and perspectives of other specialists who conducted the root cause analysis and investigation of the incidents at the workplace. It supplemented the qualitative components of the research findings with valuable and necessary information. Secondary data

was gathered for this aim from all associated sources, which not only included the workplace incident details whereas also volumes on human and their anatomy, human factor, stress, incidents and errors and research methodology, research journals, blogs published on the area of study and Internet web sources.

Tools

The extent of using the effect of stress on employees based on their age, gender, relationship status, stay conditions, designation/level in the organization, time spent at work, no. of incidents they were involved or errors made will be analyzed using percentage and comparison method, as the data is more subjective and descriptive of the emotions and experience the subject have experienced. If the data had been numerical, it would have led to using the following methodologies: Mean, Standard Deviation, Chi-Square Test, ANOVA, Correlation Analysis, Multiple Regression Analysis, and Henry Garrett's Ranking Technique.

Limitation of the study

While this study aims to provide valuable insights into the relationship between stress and workplace errors, several limitations must be acknowledged:

- *Participant Composition*

  The participants in this study are either current or former employees of specific organizations. This selection may limit the diversity of perspectives and experiences, as the findings may not be representative of a broader workforce. Different industries and job roles could yield varying insights into how stress affects performance and decision-making.

- *Lack of Live Observation*

  This research relies solely on self-reported data from participants, with no live or practical observational studies conducted. The inputs gathered are based on participants' recollections and experiences regarding specific situations. This reliance on memory can introduce inaccuracies, as individuals may misremember events or interpret them differently over time.

- *Scope of Research*

  The research is confined to back-office workplaces, excluding environments such as workshops, manufacturing production floors, construction sites, and other high-stress settings. This limitation may restrict the applicability of the findings to other types of work environments where stressors and error dynamics differ significantly.

- *Respondent Bias*

  The potential for respondent bias is another limitation. Participants may have preconceived notions or prejudices that influence their interpretation of the questionnaire. Additionally, the limited options provided in the survey may constrain their responses, leading to a lack of nuance in capturing their true feelings and experiences.

- *Subjectivity of Stress Responses*

  Stress can trigger emotional responses that are inherently subjective, which may affect the accuracy of participants' answers. Depending on their current emotional state at the time of completing the questionnaire, individuals may provide biased responses that do not accurately reflect their typical experiences or perceptions regarding stress and its impact on their work..

Conclusion

These limitations highlight the need for caution when interpreting the results of this study. Future research could benefit from incorporating a more diverse participant pool, utilizing observational methods, and expanding the scope to include various work environments to enhance the robustness and applicability of findings related to stress and workplace errors. During study it was also understood that there is considerable variation in the level and type of hormones released by different people and in response to different stressors – not a simple physiological process. Symington (1955) found that conscious dying patients showed different stress reactions to unconscious ones.

In conclusion, detailed research tracking participants' daily lives and collecting the emotional and physical parameters will help identify the stressors, errors, and incidents, which will contribute to understanding that stress is one of the main contributing factors to workplace errors and incidents, which will help employees reduce errors in their work and improve their safety at the workplace. This research will also help organizations in addressing stressors by designing effective strategies and programs on stress management, mental health support, and occupational health and safety protocols. Addressing this gap could help decrease workplace errors and accidents, improve overall worker well-being, and reduce stress, which is the leading cause of these problems.

CHAPTER IV:

RESULTS

Note: *Participants have been randomly selected and following response is based on inputs they have provided based on their individual experience, knowledge, and emotional state at the time of filling the questionnaire.*

4.1 Finding overview:

The question we are trying to address in this study is how stress impacts employees and contributes to workplace errors or incidents, ranging from typo errors to mistakes related to sharing wrong information or slips, trips, and falls. Questions in the survey have helped understand the relationship between the relationship status and various emotional experiences like disagreements, anger, etc.

Based on the survey of 110 participants, 56% have identified themselves as female, 38% as male, and 5% as LGBTQIA2S++. 58% of the participants worked in Middle Management position, followed by 23% in Senior Management, demonstrating the experience level and the age variance (68% of participants were above 35 years of age).

At a personal level – 64% of the participants are married or married with kids. Professionally, 36% of the participants were individual contributors, and 29% are team leaders with more than five members in their team.

39% of Female participants are individual contributors, and 36% of the male participants have a team of more than 5 members at the workplace.

4.2 Summary of Findings

Overarching research Sub questions:

a) What type of scenarios/causes led to stress in employees?

Recent findings indicate that various factors such as workload, deadlines, personal relationships, and family environment significantly contribute to stress among individuals. Here are the key insights from the study:

- **Workload and Constant Thoughts**
    - *Workplace Stress*: 61% of female participants and 50% of male participants report thinking about their workload either most of the time or always.

- *Family and Financial Concerns*: Outside of work, 63% of females and 58% of males frequently think about family and financial commitments.

- **LGBTQ++ Perspectives**
  - *Managerial Pressure*: 60% of participants identifying as LGBTQ++ express constant concern regarding managerial pressure and fear of failure in the workplace.

- **Working Late and Errors**
  - *Extended Work Hours*: A significant number of respondents reported working late, with 73% of females and 69% of males doing so regularly.
  - *Error Rates*:
    - 60% of females and 62% of males reported making more than five errors in a month.
    - A staggering 91% of females and 93% of males feel tired more than once a week.

- **Impact of Family Engagement**
  - *Errors Linked to Family Time*: Among those who rarely go out with family (once a month or less), 64% of females and 54% of males reported making over five errors in a month.

b) How does stress impact human behaviour in social & work life?

- **Impact on Personal Life**
  - *Family Disagreements*: A significant portion of participants reported frequent disagreements with family members, with 71% of females and 90% of males disagreeing more than once a month.

- **Disagreements When Tired**
    - *Tiredness and Family Conflicts*:
        - 69% of females and 78% of males have disagreements with family members when they are tired.
        - Additionally, 49% of females and 73% of males report disagreements with office colleagues under similar conditions.
- **Relationship Dynamics**
    - *Marital/Relationship Anger*:
        - 70% of females and 68% of males experience feelings of anger in their relationships.
        - Disagreements with spouses or partners are reported by 68% of females and 88% of males.
- **Impact of Social Media**
    - *Social Media Activity*:
        - 63% of participants are active on social media, with 72% uploading photos and 68% sharing posts about their lives.
        - Interest in hosting parties is noted by 60% of females and 57% of males.
- **Screen Time Insights**
    - *High Screen Time*:
        - A substantial number of participants (79% females, 74% males, and 80% LGBTQ++) spend more than two hours on screens daily, primarily using chatting apps (e.g., WhatsApp, WeChat) and social media platforms (e.g., Instagram, Facebook).

- **Errors and Fatigue Linked to Screen Time**
    - Among those with over two hours of screen time:
        - *Error Rates*:
            - 67% of females, 58% of males, and 80% of LGBTQ++ participants reported making more than five errors in a month.
        - *Fatigue Levels*:
            - High levels of fatigue were confirmed by 92% of females, 90% of males, and all LGBTQ++ participants (100%) feeling tired more than once a week.

c) What are the common errors or incidents at the workplace?

The data reveals a strong connection between fatigue and both the frequency of errors and incidents encountered. Forgetting to save work is notably prevalent across all demographics, while incidents related to door operations and slips/trips are also common.

- **Common Errors**
    - *Forgetting to Save Work*: The most frequently reported error was forgetting to save work, confirmed by 61% of females, 57% of males, and 100% of LGBTQ++ participants.
- **Other Notable Errors**: The second most common error for females was getting off on the wrong floor (53%), while for males, it was sending a wrong email (45%).
- **Correlation with Fatigue**
    - Among those who reported these common errors, a significant majority indicated they were tired more than once a week:
        - 95% of females
        - 100% of males
        - 100% of LGBTQ++ participants

- **Incidents Encountered**
    - *Door Incidents*: 61% of females, 55% of males, and 80% of LGBTQ++ participants reported encountering incidents related to push/pull doors in the past month.
    - *Slip and Trip Incidents*: The second most common incident reported was slipping or tripping, affecting 50% of both females and males.
- **Screen Time and Fatigue Correlation among those who experienced incidents**:
    - *Screen Time*: 82% of females, 83% of males, and only 10% of LGBTQ++ participants had more than two hours of screen time.
    - *Fatigue Levels*: High fatigue levels were reported by:
        - 89% of females
        - 96% of males
        - 80% of LGBTQ++ participants who faced these incidents

d) How has stress impacted participants, and what remedies were recommended by them?

The data highlights the significant impact of stress on both work and personal life, with a majority of participants experiencing exhaustion and various stressors. The preferred remedies reflect a desire for personal space, familial support, and mindfulness practices to help alleviate stress.

Impact of Stress

- *Work-Related Stress*:
    - 66% of participants reported encountering stress due to work on a weekly basis.
    - Additionally, 65% experienced exhaustion as a result of their work-related pressures.
- *Personal Issues*: Stress stemming from personal issues affected 56% of females and 60% of males.
- *Decision-Making Stress*:
    - 52% of females reported feeling stressed when put on-the-spot to make decisions.
    - In contrast, 57% of males experienced stress due to fears of declining performance.

*Remedies to Manage Stress***:**

Participants identified several remedies to manage stress, with the top three being:

- Being Left Alone: 61% preferred solitude as a way to cope with stress.
- Understanding from Family Members: 57% emphasized the importance of support from family.
- Meditation: 52% recommended meditation as an effective stress management technique.

4.3 Hypothesis Result

The study was carried out with the aim of understanding and evaluating if stress can have a negative impact on an individual's cognitive abilities, such as memory, attention, and decision-making. This can increase the chance of employees making mistakes and being involved in workplace incidents.

In the earlier section of this study, two null hypotheses were determined. Based on the results of the survey above.

- H01: Employees will not agree that stress management can reduce workplace incidents and errors
- H02: Not more than 30% of employees will accept that ‘leaving them alone’ can help de-stress.
- H03: Not more than 30% of employees who forgot to save their work will be tired.

Operational variables: the study was carried out based on a theoretical survey, which has the possibility of variance in responses based on participant’s mood, mental condition, environment, time of the day, and also the events that occurred with them on or during that week.

According to data received:

- H01: 100% of participants agreed that stress management can help reduce workplace errors and incidents
- H02: 61% of participants agreed that, if they are left alone will be the best solution for stress and will help them de-stress
- H03: 95% of participants who forgot to save their work were tired.

The analysis predicts the rejection of all null hypotheses. As a result, physical and mental exertion resulting in tiredness which directly and indirectly impacts an employee's work and activities.

4.4 Conclusion

The study helped investigate how stress affects employees and contributes to various workplace errors and incidents, including typographical mistakes, misinformation, and physical accidents like slips, trips, and falls. The survey results from 110 participants revealed that the maximum number of participants were female (56%), followed by male (38%), and there was some participation from the LGBTQIA2S++ community, too. A significant portion of the participants, 58%, held middle management positions, while 23% were in senior management roles, indicating a diverse range of experience levels; notably, 68% of participants were over 35 yrs.

On a personal level, 64% of the participants are married or married with children. Professionally, 36% serve as individual contributors, and 29% lead teams of more than five members. Among female participants, 39% are individual contributors, whereas 36% of male participants manage teams exceeding five members. This demographic data provides a foundation for understanding the emotional experiences related to workplace stress and its potential impact on performance and safety.

The data highlights the significant impact that fatigue and social media engagement have on personal relationships, leading to increased disagreements within families and partnerships. Furthermore, excessive screen time correlates with higher error rates and feelings of tiredness across all demographics. These findings underscore the complex interplay between work-related stressors and personal life, highlighting the need for strategies to manage workload and improve overall well-being.

CHAPTER V:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

5.1 Summary

Employees have to go through many emotional, physical, and mental journeys daily at home and the workplace. Study findings underscore the complex interplay between work-related stressors and personal life, highlighting the need for strategies to manage workload and improve overall well-being. Results have indicated that females (61%) think of workload more than males (50%) at their respective workplaces. However, females' priority shifts to family (63%) and males' (58%) to meet financial commitments once they are out of the workplace.

Forgetting to save work is notably prevalent across all genders and managerial levels, while incidents related to door operations and slips/trips are also common. Data indicates the impact of phone usage; 78% of participants had screen time exceeding 2 hours, and among them, 64% made errors, while 91% confirmed they felt tired. Once they identify these triggers or, in other words, "stressors", they will be able to devise a plan to manage them. The data reveals a strong connection between fatigue and both the frequency of errors and incidents encountered. High screen time appears to correlate with these experiences, emphasizing the need for strategies to manage fatigue and improve workplace safety.

This research will assist organizations in addressing stressors by developing effective strategies and programs focused on stress management, mental health support, and occupational health and safety protocols. Addressing this gap can help reduce workplace errors and accidents, enhance overall worker well-being, and alleviate stress, which is a primary cause of these issues.

5.2 Implications

The data underscores a strong correlation between fatigue and the frequency of errors and incidents in the workplace. High screen time is linked to these negative outcomes, highlighting the urgent need for strategies to manage fatigue and improve workplace safety. Identifying stressors is crucial for devising effective management plans to mitigate their impact on employees' well-being. A higher percentage of females (61%) report thinking about their workload compared to males (50%). However, once outside the workplace, females prioritize family (63%), while males focus on financial commitments (58%).

The study was conducted using a theoretical survey, acknowledging that responses may vary based on participants' mood, mental condition, environment, time of day, and recent events experienced during the week. Employees navigate a range of emotional, physical, and mental challenges both at home and in the workplace. The findings highlight the intricate relationship between work-related stressors and personal life, emphasizing the necessity for effective strategies to manage workload and enhance overall well-being.

The analysis suggests rejecting all null hypotheses, indicating that physical and psychological exertion leading to tiredness significantly impacts employees' work performance and activities. 52% recommended meditation as an effective stress management technique, highlighting the importance of addressing stress management in the workplace to enhance productivity and reduce errors.

Recognizing the consequences of these errors & incidents at the workplace is essential for creating effective strategies that reduce their occurrence and promote a culture of continuous improvement. The more emphasis, awareness, and training being provided to the employees to acknowledge, identify, and act on these stressors, the more effectively such simple errors and incidents, ranging from minor oversights to sending wrong emails/attachments to slip-trip-fall blunders, can be avoided and reduce the consequences, including financial losses, reputational damage, etc.

5.3 Recommendations for Future Research

Future research should prioritize practical sampling methods, such as interviews and observational studies, to deepen the understanding of workplace stress and its impacts. While theoretical surveys can provide valuable quantitative data, they often fail to capture the nuanced experiences of employees in real-time settings.

Diverse Participant Sampling: Utilizing a diverse range of participants from various industries and job roles can yield richer insights into how stressors manifest differently across different contexts. Researchers can better understand the unique challenges employees face in distinct work environments by including individuals from various backgrounds. This approach will enable researchers to gather firsthand accounts of employees' daily challenges and coping mechanisms, leading to a more comprehensive understanding of workplace stress.

In-Depth Interviews: Conducting in-depth interviews can provide qualitative data to help reveal stress's emotional and psychological dimensions. Participants can share accurate personal narratives highlighting specific triggers, such as workload pressures, family obligations, and environmental factors. These narratives will offer a detailed view of their experiences, allowing researchers to identify common themes and patterns related to stress in the workplace.

Observational Methods: Incorporating observational methods can further enrich the research by allowing researchers to witness interactions, incidents, errors, and associated behaviours in natural settings. By monitoring work environments, researchers can identify specific stressors and their immediate effects on employee performance and well-being. Observational studies can also help clarify how stress influences decision-making processes and error rates in real-time situations.

Combining Methodologies: Future research can develop more effective strategies for managing workplace stress by combining these methodology surveys, interviews, and

observational studies. This multifaceted approach will enhance understanding of the causes of stress and its consequences on employee performance and overall organizational health.

Combining these approaches will enhance the depth of understanding regarding stress and inform the development of targeted interventions. By focusing on practical examples, future research can help organizations implement effective strategies to manage workplace stress, ultimately fostering a healthier work environment and reducing errors.

5.4 Conclusion

At the start of the study, we aimed to understand human anatomy and its cohesive relationship with internal organs and the body's responses to the external environment to maintain safety and health. Basis, we recognized that the amygdala plays a crucial role in how individuals respond to stress, triggering a fight-or-flight response when exposed to high-pressure environments at workplaces and family settings.

Employees face various situations that trigger fight-or-flight responses at work and outside, stemming from multiple factors. At the workplace, common scenarios include excessive workloads, tight deadlines, and lack of support, which can lead to feeling overwhelmed. Outside of work, family commitments and financial pressures exacerbate this stress, as individuals often juggle responsibilities at home while worrying about their financial stability and aging parents' health, etc. This dual burden can lead to emotional exhaustion and increased errors in daily tasks.

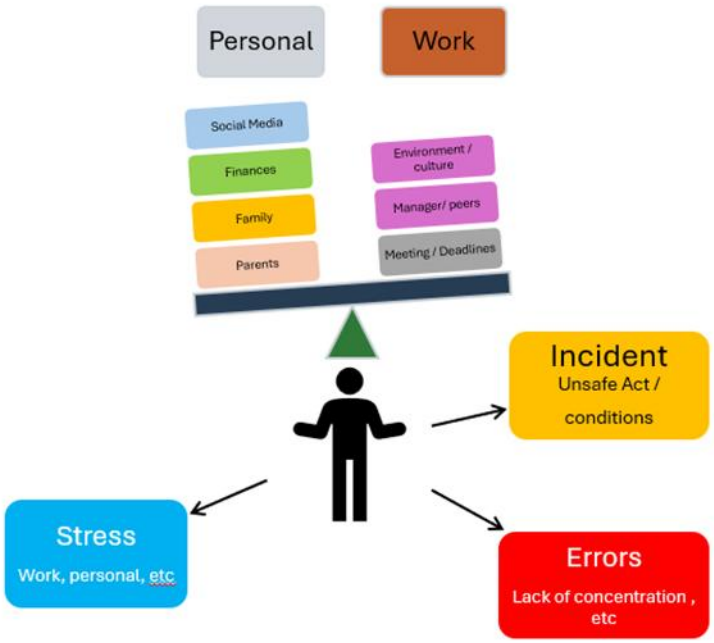

Figure 28. Sharma, A. (2024). Impact on humans from work and personal life

Overload impairs decision-making and increases the likelihood of mistakes. For instance, stressed employees may forget to save important work or miscommunicate with colleagues or family members. The cumulative effect of these stressors impacts mental health and diminishes overall productivity and job satisfaction; for instance, employees under pressure may overlook safety protocols or make poor decisions, resulting in accidents.

The study helps us understand that 61% of female and 50% of male participants reported thinking about their workload either most of the time or permanently. 63% of females and 58% of males frequently think about family and financial commitments outside of work. 60% of females and 62% of males reported making more than five errors monthly. A staggering 91% of females and 93% of males feel tired more than once a week. This interplay between stress, workplace errors, and incidents is a multifaceted issue that significantly impacts employees' well-being and productivity. At workplaces, stress from managerial pressures and job insecurity can exacerbate employee emotional health, leading to a higher incidence of mistakes.

These findings reveal that various factors, including workload, deadlines, personal relationships, family obligations, and contributes to stress. Assessing aspects such as relationships and their impact on personal life, employees in a relationship, married, parents (single or married), 69% experience anger, 77% have disagreements with family members, and 90% complain about being tired.

Based on the initial assumption of various aspects of an employee’s life that can lead to stress or incidents or errors, the study results have revealed that stress is one of the contributive factors that lead to workplace errors and incidents, mainly when the human factor is the root cause in the occurrence of workplace error or incident. Sometimes, this stress can also lead to unsafe conditions resulting in injury to self or others, e.g. leaving items on the floor or sharp objects carelessly because you got an urgent call resulting in a slip or trip, opening the car door without checking if someone is passing by whilst talking on the phone. etc.

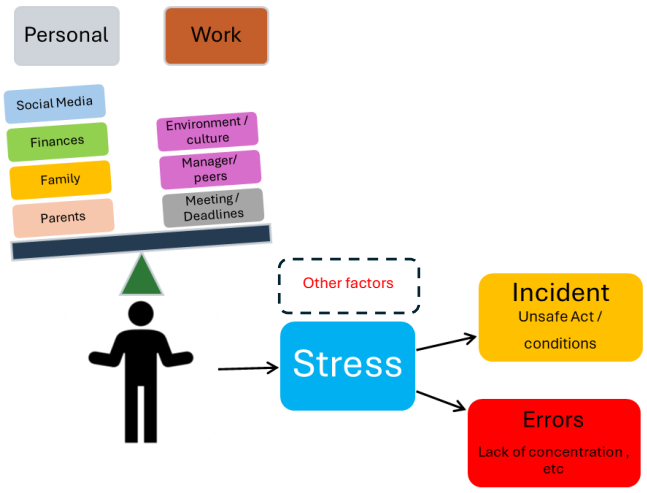

Figure 29. Sharma, A. (2024). Stress contributing to workplace errors and incidents.

There can be other factors that lead to workplace errors and incidents; however, the study results inclined toward stress being the main contributing factor to their occurrence. The above indicates the need for effective stress management strategies in both personal and professional spheres. Focusing on the root causes of human error requires a comprehensive approach that includes improving workplace conditions, providing adequate training, and fostering a supportive environment to mitigate stress and enhance overall performance. Addressing these issues is essential for promoting a healthier work-life balance and improving employee well-being.

By implementing stress management techniques such as mindfulness and emotional regulation practices, individuals can better manage their responses to stressors, ultimately reducing errors and improving overall well-being. Overall, addressing workplace stress is crucial for enhancing employee welfare and productivity. Organizations must implement effective stress management strategies that recognize the root causes of stress and provide support systems for employees.

Prioritizing practical sampling methods and diverse participant engagement will allow future studies to capture the complexities of workplace stress more effectively. By focusing on qualitative insights alongside quantitative data, researchers can create a holistic view of how stress impacts employees and develop targeted interventions that promote well-being and safety in the workplace.

This proactive approach benefits employees and contributes to a more efficient and harmonious workplace environment, ultimately improving their personal lives as well. Effective stress remedies include a variety of techniques, such as regular exercise, which helps reduce emotional intensity and clear the mind. At the same time, mindfulness practices like meditation and deep breathing activate the body's relaxation response. This study has proven that 61% of participants have selected ‘isolation’ as a stress remedy, which indirectly helps them become calm, self-actualized, and self-healed. Social support is crucial; spending time with friends and family can alleviate stress by providing comfort and perspective.

Furthermore, adopting a positive mindset through positive self-talk can shift negative thoughts and improve emotional resilience. Setting boundaries to avoid overcommitment and learning to say "no" can help manage workload and personal demands. Lastly, engaging in hobbies or activities that bring joy fosters a sense of fulfillment, further mitigating stress levels.

In conclusion, this study highlights the critical relationship between stress and workplace errors, emphasizing the importance of effective stress management strategies. We extend our heartfelt gratitude to all participants for their valuable insights and contributions, which made this research possible. Your willingness to share experiences has enriched our understanding of this important issue. Additionally, we would like to thank our professor for their guidance and support throughout the research process. Without your expertise and encouragement, this study would not have been achievable. Together, we hope to foster a healthier work environment for all employees.

Thank you, for reading!

APPENDIX A

REFERENCE:

Image Reference:

Figure 1. Sharma, A. (2024). Standard causes of incidents & errors

Figure 2. Sharma, A. (2024). Various external factors affecting humans

Figure 3. Ape Skeletons – By the original uploader was TimVickers at English Wikipedia. - Transferred from en. Wikipedia to Commons., Public Domain, 20 SEP 2007 https://commons.wikimedia.org/w/index.php?curid=2785168

Figure 4. Evolution Of Humans – History, Stages, Characteristics. Geeksforgeeks.org. https://www.geeksforgeeks.org/human-evolution-stages/

Figure 5. Johns Hopkins Medicine. Meninges - *Brain Anatomy and How the Brain Works*. https://www.hopkinsmedicine.org/health/conditions-and-diseases/anatomy-of-the-brain

Figure 6. Johns Hopkins Medicine. Main parts - *Brain Anatomy and How the Brain Works*. https://www.hopkinsmedicine.org/health/conditions-and-diseases/anatomy-of-the-brain

Figure 7. Johns Hopkins Medicine. Lobes - *Brain Anatomy and How the Brain Works*. https://www.hopkinsmedicine.org/health/conditions-and-diseases/anatomy-of-the-brain

Figure 8. Johns Hopkins Medicine. Glands - *Brain Anatomy and How the Brain Works*. https://www.hopkinsmedicine.org/health/conditions-and-diseases/anatomy-of-the-brain

Figure 9. Cleveland Clinic (2023) Nervous System. https://my.clevelandclinic.org/health/body

Figure 10. Cleveland Clinic (2024) Cardiovascular System. https://my.clevelandclinic.org/health/body/circulatory-and-cardiovascular-system

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Figure 12. Salzmann, S. (n.d.) Stress - Person Stressed Out Clipart. https://www.pngitem.com/middle/hJToxRw_stress-png-file-person-stressed-out-clipart-transparent/

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