

Hashim Talib Hashim
Athanasios Alexiou *Editors*

The Psychology of Anger

 Springer


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*I want to dedicate this book to my family: my great father (**Talib Hashim Manea**), my great mother (**Jawaher Mutar Mohammed**), my great grandmothers and for the souls of my grandfathers.*

*I want to dedicate it to my younger brother, my partner and supporter. The one who always stands for me and pushes me to do more: **Ali Talib Hashim**.*

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Foreword

As it is very efficiently attributed in the book *The Psychology of Anger*, anger has been a fundamental element of the human personality since ancient times. Everyone can be angry. Often, this anger is a way of protecting from other primal emotions we cannot manage, such as frustration, rejection, exhaustion, worry, and guilt (Bushman et al., 1999). Although anger is not always associated with aggression, its effects on the human body can be unpleasant.

The Psychology of Anger describes the origin and the causes of anger, describing the classification of anger types according to American Psychological Association (Calvert et al. 2017). The book offers the specialized professionals and the general audience a systematic review of anger in the emotional cycle from the early BC years and the Book of Rites to the latest Basic Emotion Theories that include anger and rage (Izard, 2007; Rodriguez et al., 2014). The authors reveal the variety of causes that can trigger this angry behavior and lead to the loss of the ability to self-monitor and objectively observe the current personal and social environment. In addition, they identify the neuroscience of anger and the brain regions controlling emotions and alterations in normal behavior.

Covering a broad range of topics, *The Psychology of Anger* combines the historical, social, and philosophical inquiry of anger with the several risk behaviors which may act as causes or causative to the development of severe health issues.

The Psychology of Anger must be recognized as a reference book for students, medical doctors, psychologists, psychiatrists, and neuroscientists, offering a holistic approach to the effective management of anger as a humanistic phenomenon inextricably linked to human temperament.

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Preface

This book discusses about anger in psychology, its mechanisms, predisposing factors, precipitating factors, its impacts on the brain structure and function on one end and human physical health on the other, and its prevention methods.

This is a research book which presents anger in a new, modern, and educational way of writing. It presents a mathematical expression for the law (Angers' laws) in a way to understand the anger before it truly occurs and to control the anger and prevent its occurrence.

This book describes anger from A to Z, how it develops, what makes it virulent, and how to control it, and the most important aim of the book is how to predict it before it happens.

The book is highly specialized in anger and anger's manner, its differences between people and races, its historical origin and theories that mostly described it, and how they are aligned with modern psychology and neurosciences. Moreover, the book described the predictive changes in brain and effects on the human body that can be attributed to the anger and its sequels.

It is the first book that talks about anger in detail, and there is no book that talks independently about this topic. It is—to our knowledge—the first book that vastly focuses on all aspects of anger, emerging from the significant need to fill a defect in the related resource map and incorporate meaningful updates regarding all aspects of the anger theory and practice.

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Chapter 1

Introduction and Definition of Anger



Anam Tariq and Umar Bacha

1.1 Introduction

Some people react to anger through retaliation because they have learned this, while others show coping behavior in response to anger (Videbeck 2006). Raymond Novaco, since 1975, has reported a plethora of writings on the substance. They divided the anger into three classes:

1. Cognitive (evaluation)
2. Somatic-effective (tension and anxieties)
3. Behavioral (withdrawals and antipathy)

An anger management author William Deforce explained anger as an illustration of pressure that can only be functional up to the bound with time boundary. If surpassed, it will outburst and destroy things (Yadav et al. 2017). Experiencing anger by a person will also stimulate expressive literacy of any adverse disturbance that effect on the diverse body structure resulting in changes in physiological circumstances, such as elevated blood pressure, heart rate increased, increased level of noradrenaline and adrenalin because of sympathetic liberation that is coordinated physiologically to cover up systemic body stability to hurt, fear, and sadness. Some show that anger is an impression that initiates part of the flight or fight reaction (Harris et al. 1964).

By nature, anger is an attitude to defend oneself from sadness, distress, or hurt cognitively, behaviorally, or physiologically on the extraneous aggressive exposure by an action chose on an option such as facial languages, biological reaction, advanced public behavior of fierceness and body language (DiGiuseppe and Tafra 2007).

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Animals, for example, make loud roaring noises, bodily become bigger, bare and squeeze their teeth, and glare. All these fluctuations are made as a threat to cease provoker to their frightening attitude. A physical dispute is exceptional without the premier anger expression, while most of them pass over self-monitoring capability and visibility. Modern psychologists consider that anger has a compelling value for existence and is a main, native, and mature feeling felt by almost all human beings at any moment can negatively impact both individual or communal well-being (Novaco 2013) and impact both the body and the mind destructively if it persisted hypocritically (Kemp and Strongman 1995).

Emotions are biological, subjective, goal-directed, and a social phenomenon. Innate phenomena that occur in distinctive human beings in similar conditions rarely **impact** on learning and cultural situations and reduce considered physiological responses. One of the underlying feelings in human beings is anger (Hogan 2011).

Anger may range from mild frustration to full wrath. Conversely, it is measured as a natural occurrence and, similar to other approaches and feelings, is a mark of psychological health, cleanness, and human affects. Anger could be measured as desirable because it is a way for a human to show off their unpleasant emotions. In addition, it is the fundamental subject of many courage and spirit actions in battle and military conditions (Calvert et al. 2017).

Contradictory to rational, anger is not objective, a destructive emotion, like violence and opposition; it is a normal feeling and a mystical and a general feeling. Furthermore, anger can act as a character shield in a certain way. If one can show their anger optimistically, then it is considered a strong task, and vice versa; if the anger demonstrates indignations, it can harm the individual and their neighboring social surroundings. However, while many authors and philosophers have notified about the consequences of impulsive and uncontrolled anger, there is no agreement about the essential value of anger among them (Özyeşil 2012).

In some situations, anger expression can be used as a manipulation approach for social impacts. Most of the time, anger results from damaging and/or unpredicted interpersonal relations. If any kind of clash and disappointment in interpersonal relations would come, it might be a trigger obstruction and anger. On the other hand, anger can also develop displeasure by increasing frustration, and hence, this void cycle can escalate tension in social aspects of life. Even if not articulated, anger could increase an individual's aggression and damage his activities and functions in the environment of social and interpersonal situations, adaptation, goal accomplishment, family life, and job chances (Kemp and Strongman 1995).

One of the acute situations of the manifestation of anger is in military situations. In army environments, anger manifestation and violence are usually reflected to compensate for feelings such as irritation, inferiority, hurt, and unassertiveness in front of superior employees (Mahalik et al. 2003). The risks in concerns to the expression of wrath in military environments among military employees and anger manifestation towards their family supporters are high. Anger can be shown in a variety of settings, including hospitals. Considering the long-term and adverse effects of anger and the consequences of violent actions and the responses towards clinicians, and its possible and likely effect on satisfying decision-making

measures, one of the most critical issues in clinical settings is optimum dealing with anger episodes and the limitation of such events. These, indeed, need an excellent knowledge of essential and fundamental factors of anger stimulation in individuals (Shahsavarani and Noohi 2015).

1.2 Definition of Anger

Different philosophers, scholars, and psychologists defined anger as:

Anger is the emotional reaction to an outward or internal occurrence that we perceive to be inequality, violation, and threat. It has been widely hypothesized that wrath is an adaptive reaction and is a description of the fight or flight reaction, which in response is assumed to have evolutionary helpfulness in shielding us from threat.

However, two concerns are common among them all:

1. The primary anger factors include obstacles, frustrations, and threats to personal objectives.
2. Anger's aim is usually to fight, damage and defense.

There is no agreement about an accurate description of anger, and the idea has been used in different senses in everyday language. In fact, anger is an emotion that leads to aggression, to put it more bluntly. Anger is an affective sensitive state which ranges from mild irritation to ferocious outrage and often shows up when the way to attaining goals or sufficient needs is blocked. Based on the present research, almost 20 definitions of anger were found, which are applied in specific contexts (Shahsavarani and Noohi 2015).

1.3 Origin and Causes of Anger

Angry people generally find their reasons for anger in some aspect of voluntarily, individual, and manageable other people's actions. Nonetheless, this description is based on an angry person's perception that feelings have lost the competence of self-monitoring and objective observability as a result of anger. Anger could have multidimensional origins, some of which are events distant from the individual. However, people often simply find more than one reason for their wrath. Anger experiences are slowed in temporal environmental situations and problems that seemingly do not end in anger and can regularly and necessarily make some bases for eliciting an anger manifestation recognized by focal and surrounding features. Therefore, to make a better thoughtful of anger, there is a significant requirement to know its essentials. In general, in the revised references, the roots of anger were examined in mental (sensitivity to reinforcement theory, attachment theory, and five-factor model of personality), neuropsychological physiological, and religious (Islamic) fields, which are explained in the table (Shahsavarani and Noohi 2013).

Anger cause	Explanation
Psychological	<p><i>Attachment theory</i> Approaches of childhood for wrath managing will bear in later life. Like childhood, rage in adulthood is a warning to the people that there is a delinquent, which shall be resolved. Different uncertain attachment ways in childhood, consequences in violent actions in middle age.</p> <p><i>Sensitivity to reinforcement theory</i> People with high intensities of tension and nervousness (their BIS or FFFS is dominant) are highly susceptible to indications of danger and penalties and express many provoked actions and responses. Therefore, individual variances in defensive detachment about some real persistent distance could be considered a basic behavior aspect related to “sensitivity to punishment” or “threat perception,” which are the main aspects of producing anger in individuals in different circumstances.</p> <p><i>Five-factor model of personality</i> One of the five behavioral features is Neuroticism, which is persistent in middle age and consists of six aspects: anger, anxiety, depression and hostility, impulsivity, vulnerability, and self-consciousness. Irrational people are usually full of destructive emotional state, especially nervousness, anger, and depression</p>
Physiological	<p>Physiological alterations in anger result from triggering sympathetic divisions of autonomous nervous systems, which arrange the body for dealing with particular conditions. These deviations include an increase in heart rate and an increase in number (and decrease in-depth, simultaneously) of respiration, Blood sugar increase, blood vessels of central nervous systems and stripped muscles are distended, increased blood pressure, secretion of certain hormones, the blood flow of digestion organs decreases, bristling of body hairs, and distention of pupils decrease in the secretion of saliva and mucus (and hence, mouth, nose, and throat become dry), increase in sweating. In anger, provocation of the autonomous nervous system is measured by the hormonal action of the central and cortical parts of the adrenal glands</p>
Neuropsychological	<p>The amygdala sends signals to the brain stem as a response to the autonomic nervous system, which directly impacts the internal body part and muscles. In the anger stage, the lateral orbitofrontal cortex has the highest action</p>
Religious (Islamic)	<p>The main reason for anger and wrath in human beings is grandiose, condescension, and arrogance. Human beings typically develop anger when their arrogance grandiose is blemished.</p>

1.4 Classification of Anger

American psychology classifies the anger into following types (Calvert et al. 2017).

Classification	Features
Dualistic classification of anger	<p><i>Aggressive anger</i> Intimidation, brutality, destructiveness, splendid, distressing, harmful, annoying, agitated behaviors, selfishness, frightening, blaming, changeability, hateful actions</p> <p><i>Passive anger</i> Dispiritedness, unsympatheticity, compulsive behaviors, mental abuse, defeatedness, escapism, sleath, cryptical actions, self-scarification, self-blame</p>
State-trait anger theory	<p><i>State anger</i> Describing anger feelings practiced by individuals at any time could range from annoyance to temper epidemic.</p> <p><i>Trait anger</i> A worldwide tendency for any individual to experience an angry emotional state</p>
Health/unhealthy anger	<p><i>Healthy anger</i> It ends in self-protection, defending one’s values and limits, protecting and mending rights, and confronting others’ anger.</p> <p><i>Unhealthy anger</i> People use it to attain goals other than healthy anger and are a means to achieve areas other than the extirpation of possibilities and dangers</p>
Islamic classification of anger	<p><i>Fall short</i> Faintness or having no anger power</p> <p><i>Temperance</i> Anger comes timely and appropriate so that it does not go beyond divine rules and validation and instead monitors them.</p> <p><i>Extravagance</i> Anger takes over self and proprioum to the extent which one’s actions and activities are going further than divine regulations and rationale</p>

1.5 Theories of Anger

The aggression theories are explained below:

1. Psychoanalytic theory
2. Drive theory
3. Social learning theory

Naturally, confinements of space permit neither comprehensive presentations and investigation nor a framework of more than one concept from each theoretical point of view. Theories centered on experimental research, containing clinical research. The demonstration of the individual concept is organized subsequently (1) hypothetical main points, (2) description and study design, (3) restrictions and shortcomings, and (4) existing clinical management of fierce mentally ill patients. Early ideas of historical importance and/or relevance to current theories of violence. Existing theories of wrath are dissimilar from other theories (Bjørkly 2001).

Psychoanalytical Theory

According to the perception of psychoanalysis, it is significant to identify that current psychoanalysis is not an integrated theory. As the new idea has been expanded and modified, it has progressively established several distinguishing methods. A fundamental deviation occurs between organizational theorists, who are inclined to realize anger as an instinctive drive or innate, and self-psychologists, who view violence as secondary to narcissistic damage. For a more in-depth debate of the several psychoanalytic opinions, other literature is also referred to readers Pedder (1992) and Buss (1961). Sigmund Freud's theory of violence is briefly explained as an instinctive drive (Freud 1920).

Theory of Aggression

Freud firstly sought to originate all displays of human performance from one elementary life disposition, labeled as Eros. Considered a strength, this life nature was mentioned as a libido performed to increase, reproduce, and persist in life. In 1920, though, he suggested a dual-instinct idea: a death disposition coordinated the life intuition, labeled as Thanatos. Fragmentation of the individual and social life at a great was conceived as a force urged by instinct. The association between the life and death drive is opposed—construction of specific collaboration of the antagonistic forces done by destructive and nondestructive activity. Freud also demanded that emotions of wrath and hostility outcome in dispute and insensible fault in the same way that sexual desires fix and that these impacts initiate self-protective action.

Additionally, he perceived that many instincts contain both aggressive and sexual constituents. Several clinical expressions containing masochism, ambivalence, and sadism can be clarified concerning changing degrees of fight among these determinations or their combination. In Freud's opinion, in command to protect themselves from self-devastation, the death drive forces human beings to direct hostile performances against the physical and social environment. Sublimation and displacement were announced as fundamental dynamic means of transforming the likely violence on the person into an outer redistribution. Different behaviors result from inner dynamic processes such as creativity, coping, aggression, and self-destruction toward inanimate things and human beings. Conferring to the dual drive theory, increased violence, and harmfulness can be anticipated if the violent instincts are not collective with or sufficiently "bound" or merged with love. All traumas are like object damage, deprivation, or child exploitation that can impede affection and the normative combination of aggression and love. Destruction behaviors occur due to the accumulation of destructive energy resulting from such failure. Freud amused the view of tension or catharsis decrease in assembly with destructive drive. Catharsis denotes a method in which the nondestruction display, hostile affective, and aggressive feelings can release destructive drive and decrease the power of these feelings.

Definition and Study Design

Aggression is restricted as an intra-psychological occurrence. The death drive is its elementary foundation of energy, but this dynamism can also result in inspiration, self-injurious behavior, and managing behavior. The definition of violence is the extensive and diverse social behavior, and feelings such as passive-aggressive responses, mocking language, and murder are assumed to be languages of one uniting idea. The definition is the manner of intuitive nature and orientation. While psychoanalysis is manufactured based on the patient's description, investigation in other regions of psychology is different from psychoanalytic research. The traditional study strategy is the basis of therapeutic intervention and therapy measurable. Psychoanalysis is also the ideal process to identify the reasons for personal hostility. Freud was the first to accept the connection belief to the education of mental determinism. One of the leading goals in psychoanalytic management of violence is to aid the persistent gain of perception into the intrapsychological process behind the violent drive. A step from unconscious to conscious drive is elementary to this procedure. In line with this, the importance of the character of intrapsychic tools in violence is revealed in the broad psychoanalytical description of wrath.

Limitations and Shortcomings

Freud's death drive is possibly the most debated section of psychoanalytic theory. Some writers are adamant in their disapproval of Freud's involvement in the hypothetical acceptance of human violence. However, the elementary ideas of Freud's concepts are symbolic and do not produce testable suppositions (Tedeschi 1983).

Objections to Freud's theory of anger are:

1. Is it actually thinkable to realize anger, which is an extremely multifaceted occurrence, by ways of a single descriptive issue, the death instinct? (Okey 1992)
2. Freud's stand that violence is instinctive, delayed against observed solid indication of its responsive character (Brenner 1971).
3. Absence of verifiable certification of the biological backgrounds of violence as an energy.
4. Conferring to Freud, the never-stopping self-vicious instincts of the death imaginations have to be changed constantly into externally focused aggression and hostility to fight off the long-lasting danger of termination of life. Violence is thus predictable, and efforts to switch and exclude it can only be impermanent (Bandura 1973).
5. Lastly, Freud's thinking on catharsis has been interrogated: is the decrease of pressure a matter of seconds, minutes, days, or months? Does it occur rapidly or very gradually? And, how is it probable to manage catharsis as an undisputable process despite strong adverse investigation proof of this idea? (Zillmann 1979).

Relevance to Current Clinical Practice

The psychoanalytical ideal of anger has gone through significant deviations over time. Conferring to Akhtar (1995), there are two thrilling sites concerning the origins and nature of anger. Sigmund Freud represents one extreme, embracing the idea of passing away drive and that anger is a damaging outward rebound of this disposition. The other thrilling is signified by Suttie, Kohut, Guntrip, and Fairbairn, whose opinion is that violence is an interactional and responsive phenomenon that certainly does not have an instinctive foundation. Distant from some articles on the part of countertransference reactions to fierce patients (Dubin 1989) and (Lion and Pasternak 1973).

Rorschach has a number of researches that focus on the analytic aims of examining fierce mentally ill patients. This diagnostic method can deliver material about understood aims and fundamental personality magnitudes that the patient may be uninformed of or not want to disclose (Bornstein 2001). The youngster's manifestation of suffering typically provokes a cooperative reaction from the caregiver. A result of this is that the child will most probably grow and simplify a strategy of looking for immediacy to the caregiver when anxious. On the other hand, when the child's manifestation of distress outcomes in additional refusal or battle, the youngster's most adaptive policy is to regulate the distress by either endeavoring to prevent it or intensifying and overstressing it. Theory of attachment additionally undertakes that cognitive policies established initially in life will control how interior incentives are appeared to and understood, the nature of the expressive experiences activated, and the remembrances that are recovered in later life. There are several methods for evaluating full-grown attachment. Mary Main's Adult Attachment Interview (AAI) focused on the most challenging assessment, and its psychometric characteristics are well explained (Bakermans-Kranenburg and Van IJzendoorn 1993).

There are four classifications of attachment: avoidant, disorganized, secure, and ambivalent. An avoidant attachment pattern is a reason for aggression stemming. The term disordered denotes the apparent lack, or disappointment of, a steady policy for establishing reactions to the need for security and comfort when an individual is under stress. Unsystematic activities rise under attachment-relevant personal risk situations such as adolescent parenthood, maternal depression, maternal alcohol consumption, or multiproblem family status. The assistances of Paul G. Nestor and Peter Fonagy may demonstrate the developing quantity of clinically relevant publications on relation-focused psychodynamic views affecting violence and mental illness (Nestor 2002). Two of them belonged to the controlling function of control of impulse and affect guidelines, and two of them related to personality style, i.e., paranoid cognitive and narcissism. Nestor also showed experimental proof for, and references of, measurement approach with great psychometric assets. This kind of valuation may verify to be a highly appropriate involvement to develop the worth of milieu treatment methods (Fonagy 2003), defined a progressive consideration of anger in the psychologically ill. With the help of examining an individual's attachment pattern, he stressed that we could find out the understanding and treatment of

anger. Attachment facilitates the mastery of anger through the metallization process. Referring to Fonagy, metallization denotes our ability to apprehend others' subjective understandings.

Even though he debates early intrusion, the key point of generating strong affection relationships to boost metallization is highly appropriate to clinical rehearsal with mature psychiatric patients as well. In summation, the psychoanalytic indulgence of violence has moved from a psychiatrically and medically dominated approach, emphasizing the specific youngster and their pathology to contain social interactionist perceptions on the cause and management of anger. A social, interactionist method is serious to the outlook that anger is "compelled" or "pushed out" by internal energy such as aggressive energy and death instinct. This signifies a major alteration from an instinctually founded indulgent to an interactional accepting of the origins and nature of aggression. Operationally, this has occasioned an alteration from Freud's description investigation technique to quantitative dimension through structured meetings and surveillance of social communications. The present standing of Sigmund Freud's idea of violence in clinical training exterior the conventional analyst perspective seems to be of a remarkable environment.

Drive Theory

As explained beyond, Freud's theory of violence was severely criticized by contemporary psychologists and psychiatrists. Specifically, the idea of impulsiveness in violence, the internal build-up of destructive drive, has been discharged. Still, in the late 1930s, Yale researchers relabeled the destructive energy perception into "the drive concept" (Marcus-Newhall et al. 2000) in their construction of the frustration-aggression assumption.

Theory of Aggression

The inventive assumption first postulated that any intrusion with an individual's aim concentrating actions reasons' hindrance. In this assumption, not only those aspects that will define how irritated an individual will turn into was quantified, however also how and when violence will be articulated. One may surprise why this tactic to the thoughtful of violence was named a hypothesis. Clearly, it was more diverse and exposed to experimental challenging than Freud's innovative method. Thus the foundation of the thwarting-violence theory is that when people become upset (frustrating of goals), they reply violently. This is obviously emphasized by Dollard and his colleagues in their novel work.

The manifestation of destructive behavior always assumes the presence of frustration and, inversely, that the presence of always thwarting clues to some kind of violence (Dollard 1939).

The strength of the initiation to violence (e.g., the aggressive determination) varies according to three aspects:

1. The extent of thwarting
2. The degree of interfering with an aim-seeking response
3. The frequency of frustrated responses experienced by the human being (Bjökly 1999)

Aggressive reactions are reflected self-reinforcing within the model of hydraulic accepted by frustration–violence philosophers. Thus, the relationship between specific aggressive reactions and frustration is supported by reinforcement related with drive decline. Still, the presentation of the same activities again needs an original buildup of effort for stimulation. Dominant violent reactions may be faded through penalty. This kind of learned reserve consequences, in effect, in the letdown of a dominant reply in the pyramid of aggressive reactions. One probable significance of this is that the being will latterly reveal a different aggressive response. The violent drive has originated a new outlet by means of transposition. However (Dollard 1939), it did not suggest that violence always leads instantly or directly to violence. Learned reserves may block up the determination until some later provoking occasion occurs. Though the possible for a violence drive is demanded to be innate, provoking stimuli must also be existent to recruit its progress. Both social and biological features appear equally significant in the progress of violent behavior. Consequently, the frustration–violent theory suggests no clear importance of either environment or genetics in the cause of individual violent actions.

Definition and Study Design

Aggression is well-defined as the “arrangement of behavior, the aim-reaction to which is the damage of the individual toward whom it is engaged” (Dollard 1939). The association between thwarting and the build-up of violent drive or energy was assumed to be native. Aggressive energy obliges to strengthen accessible aggressive reactions. This is primarily a procedure-oriented and instinctive description, but the theory’s emphasis on frustration is also constant with activate-mechanism descriptions.

Different ways of examining aggression in research laboratory have been developed, and it is divided into four main classifications, involving:

1. Verbal attacks in contrast to others.
2. Assaults against nonliving matters.
3. “Safe” no harmful attacks against live fatalities.
4. Apparently destructive assaults against such persons. The low edge for performance to be restricted as violence in drive theory is possibly affected by two aspects:

- (a) The legacy of the psychoanalytic instituting of drive idea.
- (b) Ethical confinements affecting to the study of social violence within the laboratory setting.

Limitations and Shortcomings

The toughest possessions of the frustration–violence suggestion were the stipulations of those causes that control how discouraged an individual may turn into and how and when violence will be articulated. The emphasis on these causal variables gave investigators the chance to test definite locations of the theory empirically, subsequent to an exhaustive scientific inspection of the building blocks of the suggestion. As a critical, numerous precise guesses that were prepared from this theory were authenticated (Bandura 1973). Specifically, the construction that frustration was an essential precipitant of violence was interrogated by many researchers (Buss 1963). Bandura disapproved of the driving idea because the center factors were incidental to the actions they instigated. He identified this by relating the term pseudo descriptions on this procedure of circularity and explained his situation by declaring that:

It must be highlighted here that it is not the presence of encouraging actions being interrogated, but relatively whether such actions are described by assigning it to the activities of inner forces or drives (Bandura, 1973, p. 40).

In addition, without a liberated capability to measure and observe the accumulation, occurrence, and discharge of violent energy, it is not conceivable to classify reactions as violence (Tedeschi 1983). The statement that an individual is automated so that thwarting always creates an initiation to aggress and that this remains until aggressive actions clear two outlines of proof have challenged it. First of all, efforts to offer experimental support have failed to do so. More essentially, biologists have concluded that an individual is simply not skilful of keeping drive or of cumulating drive over time.

In a halfway fact on the range of critics, Leonard Berkowitz (Berkowitz 1993) arose as an agent of both care for and disapproval of the original design. Reformulation of the assumption by giving amplified stress to the influence of social situations and social decisions. By this he more or less cast off the inventive linear provocation-drive conceptualization. Instead, the appeal of the actual aim, the character of related opinions, and situational indications significantly impact the power of the instigation to violence. For example, the reader is mentioned (Tedeschi 1983) for a critical analysis of Berkowitz's theory of anger. In the end, the thwarting–violence theory was appropriately precise to allow for investigational disconfirmations and upkeep for that idea. Thus, as is the situation with all technical ideas, it formed proof of its own boundaries.

Relevance to Current Clinical Practice

It is widely known as drive theory of violence features such as response to an events of specific environment situations, i.e., provoking actions, and not only to distinctive inclinations toward fierceness, is it rather more hopeful with reverence to control, prevention, and management than Freud's nature theory. It appears to imply that removing all exterior sources of anger from the set would go a long way toward reducing human violence. Yet, inappropriately, frustration is possibly such a recurrent and commonplace existence for most people that is completely eliminating it seems impossible.

The effect of thwarting as a predecessor to intra-institutional violent behavior in mentally ill patients evidently explained this point. The number of clinical examinations on the precise character of patient-staff connections that may surge the threat of violence in mental wards is rapidly increasing (Nijman et al. 1997). A strong connection between difficulties of communication in patient-staff dealings and the amplified threat of fierceness is mentioned in numerous studies (Owen et al. 1998). Shah et al. (1991) debated that authoritarian team behavior and absence of communication between patients and staff may provoke violence. Earlier studies have extended similar assumptions (Katz and Kirkland 1990).

Conversely, the limit of setting is an incorporated part of an organized management method that has been revealed to be superior to an unorganized method in managing possibly fierce, mentally-ill patients (Aquilina 1991). It is claimed here that struggles to improve nurses' ability to find out intensifying circumstances, together with actions taken to improve the staff communication quality in limit-setting relations, may decrease both rates of fierceness and the number of limit-setting periods. Experimental proof of the effectiveness of staff training programs is gradually increasing. For example, the therapeutic management protocol reported 64% reduction in restrains and seclusion in three wards (Kalogjera et al. 1989). Their protocol gives brief recommendations about how their staff members' disturbing behavior should treat to patients at an early stage. A study by Nijman and his colleagues (1997) is one of the first studies of team teaching programs that contain control circumstances. There was a significant decrease in frequencies of the anger behavior of control ward (about 40%) experimental (about 60%) that is why study failed to find the association between anger and staff training. Nijman and his colleagues determine that consistent recording by the staff of destructive periods may decrease violence rates.

Very few measures and procedures established to measure ferocity in mentally ill patients give importance to situational causes in their structures. Mentioning discoveries from studies within the drive concept of tradition, it is appealed here that prevention and operative treatment of anger in mentally ill zones may benefit from more precise nursing of provoking situational precipitants of anger (Bjølky 1999).

Social Learning Theory

At the center of the twentieth century, the most fundamental scientific method of psychology was learning theory. Arnold Buss and Albert Bandura directed the application and expansion of these concepts to destructive behavior. Compared to the drive opinions of violence, which propose that wrath stems from one or a limited number of critical causes, the social learning structure grasps that it may really be stimulated and well-known by various circumstances. Social and personality factors are the variables that impact the aggressive actions represented by Buss's theory. Still, the persuasive learning theory of violence is Bandura's theory and an ordinary first choice for demonstration here.

Theory of Aggression

Conferring to Bandura (1973), a broad investigation of violent behavior needs careful consideration of three concerns: (1) origins of aggression, (2) instigators of aggression, and (3) regulators of aggression. We need the same kind of investigation for aggressive behavior needed for any kind of manners. A wide range of reinforcement appears to show a role (1) acquirement of object encouragement, (2) increased status or social endorsement, (3) the lessening of aversion treatment, and (4) suffering and pain on the part of the target. Four interrelated are involved of learning, according to Bandura. Firstly, one must observe or consider the behavior, indications, and consequences of the demonstrated event. Then the interpretations must be programmed into some form of memory demonstration. Third, these intellectual processes are changed into new copied response configurations. Finally, appropriate incentives are given, and the modeled actions will be implemented. The model's attributes are essential in this procedure:

Reward for the performance of the model is given to people who own certain technical and social capabilities, who are intellectual, understanding social influence, and who, by their ability, conquer high positions in various grading status (Bandura 1978).

Bandura states that principal sources of aggressive models are individual subcultures, family members, and mass media. Social learning theory differentiates between two broad categories of instigators of behavior. Cognitive illustration of future results supports individuals creating current promoters of anger and forming the other central group of promoters. Both categories of instigators are thoroughly related to demonstrating violent behavior. Aggressive behavior can initiate in four ways ("instigators of aggression"):

A directive purpose of modeling is to tell the observer to inform the individual about the underlying means-ends associations in the condition. By removing a general opinion from noticing the representation's experience, individuals can simplify a causative consideration that, under the same circumstances, they will accept the same result as the ideal if they copy them.

A disinhibitory function demonstrates to the individual that they can escape with aggressive behavior without being punished. Emotional encouragement in the observer occurs by noticing others involved in aggressive behavior—the probability of an increase in Imitative aggression and even an increase in the intensity of violent reactions. Lastly, observations may have stimulus-increasing effects by pointing to the individual's responsiveness to aggressive expressions and approaches. In addition, Bandura states that information also assists as instigators of aggression behavior, and bizarre internal opinions, e.g., delusions, can trigger the aggression.

Various factors activate to confirm that it will be sustained after developing the aggression (“regulators of aggression”). Not unexpectedly, some of them are similar to the causes that assist their preliminary acquisition. (1) It also has the probability of alleviating abusive or aversive dealing from others. (2) Effective violence against others often endures delivering aggressors with social and tangible rewards. (3) There is another regulator of aggression: self-bolstering by self-directing praise and endorsement for the end of aggressive behavior. Conversely, it is a value noting that in social learning theory, self-organization is not a mental agent that commands destructive activities. Somewhat, it denotes to mental structures that arrange for the referential ideals against which others and aggressive activities are being judged.

Definition and Study Design

As Bandura defined aggression as:

Behavior that occurs due to physical destruction and personal injury. The hurt could be physical, or mental hurt through criticism and offensive exercise of forced power (Bandura 1978).

In social learning example, the most frequently used study method is assaulted by individuals against deceased objects. Typically, members are first initiated to violence through disclosure to the activities of an aggressive model and then given a chance to punch, buzz, or otherwise assault some deceased object. Violence is then measured in relation to the occurrence with which they through such activities alongside the object. “Bobo doll” is the first study conducted by Bandura and his colleagues; it is considered as best-known presentation (Bandura et al. 1963). These processes have been complained for only imposing injury upon a blowup doll and not on another living organism, as is openly comprised in Bandura's description of violence. Bandura has replied to this disapproval by considering the dissimilarity among the performance and learning of aggressive reactions. Still, one may query how much degree Bandura's robust stress on the subjective decision of causality and intentions in the anger definition is prejudiced by the favored study design, and inversely.

Limitations and Shortcomings

Bandura's learning theory has been censured for not being a particular aggression concept (Pepitone 1974). This agrees well with Bandura's learning concept position representing that uniform though different, e.g., violent, and productive, e.g., pro-social, activities are topographically dissimilar. They are maintained and established by the same elementary learning ideas. Tedeschi and Felson (1994) have concentrated on central limitations in Bandura's model of violence. Firstly, they interrogate the proof for the role of self-regulation as hands-on to destructive behavior. Their focal fact is that the advance of self-regulatory procedures do not keep all violent behavior under self-discipline:

Intellectual reinterpretations can take the form of explanatory the violent manners, by ignoring, misconstruing, or minimizing, the outcomes, or by blaming or dehumanizing the object. Such explanation disinhibits activities that otherwise would be measured unacceptable and would be reserved by expectations of self-sentence (Tedeschi and Felson 1994).

Next, they declare that the social learning idea overlooks the social setting within which actions are performed or learned. More precisely, this narrates to the test center design restrictions that have influenced social learning idea education on hostility. The external validity or generalizability of laboratory results is interrogated by declaring that, despite the name, the emphasis of social learning is on the human being, and the idea is inclined to underrate the communal behavior of individuals involved in social relations. Others have noted at substantial vagueness relating to the different processes suggested explaining the empirically revealed displaying influence in violent behavior (Zillmann 1979). Any kind of model learning has a basic element: exposure to the model. Bandura has explained important influential causes of this experience (regulators of aggression, origins, and instigators).

Whatsoever its shortcomings, the most refined theory of violence according to learning viewpoint is Bandura's theory. Today, few psychologists' inquiry the significance of modeling in reading human activities or the opinion that expectations of upcoming results guide human activities.

Relevance to Current Clinical Practice

Even though formerly not intended to be a typical scientific significance, ideologies from social learning ideas can be outlined in existing clinical thinking. Cognitive behavior therapy (CBT) shares elementary behavior investigative ideas and descriptive processes with social learning theory. In adding to an agreement on how outside results control behavior, the significant point of contact is the consideration of self-regulatory mechanism components. Conferring to Bandura, individuals can exercise some effect over their own behavior through self-produced consequences and self-generated inducements. In this self-monitoring procedure, people accept through instruction and exhibiting certain principles of manners and reply to their individual activities in self-punishing or self-rewarding ways. In theory of social

learning, self-coordination denotes intellectual structures that run the referential principles alongside which behavior is adjudicated. Nine basic types of CBT intervention approaches are described by Howells and his collaborators (Howells et al. 1997).

Six of them reveal basic components from Bandura's social learning theory of violence: modifying and recognizing the immediate stimulating events, modifying and identifying appropriate stressors, altering cognitive implications and dysfunctional schemata, declining dysfunctional implications and schemes by drawing their progressive roots, extending the collection of coping reactions, and avoidance of intensifying social behavior. These interferences all narrate to one or more of Bandura's three central constituents of social learning investigation of violence: instigators, origins, and controllers of aggression.

Dialectical behavior therapy (DBT) is a widespread cerebral behavioral management originally established for persistently par suicidal women detected with Marginal personality illness (Linehan, 1993). Over the past era, it has been modified for many additional people, comprising aggressive psychiatric patients (Berzins and Trestman 2004). A vital constituent of DBT includes pointing the following four behavioral abilities components: (1) distress tolerance skills and (1) mindfulness skills, (2) emotion directive skills, (3) mindfulness skills, and (4) relational efficiency skills. Mindfulness objects to misunderstanding by stressing self-awareness and absence of self-regulation. Distress patience includes self-soothing and distraction and techniques. Regulation of emotions demonstrates individuals how to decrease their susceptibility to negative feelings and intensify positive feelings. Finally, assertiveness and how to cope with fight situations are taught by interpersonal effectiveness.

There is an unusual similarity between these Bandura's constituent processes and skill modules in the self-instruction of behavior (1) judgmental process, referential shows, evaluation of the action, personal standards, and personal designation (2) self-observation and (3) self-discipline (self-applied consequences, self-evaluative responses, tangible and no self-response). Experimental intervention and assessment centered on individual cautioning marks fit well into Bandura's constituent procedures in the self-regulation of behavior. Some become physically stressed, some show psychotic symptoms, some patients separate themselves, others become overexcited, and others glower, etc., as signs of increased ferocity risk. Awareness and recognition of these cautionary marks may aid both patients and their atmosphere executes hostile preventive actions. In both *DBT* and *CBT*, acknowledging persistent cautionary signs as specific individual precursors of ferocity is stressed to have an essential role in fruitful treatment and decline prevention.

Although the effect of ideologies from learning theory, to my information, is not opinionated in either the DBT or the CBT tradition, it seems to be present in the basic values shown above. No matter what came first in social learning theory and CBT, the clinical significance of Bandura's idea of aggression seems to be well revealed.

Multiple Questions

1. According to the dual drive-theory, if the aggressive impulses are not combined with or adequately “bound” or fused with love, then _____aggression and destructiveness can be expected.
 - (a) **Increase**
 - (b) Decrease
 - (c) Constant
 - (d) None of above

2. _____is a process in which the affective, nondestructive display or hostile and aggressive inclinations can discharge destructive energy and thereby reduce the strength of these inclinations.
 - (a) Tension
 - (b) Wrath
 - (c) Affection
 - (d) **Catharsis**

3. _____ is an intrapsychological phenomena.
 - (a) Catharsis
 - (b) **Aggression**
 - (c) Tension
 - (d) Both a and b

4. How many theories of anger ar explained in this chapter?
 - (a) 2
 - (b) **3**
 - (c) 4
 - (d) 5

5. Which is the most influential learning theory of aggression?
 - (a) **Drive theory**
 - (b) Bandura’s theory
 - (c) Sigmund’s Theory
 - (d) Both a and b

6. How many steps are involved of learning by observation according to Bandura?
 - (a) 2
 - (b) 3
 - (c) **4**
 - (d) 5

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Chapter 2

Psychology of Emotions



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2.1 Introduction

“An essential part of virtue”, said Aristotle, “Irrational impulses which come from incorrect appraisals of what is ‘good’ or ‘bad’”, according to the Stoic theories, “a neuronal impulse” or “a behavioural output of affective processing”, according to newer proposed definitions. In 1981, Paul R. Kleinginna et al. listed 92 definitions and 9 sceptical statements to reach a unified conceptual definition (Kleinginna and Kleinginna 1981). To this day, there is no scientific consensus on a definition of emotion; hence, it is a challenging concept that has been difficult for psychologists to decipher and define in an agreed-upon way. Why is it that difficult to define such an integral part of human existence? Is it a matter of perception? Is it because some words are immanent to the human mind? Emotion has proven to be rather challenging to measure and define accurately. A vast amount of research in emotional psychology focuses on basic emotions, the psychological and behavioural responses, and the role of emotional intelligence.

Etymologically, the word emotion, first used in 1570, derives from French *émotion* meaning “a (social) moving, stirring, agitation”, from Old French *emouvoir*, to

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“stir up” and from Latin *emovere* meaning “move out, remove, agitate”. It was first recorded as a sense of “strong feeling” in the 1650s and extended to any feeling by 1808.

To provide a basis before analysing and diving deeper into emotions, we will use the definition of the American Psychological Association (APA). Emotion, according to the APA, is defined as “a complex reaction pattern, involving experiential, behavioural, and physiological elements, by which individual attempts to deal with a personally significant matter or event”.

Emotional psychology categorises emotions on a primary level as basic and complex. Basic emotions occur automatically and are linked to facial expressions. In the theory of evolution, Darwin visualised emotions under the prism of facial expressions. He proposed that the facial expressions initiated by emotions are ubiquitous and omnipresent, inferring emotions and their expressive component were innate and adaptive. Basic emotions are unmixed and innate. On the other hand, complex emotions are often defined as “an emotion that is an aggregate of two or more others”; in addition, they have different appearances and might not be as easily recognisable.

Basic Emotion Theory

Earliest references in the concept of basic emotions can be traced in the Book of Rites (禮記) (first century BC) where they are stated as the “seven feelings (七情) of men”, namely, anger (怒), sorrow (哀), fear (懼), joy (喜), love (愛), desire (欲), and hate (惡).

The basic emotion theory sets forth the idea that out of all emotions, human experience and express, a significant handful can be regarded as biologically and psychologically “basic” (Wilson-Mendenhall et al. 2013), each manifested in an organised recurring pattern of associated behavioural components (Ekman 1992). It is theorised that basic emotions are preserved due to the crucial and essential role their biological and social functions play in evolution and adaptation. Moreover, it is proposed that basic emotions have innate neural substrates and universal behavioural phenotypes (Izard 2007).

Based on the notion that basic emotions are unmixed, innate, and recognisable by facial expression, hence being the building block for complex emotion, one would assume that identification and a common consensus would be an easy task. Unfortunately, it seems a rather subjective matter and a literature review on basic emotions can yield heterogeneous results, according to the eligibility criteria for inclusion. In our search we emphasised on basic emotions theories that included anger, we have also included rage, since according to the wheel of emotion that we will further discuss in detail rage is described as the high-intensity form of anger.

Basic emotions	
R. Plutchik	Anger, joy, trust, fear, surprise, sadness, disgust, anticipation
M. Arnold	Anger, aversion, courage, dejection, desire, despair, fear, hate, hope, love, sadness
P. Ekman	Anger, disgust, fear, joy, sadness, surprise
C. Izard	Anger, interest, joy, surprise, sadness, disgust, contempt, fear, shame, guilt
W. McDougall	Anger, fear, disgust, wonder, subjection, elation, tenderness
K. Oatley and P. Johnson-Laird	Anger, disgust, anxiety, happiness, sadness
S. Tomkins	Anger, interest, contempt, disgust, distress, fear, enjoyment, shame, surprise
C. Darwin	Anger, fear, surprise, disgust, happiness, sadness
J. Gray	Rage and terror, anxiety, joy
W. James	Rage, fear, grief, love
J. Panksepp	Rage, seeking, fear, lust, care, panic, play
J. Watson	Rage, fear, love

Wheel of Emotions

Robert Plutchik proposed eight bipolar primary emotions categorised on a basis of positive emotion opposing a negative. This basis depicts that each primary emotion has a polar opposite: (a) joy opposite to sadness, (b) anger opposite to fear, (c) trust opposite to disgust, and (d) surprise opposite to anticipation. This notion provided the foundation of the wheel of emotions. In the wheel, we can trace the primary emotions in the second circle. Each emotion runs in a spectrum of intensity that is demonstrated by the flower petal pattern. The concentric circles depict each level of intensity (colour gradient), with the intensity of emotion decreasing in the outer circles and increasing as approaches the centre (Fig. 2.1).

Fig. 2.1 Drawing representation of the wheel of emotions



Low-Intensity	Basic Emotions	High-Intensity
Interest	Anticipation	Vigilance
Serenity	Joy	Ecstasy
Acceptance	Trust	Admiration
Apprehension	Fear	Terror
Distraction	Surprise	Amazement
Pensiveness	Sadness	Grief
Boredom	Disgust	Loathing
Annoyance	Anger	Rage

Overlapping of the basic emotions can yield combinatory complex emotions. In a similar manner with the way primary colour combine, primary emotions could combine to form the spectrum of human emotional experience. To complete and expand the circle, Plutchik further theorised those primary emotions can be combined in pairs of 2 (dyads) and further yield combinatory 24 emotions as primary (1 petal apart), secondary (2 petals apart), and tertiary dyads (3 petals apart), as it is demonstrated in the following table.

	Anticipation	Joy	Trust	Fear	Surprise	Sadness	Disgust	Anger
Anticipation	x	Optimism	Hope	Anxiety	Opposites	Pessimism	Cynicism	Aggressiveness
Joy	Optimism	x	Love	Guilt	Delight	Opposites	Morbidness	Pride
Trust	Hope	Love	x	Submission	Curiosity	Sentimentality	Opposites	Dominance
Fear	Anxiety	Guilt	Submission	x	Awe	Despair	Shame	Opposites
Surprise	Opposites	Delight	Curiosity	Awe	x	Disapproval	Unbelief	Outrage
Sadness	Pessimism	Opposites	Sentimentality	Despair	Disapproval	x	Remorse	Envy
Disgust	Cynicism	Morbidness	Opposites	Shame	Unbelief	Remorse	x	Contempt
Anger	Aggressiveness	Pride	Dominance	Opposites	Outrage	Envy	Contempt	x

A further expansion has been proposed by Plutchik, emotions formed from three primary emotions (triads). Therefore, it leads to a combination of 24 dyads and 32 triads, making 56 emotions at 1 intensity level.

Dimensional Theories

Dimensional theories of emotion provide a suitable framework, from a structural perspective, for presenting the emotion, in a way that establishes the possibility of differentiation based on dimensional parameters. Dimensional studies conceptualise the notion that a common and interconnected neurophysiological system is accountable for the affective states. This dimensional structure of emotion contributes to the development of computational models of emotions (CMEs) (Rodriguez and Ramos 2014), which has always been a great challenge.

Two-dimensional models visualise emotions in terms of two factors: (a) valence and (b) arousal. Valence refers to the intrinsic experience of an emotion; therefore, the degree of positive or negative feeling and arousal refers to the level of activation occurring in the nervous system. It is important to note that both parameters are viewed as levels; thus, they create a “two-dimensional map” of emotions, and they both describe a subjective experience. As a side note, anger, according to the two-dimensional model, is categorised as low valence and high arousal emotion. It is theorised that high energy negative emotion is necessary to be channelled constructively through action; hence, its susceptibility to accumulate over time can later be externalised in an out-of-proportion destructive way.

Utilising the two-dimensional model, James Russell developed the circumplex model (Russell and Feldman-Barrett 1999) suggesting the use of valence/arousal, to describe diverse affective phenomena, like emotions, mood, and feelings. According to the circumplex model, emotions can be traced in a two-dimensional circular space divided by the horizontal axis of valence and the vertical of arousal. The point of intersection of the axes and centre of the circle mark the neutral valence and medium arousal. To represent and further explain these two dimensions, he proposed the notion of core affect and together with Lisa Feldman Barrett described a modified circumplex model as representative of core affect (Russell 2003). Core affect is regarded the essence of all effective experiences. The feelings that are generated by the evaluation of the interaction between the individual and the environment are continuously represented by a consciously accessible neurophysiological state, which is defined as the core affect.

Furthermore, the dimensional model includes other aspects related to the core affect like (1) affect regulation, (2) affective quality, and (3) attributed affect. In addition, the emotions are considered as separated emotional episodes, which are the outcome of causative events, like the antecedent event, attributions, core affect, expressive and psychological changes, and subjective conscious experiences and emotion regulation. These emotional episodes present a great variety along certain dimensions, such as intensity, pleasantness, or activation. For example, different

cases of one being angry present a different amount of (dis)pleasure and activation. Rather, each specific case involves a specific degree of pleasure and activation.

Based on the above, Russell and Mehrabian (1980) proposed a framework with three dimensions, pleasantness/arousal/dominance, which is also known as the PAD model. In the PAD model, a series of emotions are identified in a three-dimensional space constructed by the mentioned dimensions. Likewise, Mehrabian occupies the PAD model to represent additional scales of temperament, which are particularly useful to define and describe personality types (Fig. 2.2).

Geneva Emotion Wheel

The expression of emotion lies in three fundamental components, the subjective component, the physiological component, and the expressive component. In terms of measurement, the most challenging component is the subjective component, which can be assessed only with self-report measures, with one of them being the Geneva Emotion Wheel (GEW) (Fig. 2.3) (Shuman et al. 2015).

The GEW consists of a circle, where emotions families are systematically aligned in a wheel, and two-axis or two dimensions, valence (negative to positive), and control (low to high) separating the emotion wheel into four quadrants: negative/low control, negative/high control, positive/low control, and positive/high control. The given response options are spikes on the wheel that refer to different intensities of

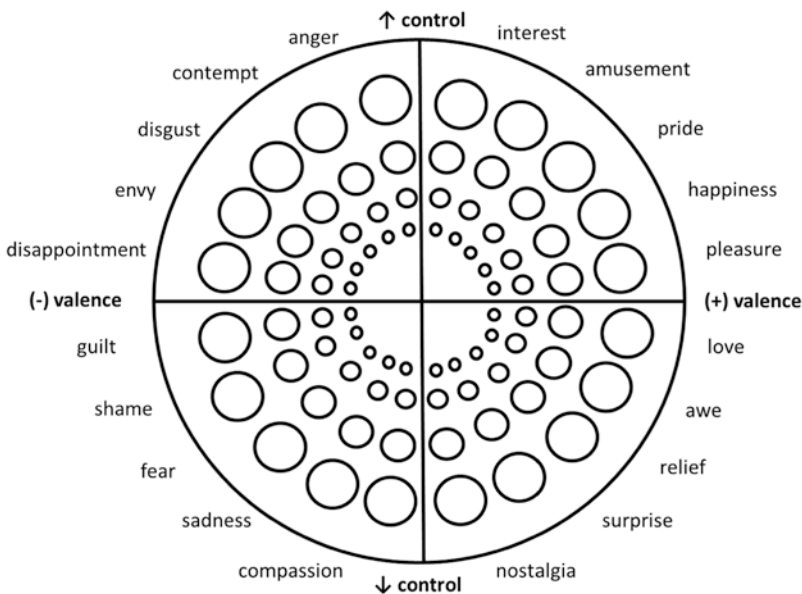


Fig. 2.2 Schematic representation of the Geneva emotion wheel



Fig. 2.3 Common-sense theory

the emotional response from low-intensity (towards the centre of the wheel) to high-intensity (towards the periphery). Also, “no emotion” and “other emotions” response options are offered in the centre of the wheel.

Free-Response Format

The alternative option “other emotion” offers the respondents freedom to express themselves, in order to emphasise that there may be differences in how and how well respondents can express themselves using their own words. Consequently, a pure free-response format could be disadvantageous, resulting in a variety of measurements across individuals and situations and reducing the measurement reliability. Another difficulty in processing the results is that emotions must be first categorised before conclusions can be drawn. The option “other emotion” overcomes partially this problem, providing an option besides a particular discrete emotion.

Discrete Emotion Response Format

Respondents report their own emotions concerning a limited number of discrete emotions on a scale that corresponds to the intensity of emotions. The format corresponds to the natural way of talking about emotions, so it can be used easier by the respondents. Also, the results are readily interpreted and in contrast with other discrete emotion measures, the emotions in GEW are aligned visually based on the two dimensions. All of the above reflects the discrete emotion response format, mostly at the periphery of the wheel.

Dimensional Approach

The dimensional approach reflects on the two dimensions that underlie the arrangement of the terms on the periphery. The two dimensions are abstract, and do not correspond to the way that one naturally talks about emotions. On the one hand, it

can make the response format more difficult to use, but on the other hand, this is convenient for the respondents because in the format answers are indicated only in two dimensions, instead of multiplying discrete emotions terms. The advantage occurs due to the combination of a discrete with a dimensional approach in the GEW is significant because the discrete emotion terms correspond to the natural way of expressing emotions and increasing the measurement's specificity, while the usability increases by the underlying dimensional structure that enables to locate the emotions.

2.2 Process of Emotion

Human experiences are defined through the interaction with others. Beyond verbal communication, communicating through emotions is a fast and efficient means to coordinate social policy by conveying information about the internal states of other people. Humans uniquely show emotional expressions with facial and vocal expression and visual communication. Other means can be utilised such as music and art. In addition, people that can understand these emotional expressions, and those who can do it more effectively have an advantage in their social and professional lives.

The emotion process is responsible for the emotional experience that sets expression and perception into motion. There is a concept of “emotional contagion”, whereby people “catch” each other's emotions in a complex interaction between expression and perception (Jang and Elfenbein 2015). As a step before diving into the sequelae of emotion, it is important to understand the three critical components of emotion, which can influence the function and purpose of an emotional response.

- *Subjective component*: The individual subjective assessment of feelings to the emotions each person experiences (feelings).
- *Physiological component*: The reaction of a person's body to the emotion experienced (response).
- *Expressive component*: Describes a person's reaction to an emotion that he/she experiences (behaviour).

Subjective Experiences

The starting point of any emotion is the subjective experience, also called a stimulus. It is argued that the essence of emotion is subjective emotional experience or feeling and that objective manifestations in behaviour and body or brain physiology are indirect indicators of these inner experiences. Everyone expresses basic emotions, regardless of culture or upbringing, however, the experience(s) that produce them is highly subjective.

Subjective experiences can be found in a spectrum and range from simple (seeing a colour) to serious (loss of a loved one). Regardless of how intense the experience is, it can elicit a wide range of emotions, and the emotions each person feels may differ. For example, one person may be filled with rage and regret over the death of a loved one, whereas another may be overcome with grief. The reporting of emotions or oneself is needed for scientific assessments of inner experiences.

People can typically provide either a verbal or nonverbal report of information to which they have introspective access, but not a verbal report of information that is only processed nonconsciously. Fractures between conscious and nonconscious processes caused by differences in verbal and nonverbal responses have thus played an important role in human studies of introspective awareness.

While other methods of reporting that do not require verbal reporting have been proposed, they too rely on introspection. In studies of consciousness, verbal self-report remains the gold standard. Verbal self-reporting is best suited to assessing the content of immediate experiences rather than remembered experiences, and it is less useful for assessing the motivations underlying actions because these are not always consciously available and verbalisable. Because nonverbal reporting is the only option in nonverbal (non-human) organisms, it is difficult to determine whether other animals have conscious, subjective experiences.

Physiological Reactions

The most evident indications of emotional arousal are peripheral reaction caused by autonomic nervous system activity. Thus, variations in heart rate, cutaneous blood flow (blushing or turning pale), piloerection, sweating, and gastrointestinal motility can all occur in response to different emotions. Alterations in the activity of the sympathetic, parasympathetic, and enteric components of the visceral motor system, which control smooth muscle, cardiac muscle, and glands throughout the body, cause these responses.

According to Walter Cannon, the intensified activity sympathetic division of the visceral motor system prepares the animal to fully utilise metabolic and other resources in difficult or threatening situations. The activity of the parasympathetic (and enteric) divisions promotes the accumulation of metabolic reserves. Cannon went on to say that the natural opposition of resource expenditure and storage is mirrored in a parallel opposition of the emotions associated with these various physiological states.

For a long time, stimulation of the visceral motor system, specifically the sympathetic division, was thought to be an all-or-nothing process. It was argued that once effective stimuli engaged the system, a ubiquitous discharge of all its components took place. Recent research shows that the autonomic nervous system's responses are quite specific, with different patterns of activation characterising different situations and their associated emotional states. Emotion-specific expressions can elicit distinct patterns of autonomic activity. For instance, if the subjects were instructed to each muscle that leads to recognisable facial expressions like anger, disgust, fear,

happiness, sadness, or surprise, without knowing they were simulating feelings, regardless of the emotion, each pattern of facial muscle activity is accompanied by specific and reproducible differences in visceral motor activity. Furthermore, autonomic responses are strongest when facial expressions are judged to be the most similar to actual emotional expressions, and they are frequently accompanied by the subjective experience of that emotion.

One interpretation of these findings reveals that when people generate voluntary facial expressions, signals in the brain are engaged not only with the motor cortex but also with some of the circuits that produce emotional states. Potentially this association explains how good actors can be so convincing. Even so, humans are quite adept at distinguishing between a staged facial expression and the spontaneous smile that comes with a pleasant emotional state.

Behavioural Reactions

The prerequisite to expressing an emotion is a combination of experiences with emotions and conscious attempts to manipulate expressions to achieve clearly defined objectives.

Evidence shows that emotions are manifested in a process set in order, despite intuition claiming otherwise (Smith and Lazarus 1990). The most common scientific definition of emotion is that it is a psychological and physiological reaction to stimulating events that people observe in everyday life (Jang and Elfenbein 2015).

Humans are able to express a wide spectrum of emotions, having specialised neural and muscular structures that give a range of expressions—something not common with other species (LeDoux 2012). Initially, emotional expressions are adaptive in preparing the physiological systems to react to stimuli that have survival implications, like a fear response that heightens the sensitivity of sensory organs (Susskind et al. 2008). These simple reflexes produce signals that convey valuable information to others and gradually become used deliberately and evolved to voice social and abstract concepts (Shariff and Tracy 2011).

Emotional expression takes on many forms. First, prompting factors create externally visible cues. Long-standing theories state that emotions are composed of subjective feeling states and physiological responses. Physiological markers of emotional experience include facial expressions, nonverbal intonations of vocal expressions, skin response, respiratory rates, heart rates, body posture, and muscle movement (DePaulo and Friedman 1998; Ekman et al. 2005). Any of those changes can provide observable cues to others, whether they were meant or not for an audience. Second, emotions are expressed with facial expressions, vocal tone, and body posture. Facial expressions are the prominent mode of expression for humans. It may be due to this reason that most of the research about emotional expression is focused on the face. However, humans can control their expression of emotions with the use of vocal cords and bodily poses, which makes emotional expressions multi-modal (Jang and Elfenbein 2015).

In analysing channels of communication of emotion, Ekman and Friesen suggested that the more controllable channels like the face are subject to high accountability from the expresser, generate responses from others., and supply the expresser with internal information (Ekman and Friesen 1969). This is opposite to the less controllable or “leaky” channels like the body and voice. As it stands, facial expressions generally express the data that we choose to show (DePaulo 1992). On the other hand, information is expressed through less controllable channels like body movements and therefore the voice provides a truer view of a person’s feelings. This information can still be controlled, albeit being tougher and needing more conscious and deliberate effort (Jang and Elfenbein 2015).

In a dramatic representation of leaky communication, expressions of contempt are found to predict the deterioration of marriages over years (Gottman 1998). Mehrabian and Ferris state that around 93% of data about expressing feelings are relayed nonverbally versus where the verbal channel is the only medium of communication (Mehrabian and Ferris 1967).

2.3 Theories of Emotions

“You are not a passive receiver of sensory inputs... but an active constructor of your emotions.” Lisa Feldman Barrett states in her book “How emotions are made: The secret life of the brain”.

“How are emotions made?”, “Can we trace emotions?”, “How are emotions constructed?”. The notion of emotion has raised many questions and puzzles researchers to this day. A plethora of theories and hypothesis have been formulated in an attempt to elucidate emotions. In this section, we will focus on the major hypothesis concerning the generation of emotions. The major theories of emotion can be grouped into three main categories:

- *Physiological (somatic) theories* suggest that responses within the body are responsible for emotions.
- *Cognitive theories* argue that thoughts and other mental activities play an essential role in forming emotions.
- *Neurological theories* propose that activity within the brain leads to emotional responses.

From Stimulus to Response

Common-Sense Theory

Common sense focuses on the notion that emotion is the catalyst of bodily response. The vast majority of emotions are often accompanied by peripheral effects in the body. These include alterations in heart rate, blood pressure, diversion of blood

from one set of tissues to another, activation of certain glands, the tension in particular muscles, and facial expression of the emotion. These responses are regulated by the autonomic nervous system and are adaptive due to their communication function or role in assisting the body in preparing for potential action. Consequently, with this logical inference, the stimulus leads to a conscious feeling and a physiological response that generates emotion.

James-Lange Theory

Opposing common sense, the James Lange theory of emotion states that emotion is equivalent to the range of physiological arousal caused by external events, proposing that bodily reactions precede emotions and cause them. William James (1884) in his textbook *The Principles of Psychology* and Carl Lange (1887) independently proposed their theories of emotion and were later combined into what is presently known as the James-Lange theory of emotion. Emotions are the outcome of physiological responses to external stimuli. James' research was focused on emotion as a result of a physiological change, while Lange had a rather specific approach, an emphasis on emotion as a depiction of cardiovascular events. The two scientists suggested that to feel emotion, a person must first experience bodily responses and once this physiological response is recognised, then the person feels the emotion. James' evidence for his theory of emotion is derived from introspection rather than experiments. The core of James's theory is that the bodily reaction to an emotion-provoking stimulus is automatic and occurs without conscious thought or feeling. The evaluation of the emotional condition occurs at a later time and depends on the perception of the physiological state.

A considerable amount of evidence in modern research supports this theory. People describe their emotions in terms of physiological changes and the types of changes they identify with each emotion are remarkably uniform (Cacioppo et al. 1992). Researchers discovered that those who are particularly adept at detecting alterations in their internal state are more likely to notice and report emotional states in themselves (Critchley et al. 2004). Furthermore, data from brain imaging studies depict that a certain portion of the somatosensory area of the cerebral cortex, which activates when a person is sensing their bodily state, becomes active when a person is consciously assessing their emotional state (Critchley et al. 2004; Damasio 2001) (Fig. 2.4).



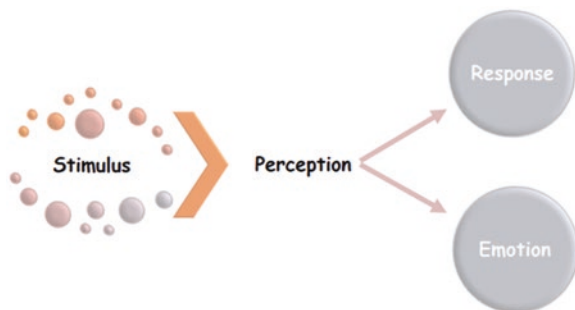
Fig. 2.4 James-Lange theory

Cannon-Bard Theory

Although physiological responses have a crucial role in emotions, they cannot solely explain subjective emotional experiences. Walter Cannon opposed the James-Lange theory in various fields. Primarily, he proposed that people can experience physiological responses associated with emotions without feeling the emotions, being necessary. Furthermore, he claimed that physiological reactions were too sluggish and frequently undetectable to account for the comparatively rapid and powerful subjective perception of emotion. In addition, he argued that the depth, diversity, and temporal flow of emotional experiences could not be explained by physiological responses that represented relatively undifferentiated fight or flight responses.

Initially, the theory was proposed in the 1920s and was subsequently developed by physiologist Philip Bard in the 1930s. According to the Cannon-Bard theory of emotion, the experience of emotions and physiological reactions occurs simultaneously. Bard's studies on animals led to the hypothesis and contributed to this theory. The results demonstrate that sensory, motor, and physiological information was initially processed by the diencephalon (especially the thalamus), prior to being subjected to further processing. Moreover, Cannon proposed, based on the anatomical data, that sensory events couldn't elicit a physiological reaction before eliciting conscious awareness. Consequently, the emotional stimuli had to elicit both physiological and experiential elements of emotion at the same time. In further detail, the theory claims that emotions occur when the thalamus in response to a stimulus sends a signal to the brain, leading to a physiological reaction. Concurrently, the brain obtains those signals that initiate the emotional experience. Therefore, the Cannon-Bard theory concludes that physical and psychological experiences of emotion occur concurrently (Fig. 2.5).

Fig. 2.5 Cannon-Bard theory



Two-Factor (Schachter-Singer) Theory

Initially, the sensation develops, and afterwards, the individual must determine and identify the cause as an emotion. A stimulus elicits a response that is then consciously interpreted and labelled, leading to an emotion. The Schachter-Singer theory, proposed in 1964 by psychologist Stanley Schachter, relies on both the James-Lange theory and the Cannon-Bard theory. Similarly, the James-Lange theory proposes that individuals realise emotions from physiological responses. Essential factors are the situation and the cognitive interpretation that is utilised to define that emotion. On the other hand, similarly to the Cannon-Bard theory, it proposes that analogous physiological responses can produce diverse emotions.

Schachter states that the feeling of an emotion is dependent on both sensory feedback of the body's response and the perceptions of the external event that presumably elicited that response. In further detail, Schachter theorises that perception and cognition on the environment affect the type of emotion felt, while the sensory feedback of the bodily arousal regulates its intensity and further argued that the magnitude of the emotion modulates how the stimulus is interpreted.

In experiments testing the theory, in 1962, Schachter and psychologist Jerome E. Singer injected people with either epinephrine or a placebo and then exposed them to various emotion-eliciting conditions. The results demonstrate that epinephrine could not elicit any specific emotion on its own, however, if combined with an emotion-inducing setting, it enhanced the strength of the emotion. As proposed in the hypothesis, the type of emotion felt depends on the external environment, in contrast, the intensity was enhanced by epinephrine. While offended, epinephrine-injected respondents showed and reported greater anger, more terror when viewing a scary movie, and more amusement when seeing a slapstick comedy compared to the placebo-injected subjects. This effect occurred solely when the subjects were not informed about the effects of epinephrine. Ultimately, Schachter concludes that significant physiological arousal stimulates emotion only when people believe the arousal is initiated by an external factor. Schachter's concept is congruent with the contemporary belief that emotions are determined by sensations and by the perceived objects of those feelings (Fig. 2.6).

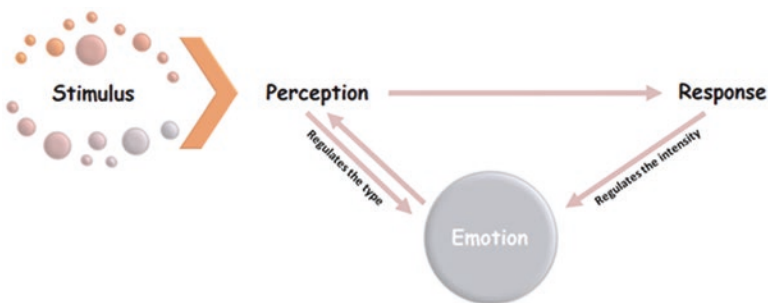


Fig. 2.6 Two-factor (Schachter-Singer) theory

Cognition and Emotion

Cognitive Appraisal Theory (Lazarus Theory)

Psychologist Magda Arnold in 1960 conceived the term appraisal referring to the cognitive processes preceding the elicitation of emotion, emphasising that the first step in experiencing an emotion is an appraisal of the situation. Initial appraisal starts the emotional sequence by stimulating both the physiological responses and the emotional experience. The cognitive appraisal was introduced as a concept in 1984, by Richard Lazarus and Susan Folkman in the book *Stress, Appraisal and Coping*, for the subjective interpretation made by an individual to stimuli in the environment and in 1991 the Cognitive appraisal theory was formulated by Richard Lazarus.

Thinking and cognitive evaluation precedes the experience of an emotion. While the two-factor theory can be regarded as a somatic-cognitive “hybrid theory” and introduces cognition to the equation of emotions, the cognitive appraisal theory establishes cognitive evaluation as the core process. Contrarily to the Schachter–Singer theory that visualises emotion because of the sensation-cognition interaction, Lazarus theory proposes that the appraisal occurs before the cognitive identification and concurrently activates the physiological stimulation and the emotional experience. Based on this theory, the sequence of events initially involves a stimulus, followed by cognitive evaluation, leading to the simultaneous experience of physiological response and emotion.

The appraisal serves as the mediator between the stimulus and emotion is instantaneous and often unconscious. Lazarus stated that the cognitive activity, associated with the interpretation of the context of emotions, might be conscious or unconscious. Additionally, it may take or not the form of conceptual processing. Furthermore, it is emphasised that the quality and magnitude of emotions are modulated by cognitive processes, which mediate the person-environment interaction via coping mechanisms serving as the foundation of the emotional reaction. Appraisal methods are classified into two categories: (a) primary and (b) secondary appraisal. Lazarus described primary appraisals as judgments seeking to establish the degree of significance or meaning of a stimulus and secondary appraisals as judgements of the options to cope with the stimulus. Cognitive evaluation, which comprises both a primary and secondary appraisal, is involved in the formation of all emotions (Fig. 2.7).

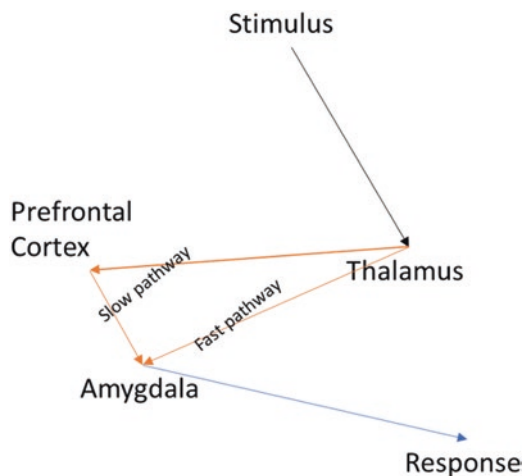


Fig. 2.7 Cognitive appraisal theory (Lazarus theory)

Neurocircuitry of Emotions

Up to this point, emphasis was stressed on feelings and peripheral reactions, not implicating the role of the brain in emotions yet. The brain is the centre both for generation of peripheral responses and for experience of emotions. Neuroscience and research in the last decades have changed the way we visualise and understand emotions. Emotions are potentially associated with certain activities in brain areas that regulate the attention, motivate the behaviour, and determine the significance of the perceived stimulus. Pioneers in the field, Paul Broca (1878), James Papez (1937), and Paul MacLean (1952), propose that emotions are linked to the limbic system. Emotions are “created” in the brain; nonetheless we cannot trace their “fingerprints” in the brain. They are regulated by the limbic system, which comprises a network of interconnected structures in the brain. Its key structures including the hypothalamus, the hippocampus, the amygdala, and the limbic cortex play a crucial role in emotions and behavioural responses. Though current research demonstrates that some of the limbic structures are not as directly related to emotion, some non-limbic structures come forth with greater relevance to emotions. The sensory information is assumed to follow two main pathways to evoke an emotion. Following the reception of the stimulus, the information is sent to the thalamus and then is directed simultaneously to the amygdala and the cortex. The amygdala (also known as the brain’s “panic button”) swiftly analyses the information and transmits signals to the hypothalamus, which stimulates the autonomic nervous system, whereas the cortex processes information at a slower pace, thus allowing the assessment and evaluation of the event. Research on the emotional systems in the brain particularly focuses on two structures: the amygdala and the prefrontal cortex (Fig. 2.8).

Fig. 2.8 The stimulus processing pathway



Amygdala

The amygdala comprises a cluster of nuclei beneath the cerebral cortex, situated in the temporal lobe. It is proposed to be the brain's early warning system, hence the name the "panic button of the brain". It receives input from all sensory systems and transmits its output to many other brain structures. The amygdala oversees performing continuous, rapid assessments of the input, and alerts the rest of the brain and body if it determines that a whole-body or behavioural reaction is required. The main routes that the amygdala receives sensory input can be divided include a rapid subcortical route and a slower cortical. The subcortical route enables the analysis of the sensory information which precedes its processing by the sensory areas of the cerebral cortex. In contrast, via the cortical route, a more extensive and detailed analysis is performed on the information processed by the cerebral cortex, explaining the differentiation in pace. The output of the processes is directed and sent towards the remainder of the brain alerting about the presence of the stimulus and evoking autonomic nervous system reactions.

Initial experiments in animals depict that damage to the amygdala results in an inability to appropriately process fear. Impaired amygdala in animals is marked by an inability to produce conditioned fear responses. A series of experiments in monkeys, conducted by Klüver and Bucy (1937) and Weiskrantz (1956), observed that removal of the amygdala along with nearby portions of the temporal lobe, bilaterally, initiates a drastic change in the behaviour, which was defined as "psychic blindness". Even though the monkeys could observe objects and move in a coordinated fashion, they were unconcerned about their psychological significance and did not respond fearfully or aggressively towards objects that previously evoked fear or anger respectively. Furthermore, they were unable to differentiate foods and nonfoods and proper and improper objects for sexual attention. These results have created the foundation of the Klüver-Bucy syndrome which is characterised by damage to the temporal lobes, bilateral amygdala, and hippocampal lesions because of brain trauma, infection, tumour, or degenerative brain disorder. The symptomatology includes visual agnosia (psychic blindness), hypermetamorphosis (high sensitivity to visual stimuli with a tendency to touch each stimulus), eating disorder (especially bulimia) hypothesised to compensate for visual agnosia, hypersexuality, and lack of sexual desire as well as anterograde amnesia.

Transitioning the research to humans, the results underline that even in partial damage to the amygdalas, an individual can experience a considerable reduction in fear and anger, even if they do not display the other signs of psychic blindness (Allman and Brothers 1994). People with impaired or damaged amygdalas are not able to recognise fear in other people, though they might be able to experience fear themselves (Feinstein et al. 2011). Berntson et al. (2007) conducted experiments to study the implication of the amygdala in selective dimensions of emotions. The authors concluded that individuals with lesions in the amygdala generally fail to respond emotionally to negative stimuli in comparison with positive ones. Leading to the conclusion that it is a matter of emotional arousal rather than processing. In addition, in brain-imaging data of people with intact brains, the increased neural

activity in the amygdala highly correlates with the increase in fear, anger, or disgust (Whalen 1998; Hamann et al. 2002). The amygdala may also be activated, though to a lesser extent, by stimuli that induce positive emotions, and maybe more generally involved in processing the relevance of both positive and negative stimuli (Berntson et al. 2007; Cunningham and Brosch 2012). Hamann et al. (2002) observed in a brain-imaging PET scan study with men (20–32 years old), the left amygdala was activated by positive emotion, while bilateral amygdala activation occurred when negative emotion was evoked. In addition, the authors observed that high-interest, unusual photographs were able to generate left-amygdala activation, underlining an implication of the amygdala in vigilance reactions to stimuli that are associatively ambiguous.

Even stimuli that are flashed rapidly on a screen too rapidly for conscious perception can evoke an emotional reaction (Öhman 1999). This effect can be explained and can be attributed to the subcortical sensory input to the amygdala. LeDoux and LaBar (1996) observed that in rats, lesions resulting in impairment of the entire visual and auditory cortex, but not the amygdala, maintained an emotional response to visual and auditory stimuli that previously paired with electric shock, while those with lesions affecting the amygdala were unable to. In a similar manner, humans with damage to the visual cortex demonstrated emotional response to visual stimuli even if it wasn't able to perceive them consciously (Anders et al. 2004). The sensory regions of the brain are essential for conscious perception of stimuli, though not for unconscious emotional responses. The notion that responses can be generated by subcortical pathways to the amygdala provides a potential reason why emotions can often be irrational and difficult to control through conscious reasoning.

Prefrontal Cortex

The prefrontal cortex constitutes the part of the cerebral cortex covering the frontal lobe. The intrinsic connections of the frontal lobe create vital circuits from the centre of prefrontal information processing. The extensive connections of the prefrontal cortex provide a linkage with distant and dispersed parts of the association and limbic cortices. Prefrontal interconnections with the amygdala, hypothalamus, mid-brain, and pons constitute crucial subcortical linkages of the extended prefrontal neural system, potentially integrating higher-order brain functions mediated by the prefrontal cortex with more developmentally fundamental brain activities including emotion-eliciting and autonomic functions (Roberts et al. 1994). The prefrontal cortex is involved in the so-called executive functions including planning, cognition, expression of personality, decision-making, short-term memory, abstraction, and controlling social behaviour. It is theorised that its major task is regulation thoughts and actions concerning internal goals.

While the amygdala is essential for unconscious emotional responses, in contrary, the prefrontal cortex is fundamental for the conscious experience of emotions and the ability to act in an intentional and organised manner. The first line of evidence can be traced to the effects of prefrontal lobotomy. Patients that underwent

this procedure as a means of treatment of mental illness were “relieved” from the agitation and tension though they were left with apathy, passivity, lack of initiative, inability to concentrate, and a reduced depth and intensity of their emotional response to life. Lobotomy is aimed at disrupting the connections of the prefrontal cortex thus disconnecting it from the remainder of the brain. As mentioned before, the prefrontal cortex receives input from the amygdala and the somatosensory cortex. This input provides information regarding the processing of stimulus from the amygdala and the level of alertness in the body.

In accordance with the theory of lateralisation of brain function, research has revealed that emotion lateralisation can be observed as each cerebral hemisphere seem to be implicated in the processing of distinct emotions (Silberman and Weingartner 1986). It is hypothesised that the right hemisphere is associated with negative emotions while the left hemisphere with positive emotions. A considerable amount of research seems to pinpoint this notion. Starkstein et al. (1987) observed that lesions in the left dorsolateral prefrontal cortex can be associated with clinical depression. While in another study Starkstein et al. (1989) observed that patients with lesions of the right frontal operculum are more likely to present with signs of inappropriate cheerfulness. Furthermore, research by Davidson et al. (1990) depicted enhanced neural activity in the right prefrontal cortex with negative emotions (disgust), while enhanced activity in the left prefrontal cortex in positive emotions (happiness). On the contrary, recent scientific literature suggests that this laterality of neural activity seems to be linked with neural preparation to respond to the stimuli that generate the emotion rather than the experience of it with the right prefrontal cortex potentially been involved in responses that entail withdrawal or moving away from the emotional stimulus, while the left is implicated in responses that involve approach or moving toward the emotional stimulus (Harmon-Jones et al. 2006; Maxwell and Davidson 2007). Thereafter, the results provide a probable explanation as to why the right prefrontal cortex is most responsive to negative emotions (disgust) and the left to positive ones (happiness).

The most revealing and intriguing evidence comes from research on anger. The two neurobiological models of emotion in the prefrontal cortex made contradicting predictions. As previously stated in the two dimension theory anger, it is a low valence emotion and is regarded as a negative. Consequently, it would activate the right prefrontal cortex. On the contrary, based on the aforementioned direction approach model anger, thus an approaching emotion would activate the left prefrontal cortex. Based on the research of Harmon-Jones et al. (2006), anger demonstrates an association with greater activation of the left prefrontal cortex, most notably in the case where the subjects are given instructions leading to visualisation of possible responses to the provoking stimulus. Although anger is a negative emotion, it tends to elicit approach rather than withdrawal. Consequently, conscious and unconscious assessments of differing emotion-provoking stimuli, as well as contradicting responses to those stimuli, differ not only in terms of subjective experience but also in the brain pathways involved.

Autonomic Nervous System

The last part of the emotion generation and response is the autonomic nervous system (ANS). The autonomic nervous system controls all the automatic functions in the body and consists of two parts: the sympathetic and parasympathetic nervous systems. The sympathetic nervous system involves expending energy generating a “fight-or-flight” response, while the parasympathetic nervous system aims to keep energy in the body generating a “rest and digest” response. In the presence of an emotion-evoking stimulus, the sympathetic branch of the autonomic nervous system initiates the response sequence. Initially, it transmits signals to the adrenal gland, which is implicated with the secretion of the hormones epinephrine and nor-epinephrine. These hormones play a crucial role in the preparation for reaction. Indicative signs of physiological responses are:

- The increase in heart rate, blood pressure, respiration rate, and blood sugar levels marks the preparation for action.
- Pupils’ dilation allows more light for vision.
- The decrease in the pace of digestive processes conserves energy, while it shifts towards the potential action.

2.4 Precipitating Factors of Anger

The term “precipitating factor” refers to a specific event or a trigger that has led to the onset of a current and ongoing problem. They exacerbate the problem rather than try to resolve it. Unresolved relationship conflicts, a lack of education, financial stress, and occupational stress are all examples (or lack of employment).

The initiators of anger can often be traced in some aspect of other people’s voluntary, personal, and controllable actions and behaviours. Nonetheless, this explanation is based on the intuition of the person experiencing anger that they have lost the ability to self-monitor and objectively observe. Anger can have a variety of causes, some of which are external to the individual, and can be more than one accumulating factors. Experiences of anger are rooted in a temporal environmental context and problems that do not appear to end in anger but can gradually lay the groundwork for triggering an anger expression attributed to focal and surrounding elements.

Psychological Causes of Anger

Attachment Theory

The childhood coping strategies for anger will last into adulthood. The expression of anger in adulthood, like in childhood, is a warning to an individual that there is a problem that must be addressed. Insecure attachment styles in childhood lead to aggressive behaviours in adulthood.

The attachment theory refers to the actions that a person takes when placed in a difficult situation, regardless of their mood or emotions (Sroufe et al. 1999). Attachment theory assists in comprehending the development of secure attachments and how attachment security helps individuals survive temporary periods of emotional distress and re-establish a sense of hope, optimism, and a state of optimal emotional health (Mikulincer and Shaver 2012). Moreover, it assists in understanding how insecure attachment develops and how it can lead to emotional regulation, interpersonal problems, as well as problems in overall mental health.

Mary Ainsworth identified three infant attachment strategies, progressing from deactivation to hyperactivation of behaviour systems related to attachment (Ainsworth et al. 1978). On the one side, “A-babies”, or “anxious-avoidant infants” portray deactivated visual showings of trouble during divisions and reunions with connection figures in the “Strange Situation” (the method utilised to evaluate connection practices). A-babies exchanged proximity to a caretaker for constant exploration of their surroundings. Through multiple interactions with their caregiver, they learned that finding closeness to a constantly insensitive parent could not relieve their distress. They concluded that others don’t seem potentially able to alleviate distress; therefore, a rigid self-sufficiency seems to be the only option, while the instinct drives towards hunting proximity to others for soothing.

On the polar opposite end, “C-babies”, or “anxious-resistant babies” portray hyperactivated attachment distress during times of separations and reunions with attachment figures. These infants chose to have constant closeness with caregivers and loved ones. By interacting with their caregiver, they learned that they had to stay on guard and observe their occasionally insensitive parent/guardian, so that they may receive the sensitivity they desire. They believed that they were unable to self-soothe and thus need others to fulfil that purpose.

Midway between the two previous categories are “B- babies”, or “secure babies”, demonstrating a more flexible response to separation anxiety. They lessen the exploration when their attachment behavioural system is activated and may seek and answer soothing offers from caregivers, which successively deactivates the distress system to return to exploration and play.

The fourth and last category, “cannot classify”, showed both hyperactivating and deactivating strategies. This category required a re-examination in order to be fully elucidated. The explanation for this disorganised strategy (equally approaching and avoiding proximity) was based on the fact that the vast majority of those infants were abused by their caregivers. The person who could assuage their fears was at the same time the main source of their fear. Consequently, they were experiencing fear without a possibility of relief or escape.

In all attachment categories, the children experience a degree of anger and frustration, based on the caregiver’s response to their distress. It partially determines how the kid copes with these emotions in the end. Avoidant children are less distressed and express their anger in more indirect ways, while resistant children are demonstrated a potential to stay angry for a long time and to express other emotions through their anger. Disorganised children, on the contrary, may get so overwhelmed with emotions that they may dissociate and become self- or hetero-aggressive. Secure children can also become angry, but instead, their anger is clearly expressed

and in the absence of the source of anger, they can utilise mental images that may soothe them and return toward a state of emotional well-being. Insecure children, on the other hand, demonstrate a lack of a positive mental object of soothing, so their mental representations are potentially contributing to more anger, instead.

Reinforcement Sensitivity Theory

Under stress or anxiety, people tend to be extremely susceptible to signals of threat and punishment, exhibiting a diverse range of angry reactions and behaviours. Defensive distance presents individual differences in response to a constant distance may be regarded as an underlying personality dimension in terms of “sensitivity to punishment” or “perception of threat,” which are crucial factors in inducing anger in various situations.

Reinforcement sensitivity theory (RST) is a novel depiction of the biological foundation of personality, consisting of “several theories within a theory.” The reinforcement sensitivity theory (RST) was based on research made by Jeffrey Gray assimilating modifications introduced by Philip Corr, Alan Pickering, and Neil McNaughton et al. (McNaughton and Gray 2000). Reinforcement sensitivity theory constitutes a significant part of the spectrum of models of human personality.

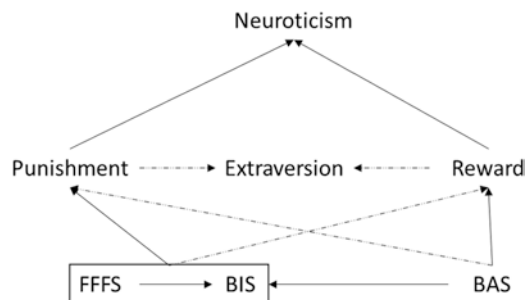
Facets of the reinforcement sensitivity theory:

1. Epistemological facet: RST is established on models of emotion and motivation usually animal ones (McNaughton and Gray 2000). Therefore, there may be cause for questioning the use of such models to understand the human personality.
2. Neurophysiological facet: RST supports the concept of a “nervous system” influencing the personality. Firstly, the fight-flight-freeze system (FFFS) moderates the reactions to aversive stimuli, including both conditioned and unconditioned and is related with fear, but not anxiety. Secondly, the behavioural activation system (BAS) moderates reactions to conditioned and unconditioned appetitive stimuli. Within RST, the behavioural inhibition system (BIS) is activated by the conflict for a goal, typically when the organism is faced with an approach-avoidance conflict associated with simultaneous activation of the FFFS and BAS; on the contrary the activation is related to anxiety and worry, but not fear. Difficulty is presented when these three systems support functional organisation of personality, motivation, and emotion.
3. Neurobehavioral facet: it describes the way that the activation of the crucial brain structures can influence behaviour. The FFFS and BAS as mentioned above control avoidance and approach behaviour, while the BIS intercepts pre-potent conflicting behaviours, focuses attention on threat, and initiates assess risk via memory and resolves goal conflict. In addition, McNaughton and Corr discuss the way that behavioural outputs may vary based on the notion of defensive distance (McNaughton and Gray 2000). Even though RST has correctly specified the neuroanatomical systems, it did not elucidate the association between varia-

tion in system activation with overt behaviour and ultimately a challenge that is presented is the cognitive-psychological view that most of this behaviour is regulated by symbolic processing of information rather than being directly dependent upon the activation level of neural systems. (Matthews 2008; Pylyshyn 1999).

4. “Neuro-trait” facet: This facet describes the relations among the parameters of neural systems and phenotypes. The modified RST asserts that susceptibility to the input of the BAS correlates with impulsivity (extraversion [E]), and the BIS correlates with anxiety (neuroticism [N]). Furthermore, FFFS is also associated with anxiety. It is important to note that BIS and the FFFS influence individual differences in susceptibility to punishment. Philip Corr’s standalone definition of neuroticism is the sum of the sensitivity to punishment and sensitivity to reward, while extraversion comprises the difference of the sensitivity to reward minus the sensitivity to punishment (Corr 2004).
5. Psychological facet: This facet denotes the explanations for the psychological correlates of traits. Crucial finding is that the pertinent traits interact with motivating behaviours to affect the outcome (Corr 2004). The initial theory forecasted that reward signals could augment learning in cases of high impulsiveness and on the contrary punishment signals could augment conditioning in cases of high anxiety and neuroticism. This motif of interactions is called the separable subsystems hypothesis (SSH). Under specific conditions, the BAS could potentially antagonise responses to aversive stimuli, and the punishment system may discourage responses to appetitive stimuli.
6. Adaptive facet: This facet denotes the way behavioural expressions of personality traits influence adaptation (Kemper and Lazarus 1992). Emphasis and interest in personality traits focuses on their correlation with real-life outcomes such as stress and its related symptoms, behaviour at work, and friction on an interpersonal level (Fig. 2.9).

Fig. 2.9 Schematic representation of the reinforcement sensitivity theory



Five-Factor Model of Personality

Neuroticism is one of the five personality factors that remain unchanged in adulthood, and it consists of six facets: anxiety, anger and hostility, depression, self-consciousness, impulsivity, and vulnerability. Neurotic people are typically filled with negative emotions, particularly anxiety, depression, and anger.

The Anger Episode Model

Kassinove and Tafrate (2002) created the anger episode model (Kassinove and Tafrate 2002), following a throughout research on how people react to anger in real-life situations. The model is composed of five major components namely trigger, appraisal, experience, expressive patterns, and outcomes. External or internal events, words, ideas, or experiences that can evoke an anger as a response are identified as triggers. The way a trigger is interpreted is called an appraisal. Anger potentially results in the perception of a negative trigger as unexpected, preventable, and purposeful. The internal awareness of fury that the person can initiate, and feel is referred to as experience. Expressive patterns refer to the individual expression of the internal experience of anger. Common patterns include outward expression, anger-in, and indirect anger expression. Direct verbal expression, overt motor behaviours, and other forms of aggression are examples of outward expression. Anger-in transpires in the case of choosing a not conscious expression of anger. In such case, the suppressed anger may either vanish or be expressed at a later point in time. Indirect expressions of anger comprise examples of passive aggression or covert sabotage. “Outcomes” are the intended or unintended consequences of expressing one’s anger. If the outcome is favourable, the behaviour will potentially repeat itself on future occasions. In contrast, if the results are negative or ignored, the probability of that behaviour occurring again in the future is reduced (Fig. 2.10).

Multiple Choice Questions

1. The American Psychology Association defines emotion as:
 - (a) Complex reaction pattern, involving experiential, behavioural, and physiological elements, by which individual attempts to deal with a personally significant matter or event.



Fig. 2.10 The five major components of the anger episode model

- (b) Intricate reaction pattern, involving experiential, sensory, and behavioural elements, by which individual attempts to deal with a collectively significant matter or event.
 - (c) Simple reaction pattern, involving experiential, behavioural, and physiological elements, by which individual attempts to deal with a personally significant matter or event.
 - (d) An essential part of virtue.
2. According to Plutchik, basic emotions are:
- (a) Fear, disgust, wonder, anger, subjection, elation, tenderness.
 - (b) Fear, grief, love, rage.
 - (c) Anticipation, joy, trust, fear, surprise, sadness, disgust, anger.
 - (d) Interest, joy, surprise, sadness, anger, disgust, contempt, fear, shame, guilt.
3. Which of the following statements is correct regarding dimensional theories:
- (a) They provide a way to visualise emotions in terms of several factors, e.g., arousal/valence.
 - (b) Anger is regarded as a high valence/high arousal emotion.
 - (c) Based on the three-dimensional models, the axes are pleasantness/valence/arousal.
 - (d) The intersection of the two axes in the two dimension model represents the core affect.
4. Which of the two physiological reactions are correct?
- (a) Facial expression and skin temperature.
 - (b) Skin response and heart rate.
 - (c) Heart rate and skin temperature.
 - (d) Facial expression and skin sensitivity.
5. What is the drawback of the statement made by Mehrabian and Ferris?
- (a) The relation between the expresser and perceiver over time and space.
 - (b) There is no perceived drawback in the statement.
 - (c) The range of emotions used to express oneself exists.
 - (d) The range of emotions used to express oneself is not accounted for.
6. Emotion is equivalent to the range of physiological arousal caused by external events according to:
- (a) Schachter-Singer theory
 - (b) Lazarus theory.
 - (c) James-Lange theory
 - (d) Cannon-Bard theory
7. The appraisal serves as the mediator between the stimulus and emotion in:
- (a) Schachter-Singer theory
 - (b) Lazarus theory

- (c) Common sense theory
 - (d) James-Lange theory
8. Klüver and Bucy observed that removal of the amygdala along with nearby portions of the temporal lobe of the cerebral cortex on both sides of the brain initiates a drastic change in the behaviour, which was defined as:
- (a) Psychic blindness
 - (b) Hypermetamorphosis
 - (c) Altered abstraction
 - (d) Psychic agnosia
9. Following the reception of the stimulus, the information is sent to the thalamus and then is directed simultaneously to the amygdala and the cortex.
- (a) The cortex rapidly analyses the information and transmits signals to the hypothalamus, which stimulates the autonomic nervous system, whereas the amygdala processes information at a slower pace, thus allowing the assessment and evaluation of the event.
 - (b) The amygdala rapidly analyses the information and transmits signals to the thalamus, which stimulates the autonomic nervous system, whereas the cortex processes information at a slower pace and stimulates the central nervous system.
 - (c) The amygdala rapidly analyses the information and transmits signals to the hypothalamus, which stimulates the autonomic nervous system, whereas the cortex processes information at a slower pace, thus allowing the assessment and evaluation of the event.
 - (d) The amygdala rapidly analyses the information and transmits signals to the hypothalamus, which stimulates the central nervous system, whereas the cortex processes information at a slower pace, thus allowing the assessment and evaluation of the event.
10. Mary Ainsworth observes that _____ felt the least secure in relation to their attachment with a caretaker.
- (a) C-Babies
 - (b) D-Babies
 - (c) A-Babies
 - (d) B-Babies

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Chapter 3

The Control Center of Anger



Ammara Arshad and Umar Bacha

3.1 Introduction

Every person shows different psychological signs at the time of anger, and identification of these individual signs is crucial to understanding the problem. Anger can be perceived as a survival tool and energy source that can be wholesome or unhealthy depending on that person's psychology. Outcomes can be unhealthy if anger continues for an extended period or if it is repressed for the time being. We experience a primary emotion before we feel anger, and that primary emotion can be a sense of fear, transgression, insolence, force, trap, or burden. When intensified, these primary feelings turn into anger's secondary emotion (Phillips et al. 2006).

Literature showed that anger that is not expressed could be detrimental and unhealthy for our bodies and mind. There is a right way to express and manage your angry thought, but not everyone is familiar with this right away. Repressed anger is not a proper way to hold back your emotion because it can lead to depression and anxiety. Holding back anger will intensify the emotion instead of getting rid of it. Hidden and blocked emotions can cause severe problems. Various research outcomes indicated that if abandoned angry and aggressive behavior can ultimately cause fatal changes in the brain and hinder the production of serotonin, a neurotransmitter involved in suppressing the feeling of depression and aggressive behavior (Chemtob et al. 1997).

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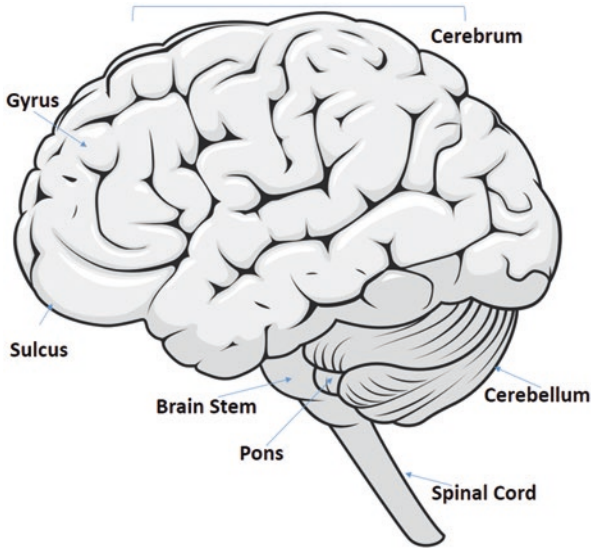


Fig. 3.1 Structure of the brain

3.2 Brain Anatomy in Brief

The brain is a part of the central nervous system (CNS) and is located within the cranial vault, the encephalon. It has a complex and three-dimensional structure (Fig. 3.1) consisting of the cerebrum, the brain stem, and the cerebellum. The cerebrum holds cerebral hemispheres and diencephalons, while the brain stem holds the midbrain, pons, and medulla. Each hemisphere is divided into four lobes (frontal, parietal, temporal, and occipital) and distinguished from one another by anatomical landmarks. The hemispheric surface of the brain got a wrinkled appearance (gyrencephalic) due to gyri (folds) and sulci (grooves). The central sulcus separates the frontal lobe from the parietal lobe. The lateral groove separates the temporal lobe from the frontal and parietal lobes.

Meninges are three connective tissue membranes that surround the brain and spinal cord. The brain is also surrounded by cerebrospinal fluid (CSF). The primary function of meninges and cerebrospinal fluid is to protect CNS. The Prieto-occipital sulcus demarcates the occipital lobe, while the interhemispheric fissure separates the left and right hemispheres of the brain. The frontal and temporal lobes are additionally divided into superior, middle, and inferior gyrus (Snell 2009).

Divisions of the Brain

The brain is classified into six postembryonic divisions: telencephalon, diencephalon, mesencephalon, medulla oblongata (myelencephalon), and pons, and cerebellum (metencephalon) (Fix 2004).

1. Telencephalon

It holds cerebral hemispheres (cerebral cortex and white matter) and basal ganglia. In addition, the cerebral hemisphere contains the lateral ventricles.

2. Diencephalon

Diencephalon is placed between telencephalon and mesencephalon and mainly receives the optical nerve (CN II). In addition, the epithalamus, thalamus, hypothalamus, subthalamus, third ventricle, and some associated structures are part of the diencephalon.

3. Mesencephalon (Midbrain)

It is located between the diencephalon and the pons. It contains the cerebral aqueduct that interconnects the third and fourth ventricles. Its ventral surface consists of the cerebral peduncle and interpeduncular fossa, while the dorsal surface holds basic structures including the superior colliculus, brachium of the superior colliculus, and inferior colliculus, brachium of the inferior colliculus, and trochlear.

4. Pons

Pons is present between the midbrain and medulla, and it extends from the inferior pontine sulcus to the superior pontine sulcus. The base of the pons is located in the ventral surface and the cranial nerves (CN V, CN VI, CN VII, and CN VIII). Its dorsal surface contains facial colliculus and sulcus limitans.

5. Medulla Oblongata (Myelencephalon)

It is located between the pons and the spinal cord and extends from the first cervical nerve (C1) to the inferior pontine sulcus. The ventral surface contains the corticospinal tract and cranial nerves (CN IX, CN X, CN XI & CN XII). The dorsal surface consists of the gracile tubercle and cuneate tubercle and rhomboid fossa.

6. Cerebellum

It is found in the posterior cranial fossa and attached by three cerebellar peduncles to the brainstem. It forms the roof of the fourth ventricle. Tentorium cerebelli separates the cerebellum from the occipital and temporal lobes.

Gray matter and cortex are the main areas of interest for cognitive neuroscience that deals with the study of mental functions. This is because there are glial cells (cell bodies of neurons with their synaptic connections) present in the cortical tissue.

The cortex, further, consists of the following parts:

(a) **Neocortex and limbic cortex**

From an evolutionary point of view, the neocortex is the youngest part, a 1 cm thick, intensely folded layer of gray matter that covers the cerebrum's whole

surface. The limbic cortex is the old one, and it consists of the cingulate gyrus, the amygdala, and the hippocampus.

(b) Cortex and subcortical structures

The subcortical region is the gray matter below the cortex, and it is concentrated in nuclei, the regions allocated as high neuron density. Subcortical regions are primarily involved in memory processes, emotional perception, and experience.

(c) Paralimbic structures

These cortical or subcortical areas are functionally related to limbic structures.

The Triune Brain

The primal/reptilian and modern brain came into existence during the 1960s when Paul Maclean, a neuroscientist, coined the term “triune brain”. He proposed that the human brain comprises three layers (Fig. 3.2), three dominant structures of the brain (sometimes referred to as separate brains) that evolved sequentially. “Basal ganglia come first that is also called “reptilian brain”. It usually controls body core temperature, breathing, and heart rate. “Limbic system” comes second which consists of amygdala and hippocampus. It is usually involved in emotional responses. Then comes the cerebral cortex or neocortex, the third essential structure. It plays a role in reasoning and language (Lieberman 2001; Archer 2009).

The reptilian brain, consisting of basal ganglia (striatum) and brain stem, holds on to primitive drives such as hunger, sexuality, habits, anger and aggression, and procedural memory. Sometimes, the brainstem and cerebellum, amygdala, and hypothalamus regions are randomly labeled as reptilian brain or complex (Callard et al. 1977).

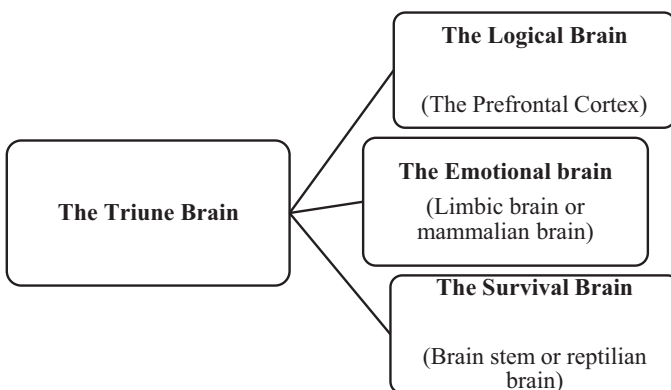


Fig. 3.2 The triune brain

3.3 Anger Center Anatomy

The brain acts as the control center for the body. According to Addotta (2006), anger is associated with the limbic structure known as the amygdala. The reptilian part of our body is involved in emotional processes. The almond-shaped amygdala is one of the three basic parts of the limbic system and is present just above the brain's hypothalamus gland. Our body has two amygdalas positioned just a few inches from each ear. The amygdala forms an integral part of our brain stem, consisting of a complex neural network connecting various body parts to the central nervous system, such as the neocortex and the visual cortex.

Wrath and aggression are the advanced levels of anger, and this progression must be clogged before getting out of control. The prefrontal cortex shows violent behavior whenever the amygdala initiates the emotion of anger. Society for Neuroscience (2007) narrated that research work performed at the University of California in San Diego is helping scientists get an indication of what is going on in the brain of teenagers who show unfortunate anger and aggressiveness when they feel endangered. Research findings portrayed that this aggressive and belligerent behavior is associated with an agitated response in the amygdala and suppressed activity in the brain's prefrontal cortex.

According to a research paper circulated by *Science News*, a woman had surgery to remove her amygdala to control epileptic seizures (Bower 1997). Consequent to recovery, she had been able to control seizures, but on the other hand, she lost the ability to sense the signs of anger and aggression. Moreover, she was unable to perceive fear in others' voices. Her doctors performed different studies after recovery that revealed that she found difficulty in understanding the tone of voice during emotions such as fear, anger, and distress. However, she distinguished and apprehended lexes of despondency, bliss, repulsion, and astonishment (Bower 1997). The amygdala is considered an excellent pointer to threats and warnings. It is involved in emotional and communal processing. Literature on anger revealed that our brain responds to threat before the prefrontal cortex can gauge the reaction's prudence. In other words, the amygdala makes the brain counter the threat or fear before the prefrontal cortex can consider the extent of a reaction. Irrepressible people recover from anger and stress rapidly. Amygdala cannot negotiate itself; instead, it torrents the body with a series of cortisol or stress hormones ("Effects of Anger," 2008, para. 18).

3.4 The Anger's Effects on the Brain

Anger is a psychological and emotional state of mind that differs among individuals. However, anger may develop into constant trait patterns with persistent social encounters. Literature on neuroimaging studies showed that anger-related incentives involve a corticolimbic neural sensation of highly aroused negative emotions

(prefrontal cortex regions, amygdala, hippocampus, insula, and thalamus). Responsiveness and control of anger include emotional arousal that influence regulation and are related to the advent of behavioral self-control (Gilam and Hendler 2015).

Anger as an emotion is primeval and prehistoric from an evolutionary standpoint and considered to be grounded on regions of the limbic system. Numerous studies performed via fMRI supported the tentative postulate that increased activation of orbitofrontal and anterior cingulate cortex (ACC) regions has been observed to view the facial expression of anger, but not sadness. Contrastingly, some studies supported the activation of the medial prefrontal cortex (MPFC), the insula, and the temporal pole (Bailie et al. 2015).

To interpret emotional facial expressions is crucial for communication and interaction with people. That is why face perception is one of the humans' most proficient perceptual tasks. A person who easily gets angry compared with others and is likely to turn his anger against himself is known as anger in person (AI). On the other hand, a person who easily becomes angry but tends to show anger mainly against other people or objects is an anger out person (AO). As a result, there are two self-regulating measuring scales to determine anger expressions and anger experience. Previous literature specified the relationship between anger expression style and physiological components. For example, a three times increase in a heart-beat has been observed in AI compared to AO during anger situations (Miles et al. 2021).

A study has been conducted to inspect the linkage between AI or AO trait-specific neural networks involving regions of cortical and subcortical areas. In the present study, fMRI has been used to observe the difference in the neural structures of AI and AO subjects. These neural structures are involved in the processing of facial anger images. The study's findings indicated that subjects in the AI group showed fusiform face area activation and only weak frontal and prefrontal activations were observed. On the other hand, there were weak activations observed in the occipital regions of the brain in subjects of the AO group. Furthermore, areas of the frontal brain, especially the inferior frontal and middle frontal regions, portrayed more robust, bold responses. Moreover, various research studies on anger and aggression resulted in activation of middle and inferior frontal gyri (Taggart et al. 2011).

3.5 Structural Disorders

Structural disorders are categorized as a group of neurological disorders that affect the structure or function of the brain or spinal cord. There are three basic categories to define structural disorders of the brain or nervous system (Fig. 3.3):

1. Neurodegenerative disorders include Alzheimer's disease and Parkinson's disease.

2. Upper motor neuron disorders include Bell's palsy, cerebral palsy, motor neuron disorder (MND), epilepsy, and multiple sclerosis.
3. Lower motor neuron disorders include Guillain-Barre syndrome and neurofibromatosis.

(a) **Alzheimer's Disease**

Alzheimer's disease is one of the neurodegenerative disorders of neurotransmitters that involve changes in the function of the monoamine neural system (involved in the release of glutamate, norepinephrine, serotonin, and a few neuropeptides containing systems). Some degenerative changes have been observed in specific brain regions, including the temporal and parietal lobes and restricted areas within the frontal cortex and cingulate gyrus. These neurodegenerative changes trigger different aspects of dementia associated with Alzheimer's disease. Being a common causative agent of dementia, Alzheimer's disease involves ongoing dipping of sporadic memory and cognitive function. Consequently, it results in deficiencies of language and visuospatial skills, leading to neuropsychological disorders such as apathy, aggressiveness, and depression. However, research on Alzheimer's disease has one major drawback: not even a single current hypothesized mechanism can explain the cellular and regional distribution pattern that illustrates the disease's neuropathology (Mucke 2009; Silva et al. 2019).

Extracellular accumulations of insoluble beta-amyloid peptide (A β) and neurofibrillary tangles (NFT) encompassing neuronal cytoplasmic hyperphosphorylated tau protein (P-tau) are considered a notable pathophysiology in patients' brains. Roughly 70% of the menace of Alzheimer's disease comes from inheritance. On the other hand, cerebrovascular diseases, diabetes, hypertension, obesity, and dyslipidemia are acquired factors that augment the risk of AD development (Stern 2012). The onset of the disease is classified as the patient experiencing the first symptom. Early-onset affects individuals under 65 (4–6% of total cases), while the late form of AD have an effect on individuals 65 or older. Early and late AD forms differ in

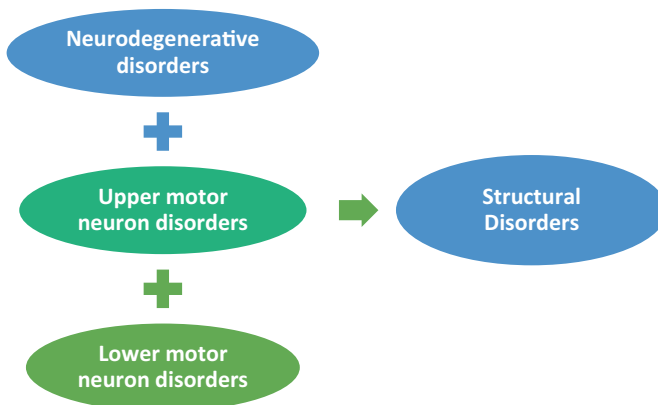


Fig. 3.3 Structural disorders

neuropsychological, neuropathological, and neuroimaging aspects (Khachaturian 1985; Goedert and Spillantini 2006).

Literature on risk factors of the condition is significant to interpret the pathophysiological progressions in the advancement of AD. Facing this scenario, adjustable risk factors (diabetes, hypertension, and dyslipidemia) should be carefully monitored to avoid complications favoring cognitive decline or improving patients' quality of life (Goedert and Spillantini 2006). Based on this, the importance of some protective factors (physical exercise, diet, and cognitive stimuli) should be highlighted to trim down the risk of this disease. Meanwhile, no contemporary drug intervention can be helpful to overcome the pathophysiological mechanisms related to the development of this neurodegenerative disease; embracing these preventive measures constitutes an important strategy for clinical management to prevent or postpone cognitive decline (Palop and Mucke 2016; Tong and Chen 2021).

(b) Parkinson's Disease.

James Parkinson, in his 1817 monograph titled *An Essay on the Shaking Palsy*, explained the characteristics of Parkinson's disease as the most prevalent age-associated neurodegenerative disorder after Alzheimer's disease. Parkinson's disease is a prevalent neuro disorder affecting the human central, peripheral, and enteric nervous systems. Slow and persistent progression involves multiple neural systems. A cascade of changes in the neuronal cytoskeleton has been observed in only a few vulnerable types of nerve cells. It is a slowly persistent progressive disorder. The underlying pathological process progresses slowly but relentlessly and involves multiple neuronal systems. The disease is the consequence of changes in the neuronal cytoskeleton developing in only a few susceptible types of nerve cells. Plagued neurons, in time, produce clumps of abnormal proteins (Lewy bodies) in their cell bodies and Lewy-neurites in their neuronal projections (Fig. 3.5). In addition, various inclusion bodies (from ordinary dot or thread-like structures to particularly massive bodies) have been exposed to immunoreactions against the presynaptic protein (alpha-synuclein). The discerning liability of nerve cells provokes a unique division pattern of lesions which lingers surprisingly consistent across cases. The regions of the limbic system and motor system are predominantly susceptible to severe demolition. Literature added that various subnuclei of the substantianigra also experience key changes. This potential smash up is assorted by extranigral alterations (entorhinal region, the second sector of the Ammon's horn, and important subnuclei of the amygdala). Besides, severe lesions have been observed in different regions like the nucleus of the stria terminals, elements of the hypothalamus, all of the non-thalamic nuclei with disseminate projections to the cerebral cortex, and most of the centers regulating autonomic functions.

Parkinson's disease got the attention of researchers after Arvid-Carlsson's discovery (1958) of dopamine (DA) in the mammalian brain (Nussbaum and Ellis 2003). SNpc neurons were involved in forming the nigrostriatal dopaminergic pathway, and this dopamine of research was followed by two fundamental discoveries. First, the thrashing of SNpc neurons gives rise to striatal DA deficiency, which is accountable for the foremost symptoms of PD. Second, the replacement of striatal

DA through the oral administration of the DA precursor levodopa (L-3,4-dihydroxyphenylalanine) assuages most of these symptoms (Dauer and Przedborski 2003; de Lau and Breteler 2006; Davie 2008).

The SNpc contains the cell bodies of nigrostriatal neurons, and they project primarily to the putamen. The loss of these neurons produces the classic gross neuropathological discovery of SNpc depigmentation. The prototype of SNpc cell loss becomes visible to the level of expression of the DA transporter (DAT) mRNA (Schapira 1999) and is reliable with the pronouncement that diminution of DA is most marked in the dorsolateral putamen (Jankovic 2008), the chief site of projection for these neurons. As the symptoms appear, putaminal DA is worn-out upto 80%, and ~60% of SNpc dopaminergic neurons have already been gone astray. It is believed that the mesolimbic dopaminergic neurons (the cell bodies which inhabit next to the SNpc in the ventral tegmental area -VTA) are much less pretentious in Parkinson's disease (Braak and Braak 2000; Tolosa et al. 2006). As a result, there is considerably less diminution of DA in the caudate (chief site of projection for these neurons).

(c) **Bell's Palsy**

Sir Charles Bell (1774–1842) first described this condition, titled Bell's palsy, associated with the anatomy and function of the facial nerve. It is a prevalent acute mononeuropathy that affects a single nerve and is the most frequent diagnosis linked with facial nerve weakness/paralysis. Bell's palsy is basically a brisk unilateral facial nerve weakness or paralysis of unknown cause. Furthermore, immune, infective, and ischaemic mechanisms are the key causative agents in the progression of Bell's palsy, but the particular root remains imprecise. Encroachments in understanding intra-axonal signal molecules and the molecular mechanisms supporting Wallerian degeneration may demarcate its pathogenesis in conjunction with in vitro studies of virus–axon interactions (Angulo and Babcock 2015). The yearly prevalence of Bell's palsy is 15–30 per 100,000 individuals (with the same numbers of men and women affected). Bell's palsy has been observed in patients of all ages but hit the highest point in the 1940s. It frequently crops up in patients with diabetes and pregnant ladies. Studies revealed that patients who have had one incident of Bell's palsy have an 8% risk of recurrence.

Incomplete eyelid closure (with resultant dry eye) is the prevalent short-term obstacle of Bell's palsy. While on the other hand, facial weakness associated with muscle contracture is the less common long-term complication of Bell's palsy. The situation leads to the fractional or absolute lack of ability to voluntarily move facial muscles on the affected region of the face. Facial nerve weakness or paralysis can cause momentous temporary oral ineffectiveness and an incapacity to close the eyelid, leading to a prospective eye injury (Peitersen 1992). Further long-term unfortunate upshots do occur and can be overwhelming to the patient. On average, patients with Bell's palsy complain of paresis or complete muscular paralysis on one side of the face. As a result, grooves and nasolabial fold on the face evaporate, the forehead unfurrows, and the mouth corner wilts.

Moreover, the eyelids will not put up the shutters and the lower lid slumps; on attempted shutting, the eye rolls uphill (Bell's phenomenon). Eye exasperation repeatedly results from a lack of lubrication and unvarying contact. Tear production slows down; on the other hand, the eye may appear to tear markedly because of loss of lid control (which allows tears to drop freely from the eye). Saliva and food may pool in the affected area of the mouth and can drop out from the corner. Patients often feel numbness from muscular weakness and paralysis, but facial consciousness is potted (Eviston et al. 2015).

Patients of Bell's palsy generally step forward from the beginning of symptoms to complete muscular weakness in 3 days and roughly always within 1 week. A more menacing start or succession over more than 2 weeks should undergo punctual reassessment of disease identification. Patients (85%) who left untreated show will be evidence for at least fractional recovery within 3 weeks of onset. One of the research studies was based on guidelines for the acute treatment of Bell's palsy sponsor for steroid monotherapy, even though hullabaloo exists over whether mutual corticosteroids and antivirals probably have a beneficial role in selected cases of severe Bell's palsy (Baugh et al. 2013).

(d) **Cerebral Palsy**

Developmental pediatricians and neurologists have modified the definitions of cerebral palsy over time. Most of the time, they focused on two key hallmarks. The first one is static encephalopathy, which includes cerebral palsy resulting from a laceration in the juvenile brain, and health experts call it a nonprogressive state. It is obviously imperative to distinguish between cerebral palsy and progressive neurological states from the perspective of both taxonomy and clinical management. In the second place, cerebral palsy arises from a disarray of posture and movement, undeviating but not static. However, there is a possibility of a third feature that cerebral palsy results in progressive musculoskeletal pathology in most affected children. It is unfortunate to emphasize the point that cerebral lesion is static without clearly stating that the musculoskeletal pathology will be progressive (Nelson and Grether 1999).

The salient trait of musculoskeletal pathology is a collapse of the longitudinal escalation of skeletal muscle. Short muscle disease is an appropriate orthopedic synonym for cerebral palsy. The circumstances for normal muscle growth include habitual stretching of relaxed muscles in situations of physiological loading. The skeletal muscle does not lighten up during activity due to abnormal muscle tightness (spasticity) in cerebral palsy children. Furthermore, these children have greatly abridged activity levels because of weakness and poor balance (Krägeloh-Mann and Cans 2009). Statistical data from more economically developed countries concluded that cerebral palsy is deliberated as the most frequent cause of physical disability in children (2.0–2.5 per 1000 live births). It is considered a varied collection of clinical syndromes associated with abnormal motor patterns and postures instead of merely a particular unit. Even though the orthopedic burden, secondary to poliomyelitis and myelomeningocele, is on its last legs in most parts of the world, the manifestation of cerebral palsy is inert or escalating. Trauma in most pediatric orthopedic units has

increased its prevalence, and, therefore, it has gained substantial premeditated importance in terms of share of resources, planning, and service delivery (Reddihough and Collins 2003).

At birth, the newborn child with cerebral palsy usually does not show any deformities or musculoskeletal abnormalities. However, as the child overgrows, associated features like scoliosis, disarticulation of the hip, and unchanging contractures develop. Cerebral palsy is a constructive term that illustrates a large group of children with motor disorders from numerous reasons and is articulated as a wide variety of clinical syndromes. Therefore, cerebral palsies would be the preferred term. The augment in the commonness of cerebral palsy in preterm infants is because of neonatal intensive care and amount in multiple births. Cerebral palsy is further classified according to the movement disarray and topographical allocation. Spastic and mixed motor disorders are a reason for more than 85% of children currently, while dyskinetic cerebral palsy is rarely found. Spastic hemiplegia, spastic diplegia, and spastic quadriplegia (whole-body involvement) are the most common topographical syndromes (Bax et al. 2005).

(e) **Epilepsy**

Epilepsies are severe brain disorders and can occur at all ages. Literature on epilepsy portrayed that this condition showed various doable presentations and causes. Although in developed countries, the incidence in childhood has decreased over the past three decades, this decline is harmonized by an increase in elderly people. It is associated with multiple possible etiologies, and on the contrary, various mutations in one gene give rise to various epileptic syndromes. Most of its variants are generally complex traits with environmental effects on inherited vulnerability, arbitrated by the common disparity in particular genes. Diagnosis of the disease remains clinical, and neurophysiological examinations help diagnose the syndrome. Brain imaging helps recognize the structural and functional origins and outcomes of epilepsies. Present drugs and medications against epilepsy hold back seizures without affecting the fundamental inclination to cause seizures and are valuable in 60–70% of individuals (Moshé et al. 2015).

Epilepsy is the predisposition to the episode of wanton epileptic seizures. Different conditions may articulate themselves exclusively by persistent seizures and thus entitled as epilepsy. Epileptic seizures may also crop up due to a surplus of acute brain injuries and metabolic derangements. Those seizures generated by clear precipitants are termed acute symptomatic seizures and do not add to epilepsy even if repeated. According to World Health Organization (2006), epilepsy affects round about 50 million people all over the world, with an estimated 2-3 million existing in the US (Hirtz et al. 2007), 6 million in Europe (World Health Organization 2010), and as a minimum 40 million in the developing world (World Health Organization et al. 2005). Epilepsy pretenses a noteworthy encumber on the eminence of life of afflicted people and their families. Since the introduction of bromide as an antiseizure drug (1857), there has been a remarkable spreading out of therapies that are clinically valuable in minimizing the incidence and sternness of seizures in people with epilepsy. This class of symptomatic treatments is generally referred to as “anti-epileptic drugs” (AEDs) (Duncan et al., 2006).

Causes and risk factors for the onset of epilepsy vary with age and geographic setting. Inherited developmental and genetic conditions are mainly related to the development of epilepsy in childhood, adolescence, and early adulthood. Head strain, central nervous system infections, and tumors may take place at any age and may lead to the development of epilepsy, even though tumors are more likely over age 40 (Galanopoulou et al. 2012). Cerebrovascular disease (CVD) is the noticeable causative agent of epilepsy in people over 60 years. Endemic infections (malaria, neurocysticercosis, toxocariasis, and paragonimiasis) are linked with epilepsy in definite environments, predominantly in resource-poor countries. The existence of a family history of epilepsy appears to augment other risk factors, suggesting that the origin of epilepsy is multifactorial (Sander 2003).

(f) Motor Neuron Disease

Motor neuron disease (MND) is an intensifying, degenerative disease that primarily affects the person's motor system, resulting in significant disability and eventually death (within 3 years). In the western population (including Australia), the occurrence of MND is approximately 8 per 100,000 population. At present, around 1500 Australian patients go through the disease (Bak and Hodges 2004). There is no proper diagnostic test for motor neuron disease. Therefore, clinical evaluation is considered a suitable diagnostic tool based on symptoms of patients, neurophysiological testing, and structural imaging to eliminate imitate disorders. Clinically and pathologically, MND is heterogeneous in nature. Therefore, it is challenging to identify therapeutic and neuroprotective targets. On the other hand, advancement (better understanding of different clinical phenotypes, advancement of standards of care, the gamut with frontotemporal dementia (FTD), the part of genetics, and the global clinical trials) in topical years has encouraged groundbreaking research into this overwhelming disorder (Neary et al. 2000; Talbot 2002).

Amyotrophic lateral sclerosis (ALS), primary lateral sclerosis (PLS), and progressive muscular atrophy (PMA) are collectively considered three forms of motor neuron disease (MND). ALS is considerably the prevalent one in which there is a loss of upper and lower motor neurons (UMN and LMN), portraying a specific mixed picture. PMA is a disease condition for most LMN even though some UMN features increase late in the disease. The literature stated that PLS is the exceptional appearance of MND, and it principally includes UMN and is coupled with the best prospects. Nevertheless, some of the characteristics of LMN may develop in the long run. Captivatingly, motor neurons allocated for the pelvic floor and extraocular muscles are spared in all forms of MND (Leigh 2003). Exceptionally, MND may be coupled with extra-motor features.

On the other hand, 10% of usual ALS is related to frontotemporal dementia, even as the atypical Guamanian variant has additional extrapyramidal features and dementia. Accelerating bulbar palsy is a kind of ALS primarily influencing the bulbar region, while LMN disease predominantly affecting upper and lower limbs is also documented. In some geographical regions, monomeric forms of MND are prevalent (Oliver 2016).

At first, NF₂ was considered a subtype of NF₁, and the clinical features of NF2 were primarily illustrated in the late 1800s. NF₂ almost took hundred years to be recognized as a separate entity. However, NF₂ affects 1 individual in 25,000 and is not more prevalent when compared with NF₁ (Hogg et al. 1994). Hearing loss is primarily the first clinical sign of NF2 because of the formation of bi- or unilateral vestibular schwannomas (Shaw and Wood-Allum 2010). These tumors are present most likely on or just about the vestibular branches of both auditory nerves. When we talk about the consistency of these tumors, NF₂ tumors in patients begin uniformly as compared to NF₁ tumors in patients. These tumorous growths can even squeeze connected nerves and can originate substantial pain, intracranial pressure, and nerve dysfunction (Asthagiri et al. 2009); Gutmann et al. 2017).

(g) Multiple Sclerosis

Multiple sclerosis (MS) is a central nervous system disorder (CNS) that involves chronic autoimmune, inflammatory neurological conditions. In this state, myelinated neurons of CNS have been affected (including the destruction of myelin and axons to a varying extent). The pathway that MS usually follows is extensive and capricious. Initially, most patients experience events of reversible neurological shortfalls that are often next to progressive neurological deterioration in the fullness of time (Poser et al. 1983; Goldenberg 2012). In the United States, about 250,000 to 350,000 patients have multiple sclerosis, and 50% of them need assistance during walking within 15 years after the commencement of the disease.

The following are the four major categories (based on the course of the disease) of MS patients according to neurologists (Fischer et al. 1999):

Relapsing-remitting MS: The most prevalent type usually affects approximately 85% of MS patients. Relapsing-remitting is primarily associated with break outs, relapses, or exacerbations of symptoms; subsequently, phases of cutback when symptoms get better or fade away.

Secondary progressive MS is observed in patients with the relapsing-remitting disease. In most patients, management assisted with disease-modifying agents helps to an impediment such as succession. Nevertheless, the itinerary of secondary progressive MS continues to go downhill with or without periods of decrease or leveling off of symptom strictness (plateaus).

Primary progressive MS: It usually influences around 10% of MS patients. Symptoms keep on poorer progressively from the commencement. There are no setbacks or diminutions, but there may be an infrequent area of slight variations. This variety of MS is more challenging than the drugs and medications usually used to treat the disease.

Progressive-relapsing MS: Progressive relapsing MS is a form rarely observed and affects less than 5% of patients. It is ongoing from the start, with alternating breakouts of declining symptoms. There is no episode of cutback observed in this condition.

MS is a multifarious disease, and many genes diffidently augment disease vulnerability other than numerous definite environmental factors (e.g., vitamin D or

ultraviolet B light (UVB) exposure, Epstein–Barr virus (EBV) infection, obesity, and smoking) (Krupp et al. 1988; Dobson and Giovannoni 2018).

(h) **Guillain-Barré Syndrome**

Guillain-Barré syndrome is an acute inflammatory immune-mediated polyradiculoneuropathy. General aspects include tingling, successive weakness, and pain. Experts consider it one of the suitable examples of a postinfectious immune disorder and offer imminent into the mechanism of tissue damage in other common autoimmune diseases. It is also well-thought-out as an imprudent, self-limited, autoimmune disease prompted by a former bacterial or viral infection. *Campylobacter jejuni* is the chief causative agent of bacterial gastroenteritis globally, and it is also the most frequent forerunner pathogen (Ross 1992; Hahn 1998). The infecting agent induces humoral and cellular immuneresponses (because of the sharing of homologous epitopes) that cross-react with ganglioside surface components of peripheral nerves. Immune responses aligned with target epitopes in Schwann-cell surface membrane or myelin bring about acute inflammatory demyelinating neuropathy (85% of cases). Moreover, immune reactions against epitopes controlled in the axonal membrane cause the acute axonal forms of GBS (15% of cases) (Wise 2016).

There are four subdivisions of acute peripheral neuropathy in Guillain-Barré syndrome. Foremost proceedings have been made in accepting the methods of some of its subtypes. The history outlook of the acute inflammatory demyelinating polyradiculoneuropathy (AIDP) subtype bears a resemblance to experimental autoimmune neuritis, which is principally caused by T cells intended for peptides from the myelin proteins P0, P2, and PMP22. The objective of T-cell-mediated immunity activation in AIDP is indistinguishable, and there is confirmation for the participation of antibodies and complements (Colls 2003). According to strong evidence, axonal subtypes of Guillain-Barré syndrome, acute motor axonal neuropathy (AMAN), and acute motor and sensory axonal neuropathy (AMSAN) are attributable to antibodies to gangliosides on the axolemma that intend macrophages to march into the axon at the node of Ranvier (Hughes and Cornblath 2005). It is stated that most of the patients suffering from Guillain-Barré syndrome experienced a recent *Campylobacter jejuni* infection. Furthermore, axonal forms of the disease are widespread in these people. The lipo-oligosaccharide in the *C jejuni* bacterial wall holds ganglioside-like structures, and its inoculation into rabbits persuades a neuropathy that bears a resemblance to acute motor axonal neuropathy (Burns 2008).

The patient with GBS characteristically shows weakness together with tingling dysesthesias in the extremities. This weakness is high-flying in the proximal muscles, especially legs are more frequently affected than arms. Paresthesias occur, scattering proximally but rarely extending past the wrists and ankles. Deep tendon impulses vanish in the first few days of symptom onset (Wijdicks and Klein 2017).

(i) **Neurofibromatosis**

The neurofibromatoses comprise two discrete disorders (the genes for which have in recent times been positioned on separate chromosomes). Neurofibromatosis 1 (von Recklinghausen's neurofibromatosis) affects about 100,000 people in the USA (Martuza and Eldridge 1988). It is a widespread and potentially somber

hereditary disorder of the human nervous system. Neurofibromatosis 2 (bilateral acoustic neurofibromatosis) influences more than a few thousand Americans and has a molecular foundation analogous to that of some of the common intermittently stirring tumors (meningiomas, schwannomas, neurofibromas, and possibly gliomas) of the nervous system (Lewis and Riccardi 1981).

As an inherited autosomal dominant trait, this phacomatosis is divided into two genetically distinctive subtypes differentiated by several cutaneous lesions and the peripheral and central nervous system tumors. Neurofibromatosis type 1 (NF1) influences approximately 1 in 3500 individuals and presents with distinguishing abnormalities of the skin and the peripheral nervous system (Boyd et al. 2009). On the other hand, neurofibromatosis type 2 (NF2) has a rare incidence and occurs in less than 1 in 25,000 people. Most of the time, the first clinical signs of NF2 become obvious in the adolescents with an unexpected loss of hearing ability because of the development of bi- or unilateral vestibular schwannomas. Moreover, NF2 patients may suffer from other nervous tissue tumors like meningiomas or gliomas (McClatchey 2007).

3.6 Psychiatric Disorders

The Diagnostic and Statistical Manual of Mental Disorders (DSM) is a widely used instruction book for clinicians and psychiatrists in America. American Psychiatric Association (APA) published this book to diagnose psychiatric illnesses, and it covers all categories of mental health disorders for both adults and children.

According to DSM, major depressive disorder (MDD), bipolar disorder, generalized anxiety disorder (GAD), posttraumatic stress disorder (PTSD), obsessive-compulsive disorder (OCD), attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorder (ASD), and schizophrenia (SCZ) are the major psychiatric disorders present worldwide (Cooper 2017). Psychiatrists perceived these disorders as a negative emotional experience. Several cognitive, biochemical, behavioral, and psychological conditions are associated with these psychological disorders. Depression, stress, and anxiety are highly concurrent, widespread, and persistent mental disorders with some properties like stumpy cognitive and emotional reactions. According to a random survey, depression prevalence is about 15% during the lifecycle. Nowadays, it is considered the key reason for disability worldwide and is in the fourth position among the ten most essential etiologies of the world load of diseases. In depression, after cardiovascular disorders, the incidence will be increased to the second supreme risk of morbidity, causing a significant socioeconomic burden (Hammen 2015).

(a) Anxiety

Anxiety is a booming state of affairs of emotional incentive that contains trepidation or worry. Contrasting the patients with fear and horror, the patients with worry frequently be aware of danger sources indistinctly. Research data revealed that

anxiety, among the behavioral problems, has the uppermost recurrence rate. Furthermore, studying factors affecting students' anxiety reveals that physical, social, growth, and affective factors affect their anxiety. In an average estimate, around 500 million people worldwide suffer from anxiety disorders (Bandelow and Michaelis 2015). Anxiety, in general, has diverse psychological and physical signs, including tremors, muscle cramps, perspiration, asthma, nausea, aggravation, urination, feeling of fear and stress, failure to come across the position, vagueness about the future, probability of sadness and distress, lack of ability of attention, and night sleeplessness. Furthermore, research studies portrayed neurobiology abnormalities of noradrenergic, serotonergic, GABAergic, and glutamatergic transmission as the pathophysiology of anxiety. Participation of these systems is imitated in the usefulness of benzodiazepines, selective serotonin reuptake inhibitors, and selective serotonin and noradrenaline reuptake inhibitors in treating anxiety (Torgersen 1983).

(b) Major Depressive Disorder

Major depressive disorder (MDD) is a debilitating ailment condition that shows characteristic features like disheartened mood, moderated interests, weakened cognitive function, and vegetative symptoms, such as perturbed sleep or appetite. MDD becomes apparent about twice as frequently in women than in men. Furthermore, it affects one in six adults in their life span. MDD showed multifactorial etiologies, and its heritability is predictable to be in the order of 35%. Besides environmental factors, some other factors like physical, sexual, or emotional mistreatment during childhood are strappingly coupled with the risk of developing MDD. However, no traditional mechanism can make clear all features of the disease. Conversely, MDD is linked with amendments in local brain volumes, principally the hippocampus and functional modifications in brain circuits (e.g., the cognitive control network and the affective salience network) (Otte et al. 2016).

In addition, disorders in the foremost neurobiological stress-responsive systems (counting the hypothalamic, pituitary, adrenal axis, and immune system) occur in MDD. The incidence of five of the nine criteria symptoms (disheartened mood, loss of interest or pleasure, change in appetite, sleeplessness or hypersomnia, psychomotor shakeup or retardation, exhaustion, feelings of worthlessness or federation, poor concentration and difficulty making decisions, or suicidal ideation) over a period of at least 2 weeks confirm the presence of disease. Therefore, management of MDD first and foremost includes psychotherapy and pharmacological treatment. For patients who have not responded (treatment-resistant patients) to several intensifications or mixture treatment attempts, electroconvulsive therapy is the treatment option with the best empirical support.

(c) Bipolar Disorder

Bipolar or [manic depressive disorder](#) is a recurrent, rigorous, mostly persistent mood disorder allied with immense morbidity. The incidence of bipolar disorder is about 1.3–1.6% worldwide. The mortality rate of BD is two to three times more elevated than that of the wide-ranging people. Research indicated that approximately 10–20% of patients who have bipolar disorder take their own lives (suicide attempt). Moreover, about one-third of individuals acknowledge at least one suicide

effort. The clinical demonstrations or signs and symptoms of this condition are remarkably varied. They assort from gentle [hypomania](#) or placid depression to rigorous kinds of obsession or depression in the company of insightful psychosis. Bipolar disorder is thought to be one of the core basis of disability among young people, resulting in cognitive and functional mutilation and increased mortality, predominantly death by suicide. Increased incidence of psychiatric and medical comorbidities is distinctive in affected people (Garcia-Blanco 2016; Taylor 2016).

No less than one agitated episode is defined by a high-minded or short-tempered mood together with at least three coupled symptoms like pomposity, diminished sleep needs, influenced speech, a voyage of ideas, trouble-free distractability, raised goal-oriented activity, or impulsivity. Bipolar disorder is uniformly widespread across both sexes, with the exemption of hasty cycling, a stern, and challenging to treat alternative of the disorder, which arises primarily in women (Anderson et al. 2012). Precise diagnosis of bipolar disorder is intricate from a clinical point of view because the onset is more frequently a depressive event and looks comparable to unipolar depression. In addition, there are no suitable biomarkers for the disease. For that reason, the role of clinical evaluation hangs on explanation. Revealing hypomanic periods and longitudinal evaluation are central to distinguishing bipolar disorder from other conditions (Das 2005). Existing social contact of the increasing pharmacological and psychosomatic strategies in bipolar disorder is of intense significance. Long-term prophylactic pharmacological treatment is indicated in case of the amplified menace of recurrence and suicide. [Lithium salts](#) are the preferable long-standing precautionary treatment for bipolar disorder. They also hold well-documented antisuicidal effects. As the second choice, prophylactic treatments are [carbamazepine](#) and [valproate](#), even though verification of their usefulness is scrawny (Geddes and Miklowitz 2013; Newman 2021).

(d) **Generalized Anxiety Disorder**

Generalized anxiety disorder (GAD) is a unremitting, ubiquitous, and debilitate disorder. It is an established and disabling disorder characterized by continual worrying, anxiety symptoms, and anxiety. It is, however, the frequent anxiety disorder in primary care, with an incidence of 22% of primary care patients who complain of anxiety and depression. Woefully, this condition lacks particular research attention due to the variable diagnostic status of GAD. Criteria of diagnosis for GAD, compared to the other anxiety disorders, have noticeably oscillated with each edition of the DSM. Even though this disorder has have more steadiness in diagnostic criterion in up to date years with the publication of the DSM-IV in 1994. However, there is still a question about the crucial criteria and duration of symptoms required for diagnosis. For instance, numerous research studies put forward that the 6-month least duration of extreme worry and anxiety may not be needed and may even forego on a small but considerable number of people who present with all other symptoms of GAD but for a shorter duration (Spitzer et al. 2006).

The predominant velocity of GAD in primary care, compared to that reported in the general population (12-month prevalence 1.9–5.1%), proposes that GAD patients use primary care reserves more frequently. It is reported that GAD affects

women more than men and even rates are high in midlife (35: 10%) and adult subjects but comparatively near to the ground in adolescents. The expected track of GAD can be characterized as chronic with few complete diminutions, a peaks and valleys course of GAD symptoms, and the incident of considerable comorbidity for the most part with depression. Individuals with GAD make obvious a substantial degree of mutilation and disability, even in its untainted type, straightforward by depression or other mental disorders. The extent of injury is comparable to that of cases with major depression. GAD comorbid with depression typically reveals by a long way higher numbers of disability days in the past month than any condition in its wholesome form. Accordingly, GAD is connected with a momentous economic burden due to compromised work efficiency and augmented use of health care services, particularly primary health care (Wittchen 2002).

(e) **Posttraumatic Stress Disorder**

Posttraumatic stress disorder (PTSD) is that only mental condition of known etiology. The cause of PTSD can be an event that involves warning or threat to the physical uprightness of oneself or others and induces a rejoinder of strong fear, vulnerability, or disgust. According to research findings, a sudden tremendous stressor may cause posttraumatic stress disorder (PTSD). Central traumatic incidents include conflict, aggressive personal assault (sexual assault, and physical attack), being taken captivated or hijacked, detention as a prisoner of war, torment, terrorist attack, relentless car accidents, and natural catastrophes (Yehuda et al. 2015).

Sexual assault or observing serious injuries or death of loved ones during childhood are among important distressing events. PTSD can be classified into two types of acute and chronic PTSD: if symptoms persist for less than 3 months, it is termed as acute PTSD, while on the other hand, it is called chronic PTSD if it stays for more than 3 months. About 60.7% of men and 51.2% of women would go through as a minimum one potentially traumatic episode in their lifetime. The frequency of PTSD in crime victims is about 19–75%; pace as high as 80% has been identified following rape (Yehuda 2002).

Female gender, preceding psychiatric history, concentration and nature of coverage to the traumatic affair, and need of social support are known risk factors for work-place PTSD. Furthermore, working together with severely ill patients, journalists, and their families, and viewers who witness serious trauma and battle at increased risk of PTSD. It is allied with clinically significant agony or mutilation in social, work-related, or other important areas of functioning (Bryant 2011).

Literature on PTSD stated that psychologists suggest the presence of any three of the following symptoms from each clusters (Pacella et al. 2013):

- (a) Intrusive recollection in which the distressing exposure is continuously being faced in at least one of the following ways (Fig. 3.4).
- (b) Avoidant/numbing: three of the following states (Fig. 3.5) present in case of persistent circumvention of spurs allied with the trauma and deadening of general approachability (not present before the trauma. Hyper-arousal: two of the following (Fig. 3.6) tenacious symptoms of increased arousal (not present before the trauma).

Multiple biological systems (e.g., brain, cellular, immune, endocrine, and metabolic functions) are affected by PTSC. Various treatment approaches (combination of medications and psychotherapy condition) have been adopted to manage this psychological condition, with psychotherapy overall showing greatest efficacy (Shalev et al. 2017).

(f) Schizophrenia

Schizophrenia, in general, arises in response of additive and interactive effects of both genes and environment (van Os et al. 2010). Genes responsible for schizophrenia and some other psychological disorders are greatly expressed in the human brain during mid-gestation period (duration coinciding with cortical neurogenesis, axonal path finding, and neuronal functional development). Brain anatomy during schizophrenia involved changes in the structure and function of prefrontal and medial temporal lobe regions. These regions are associated with declarative memory. Sequentially, the characteristic start age of schizophrenia is about early 20s to 30s and is headed by cortical excitatory synaptic transformation and mellowing of the inhibitory system.

In the patient’s brain, loss of particular neuronal subtypes and cortical layer disorganization has been observed in neuroimaging and autopsy examination. Conversely, the starting point of these changes has persisted indescribable. Functional imaging tools revealed an abnormal activity when patients are involved in different cognitive tasks (assess their short term memory as well as long term memory, decision making abilities an emotion processing) (Messias et al. 2007). Similarly, improved structural and functional brain connectivity have been interrelated to schizophrenia but the neurobiological mechanisms lashing these changes are not entirely tacit. Social or professional dysfunction occurs in the locale of at least 1 month where one or two of the following occur: misconceptions, phantasm, muddled speech, confused behavior, lack of motivation, horizontal affect, or alogia. Inherited abnormalities including gray matter of schizophrenic patients are linked with intrauterine risks including fetal hypoxia (Räsänen et al. 2022).

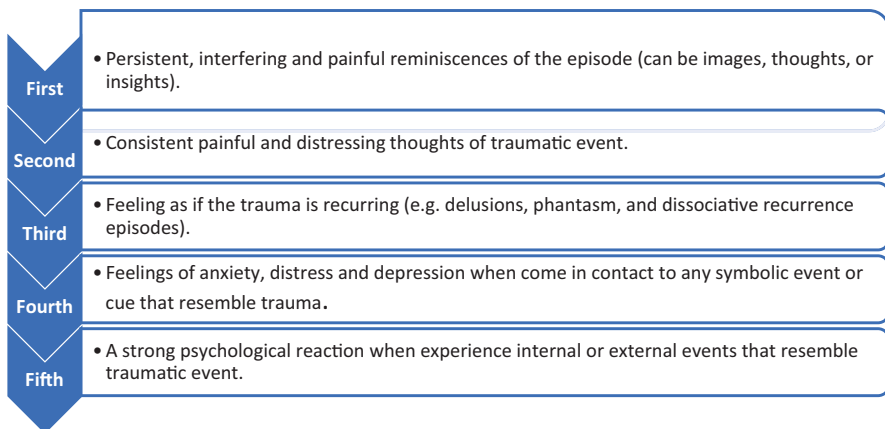


Fig. 3.4 Symptoms of Intrusive recollection

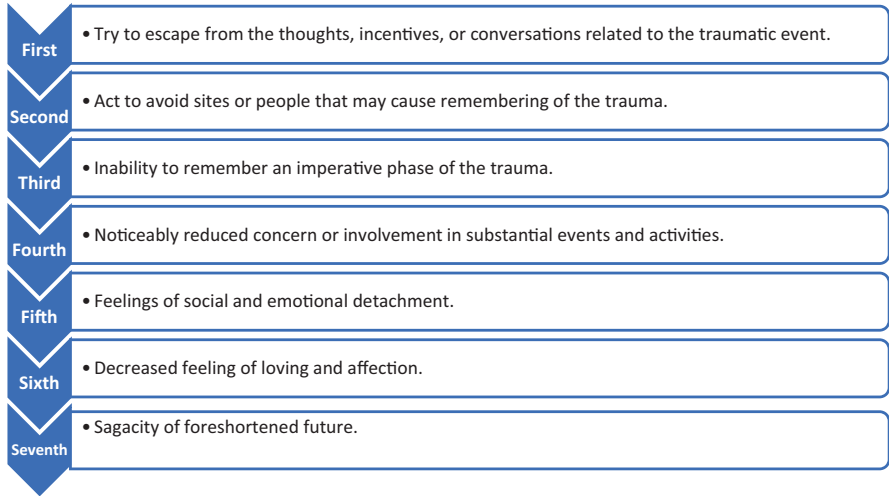


Fig. 3.5 Symptoms of avoidant/numbing

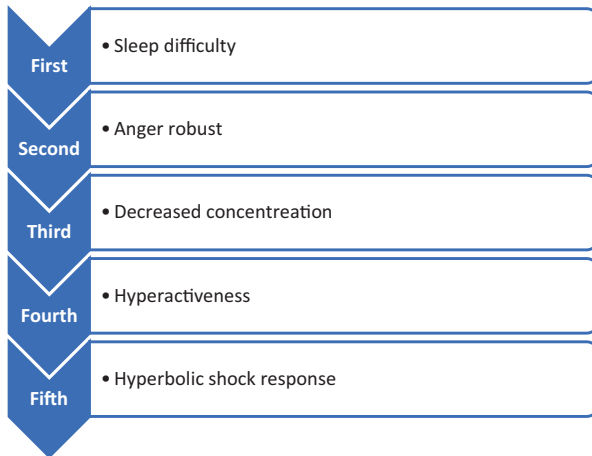


Fig. 3.6 Symptoms of hyper-arousal

3.7 References

Amygdala as a Trusting Brain

Trusting people is an adaptive ability of humans; it means the brain processes the feelings of attachment when we meet someone for the very first time. Amygdala is actually the brain part that tells us whether someone is safe or dangerous. Either it

will be okay to trust him or not. Some people's amygdala works amazingly and has the potential to differentiate clearly between "truth" and "deception" (Carter 1999). The amygdala releases oxytocin, a hormone, in the brain and body when it senses that some are trusting us. This bond is very important while building your social bonding and interactions. Modern science called it "gut feeling" that tells someone is trustworthy. Trust brings about trust as both participants produce oxytocin, the fourth principal human drive for intimacy, compassion, and collaboration (Society for Neuroscience 2003).

Brain and Trauma

The brain is well-designed to manage stress and danger. When, at first, the brain faces any unfamiliar person or stimuli, it perceives them as threatening or possible danger. The brain perceives these stimuli as a danger until we develop positive interaction with that incentive. During trauma or any painful event, the distressing experiences attached to it produce painful feelings, and the individual embraces defensive managing behavior to avoid relapse. This situation has been observed primarily in children who have tremendous brain growth and development potential. Unfortunately, the traumatic events in their childhood suppress this potential to grow and develop. According to a research study conducted by Gaskill and Perry (2011), children who experience trauma during their childhood are more likely to use their primitive brain systems. They easily may be triggered by some destructive emotional impulses (hurting themselves). The regulation and management of this situation involve mature capacity in the higher brain centers (Aggleton 2000).

Multiple Choice Questions

1. The brain has an intricate and three-dimensional structure consisting of the cerebrum, the brain stem, and the cerebellum. ----- holds cerebral hemispheres and diencephalon while ----- holds the midbrain, pons, and medulla.
 - (a) Brain stem, cerebrum
 - (b) Cerebrum, spinal cord
 - (c) **Cerebrum, brain stem**
 - (d) Spinal cord, cerebrum
2. ----- is positioned between the diencephalon and the pons. It contains the cerebral aqueduct that interrelates the third and fourth ventricles.
 - (a) Telencephalon
 - (b) Diencephalon
 - (c) Mesencephalon
 - (d) Metencephalon
3. According to Addotta (2006), anger comes from the reptilian part of our body known as the -----.

- (a) Cerebrum
 - (b) Cerebellum
 - (c) **Amygdale**
 - (d) Spinal cord
4. Alzheimer's disease is the most common form of which of these?
- (a) Malnutrition
 - (b) **Dementia**
 - (c) Fatigue
 - (d) Psychosis
5. Parkinson's disease is marked by a lack of a chemical in the brain?
- (a) Serotonin
 - (b) GABA
 - (c) **Dopamine**
 - (d) Norepinephrine
6. What are some symptoms of cerebral palsy?
- (a) The baby doesn't roll over in either direction
 - (b) The baby cannot bring her hands together
 - (c) Baby has difficulty bringing her hands to her mouth
 - (d) **All of the above**
7. In phobia, individuals acquire a robust set of phobic beliefs, which:
- (a) Information about why they think the phobia is threatening
 - (b) How to react when they are in the phobic situation
 - (c) Appear to control their fear
 - (d) **All of the above**
8. Another term that has been previously used for bipolar disorder is -----.
- (a) Schizophrenia
 - (b) Paranoid schizophrenia
 - (c) **Manic depression**
 - (d) Multiple personality disorder
9. PTSD may follow after an event such as:
- (a) Natural disasters and serious accidents
 - (b) Military combat and terrorist incidence
 - (c) Violent personal assaults and sexual assaults
 - (d) **All of the above**
10. DSM stands for:
- (a) Diagnostic and scientific manual of mental disorders
 - (b) Diagnostic and statistical manual of major disorders
 - (c) Diagnostic and scientific manual of major disorders

(d) **Diagnostic and statistical manual of mental disorders**

11. The part of the brain that handles language, reasoning, and emotional control includes:
- (a) The survival brain
 - (b) The emotional brain
 - (c) **The logical brain**
 - (d) The prefrontal cortex
12. The brain stem or reptilian brain usually controls one of the following actions:
- (a) Reasoning and language
 - (b) Trigger emotions and long term memory
 - (c) **Fight or flight mechanisms**
 - (d) Motivate behavior

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Chapter 4

Factors Controlling Anger



Asma Khan, Umar Bacha, and Ammara Arshad

4.1 Introduction

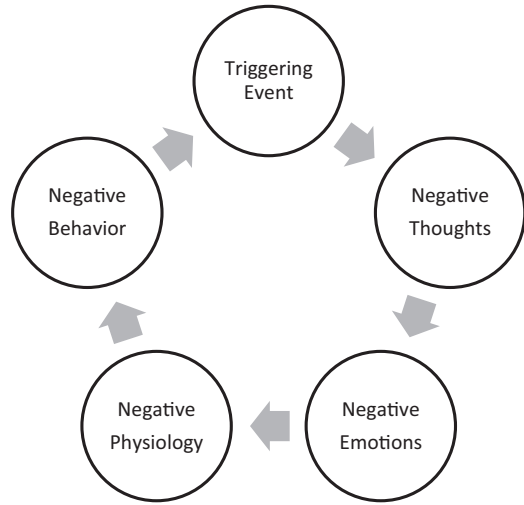
Anger is basically an amalgam of thoughts, feelings, behavior, and physiology. These four components run a cycle, and this cyclic cascade starts from a triggering event but ends with a negative behavioral response. Figure 4.1 represent components of anger and their interaction.

According to behavior therapists and psychologists, the type of interactions among different components of anger can directly impact how negative behaviors should be controlled or managed. The interaction between feeling, thinking, and behavior can be studied using the following approaches:

- Psychological interrelatedness between thinking, feeling, and behavior
- The behaviorist tactic to understand the interrelationship between feeling, behavior, and thinking
- Cognitive-behavioral approach for the link between feeling, behavior, and thinking

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Fig. 4.1 The complex interaction of components of anger



4.2 Psychodynamic Approach

Sigmund Freud's idea of the psychodynamic approach (1967) demonstrated the prime importance of emotions and feelings in driving angry behavior. According to this approach, an emotionally insecure person will express anger as a self-defense mechanism.

4.3 Behaviorist Approach

The behaviorist approach sees behavior as the primary factor in anger stimulation. A negative behavior leads to negative emotions and thinking, which ultimately give rise to another adverse behavioral event. Another way of reviewing this approach is through the “**ABC model**,” a behavior management tool. ABC model involves functional analysis of behavior and concludes that behavior (B) is a summation of forerunners (A) and outcomes (C), which means events triggering the behavior or its consequences should be maneuvered to prevent the occurrence of a particular behavior.

4.4 Cognitive-Behavioral Approach

The believers of this approach say that it is not the triggering event that generates anger in us; instead, it is the thinking pattern we adopt about the triggering event, which can result in outrage. This can be justified because the same awful event happening to five different individuals will result in five different reactions depending

upon their beliefs and thought patterns. Therefore, we can control reaction intensity in anger by changing the way we interpret and process our triggers.

Aaron Beck (1988) described the problematic thinking as “extremist thinking” with yes-or-no, all-or-nothing, and black-and-white patterns. It is important to predict a person’s internal thoughts and self-talk dialogues when triggered with anger. This can help identify the thought pattern and replace it with rational thinking. The rigid thought pattern can also be the result of irrational beliefs. Persons with anger issues often irrationally depend on the views and values that other people give to them. In this case, the arousal of anger is an unavoidable fact because no one can expect to be treated precisely according to their real worth and value.

Another critical component of anger is brain anatomy and “physiology.” “A healthy body has a healthy mind” and vice versa. The parts of our brain’s amygdala and frontal lobe play an essential role in regulating negative emotions (anger, jealousy, pain) and positive emotions (happiness, gratitude). Therefore, any defect in these parts of the brain will definitely affect the regulation of emotions. To justify this, here is the case study of Phineas Gage. In 1848, Phineas Gagean American railman (1823–1860), experienced a traumatic brain injury when an iron rod was driven in from his left cheek and exited from the skull. As a result of this injury, his frontal lobe got damaged, but he survived miraculously. However, after this injury, he exhibited significant behavioral changes. He could not be able to control his anger and become very irritable and eventually lost his job. Now let us dig into the anger physiology. When a person is angry, there is a shift from normal physiology to adrenalin, and cortisol causes arousal of symptoms.

Symptoms of anger generally include faster breathing, pounding heart, upset stomach, cold sweats, face pallor with antecedent flushing, muscle tension in limbs, pupil dilation, and psychomotor agitation. The underlying physiological changes to support the phenomenon of anger start when the brain signals adrenal glands to release adrenalin and cortisol. These chemicals in the bloodstream give rise to blood glucose, which serves as active fuel for energy production. To utilize glucose as an energy substrate, we need oxygen provided by rapid respiratory activity, i.e., heavy breathing and flared nostrils. Therefore, excessive oxygen and glucose supply will enable sufficient energy production and utilization of active muscles.

Adrenalin plays a significant role by increasing the heart’s ability to pump faster, increasing blood pressure, and, consequently, oxygen transport to muscles in need. Another mechanism that a body prepares itself for with the aid of cortisol is the release of clotting factors, which are primarily increased to ensure survival in case of bleeding injury during an episode of anger outrage. The blood supply is maximum towards muscles (limbs) and least towards the digestive system, leading to indigestion decline. As a result, an angry person often has very low to no appetite and often feels a parched mouth.

The blood supply to the analytical part of the brain also reduces, and thus a person’s ability to stay rational declines in anger. The blood supply to the face is also reduced, which is the reason for pallor. The body’s effort to produce a large backup of energy will leave you heated, and there come the role of sweating to cool you down. Finally, the dilation of pupils is meant to make you vigilant about all the

quirky moves of your rival. This manifestation of sympathetic nervous system activation is constructive for situations when an individual's life is threatened, and the impact subsides once the threat is over.

A similar fight and flight response is also common when a person opts for strenuous physical activity (strength training) but achieves a healthy equilibrium afterward. However, this physiological response of the body becomes pathological when it gets hard for the body to normalize the cortisol levels, which generally has a longer stay time in the body than adrenalin. In addition, if a person stays persistently angry, the level of stress hormones in the blood will also remain high, impacting that individual's overall health. According to Morilak, in times of a threat (provoking fear or anger), behavioral adaptations to maintain homeostasis is activated with the adrenaline system (Morilak et al. 2005).

Individuals facing anger issues have more probability of getting sick with many illnesses, including metabolic and psychological disorders. It is also known that higher anger expression is associated with a higher prevalence of metabolic syndrome in older adults (Boylan and Ryff 2015). Adrenaline-associated vasoconstriction can also lead to an episode of stroke. The bottom line is "anger can kill you." Ronald Potter-Efron, a clinical psychotherapist and a recognized anger expert, stated that anger is a real health risk. The medical problems and anger can also route to violent behaviors, hurting the angry person or the people surrounding him. Rash driving is often practiced as an expression of anger in this modern world. Teens get into actual physical fights when angry and reach the point of blind rage. "Blind rage" is a term used to describe a person who has attained the level of madness, leaving all logical reasoning behind. A person in the stage of blind rage can cause serious physical harm to others or even himself.

The term "trigger" is extremely vast and exists with inter-individual differences. For example, a threat to self-preservation in any form can act as a trigger. Anger is actually a sign that someone has appeared to harm your personal worth, basic convictions, or simply in reaction to preserve your basic needs. To put it simply, the trigger can be anything that violates an individual's boundaries and forces him out of his comfort zone.

4.5 Personal Worth

The most hurtful situation for any individual is to face rejection or abandonment. A man, for instance, can experience extreme anger, if he is being treated rudely and has to face a romantic rejection. Interpersonal events such as refusal of a marriage proposal are one of the known causes associated with anger. The anterior insula and dorsal anterior cingulate cortex (Dacc) mediate the socioeconomic theory in which a person links their self-esteem with relational value in life, according to neuroscientific investigations suggested by Leary. These neural regions are involved in physical pain that may assist in summarizing why people report that they are hurt when others devalue or reject them.

4.6 Essential Needs

Although we as living beings need food, water, oxygen, and shelter to survive, emotions are unavoidable. Emotional needs are considered one of the most basic needs of human beings. One experiences them when feels happy, satisfied, or at peace. A person deprived of emotional needs may feel exasperated, hurt, or dissatisfied. Feeling appreciated, accomplished, safe, or part of a community are some examples of emotional needs. Anger manifestation can be reported more in communities where essential needs are not being met. Human beings can be categorized into “money-can’t-buy happiness type” and “money-is-key-to-life type.” If primacy at the heart of an individual is money, devoid of emotions cannot be a basic trigger for anger.

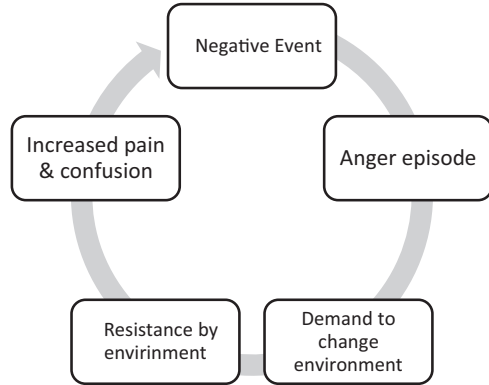
4.7 Basic Convictions

Basic convictions are beliefs that someone is firm about and religiously follows. Some fundamental convictions today are gender equality and women's empowerment, extra marital affairs, body shaming, sexual objectification of women on media platforms. All of the preceding matters are undoubtedly important, but one should know where these firm beliefs can turn their path and trigger anger. We cannot control society and all events happening around us. Taking a stand for your convictions is one thing, but we should learn that nothing is perfect and develop tolerance towards certain aspects without disturbing our mental peace. We might be sharing geographical areas with many people with different beliefs and convictions, so avoiding and accepting are the two best policies to stay calm. The bottom line is anger should not be associated with trivial matters.

After learning about basic triggers, we can try to answer a very difficult question. Is anger good or bad? Answering this question might seem tricky, but it becomes easy to identify your type of vulnerability by defining anger as intent to preserve basic needs, self-worth, and convictions. If your anger is a reaction to your unmet needs or violation of convictions irritates you, this is potentially a normal form of anger and is considered healthy. We call anger a negative emotion just because we do not enjoy being angry, as it is often associated with other depressing emotions, shame, guilt, and anxiety. But just like pain as an indicator of any pathological event inside the body, anger also indicates that the situation is alarming. In most cases, anger subsides and does not convert into rage if it is not ignored or suppressed.

The problematic form of anger intends to harm or physically abuse a person associated with your trigger. Anger, in extreme cases, can force us to do violent things, just as forcing someone to meet our emotional or financial needs and punishing them in case they fail to do that. A basic understanding of anger has made us informed that anger has three major functional types; in other words, we can say that anger is meant to perform three functions for us:

Fig. 4.2 Nonproductive anger cycle



- Anger as a response to deprivation
- Anger as a tool to fulfill needs
- Anger as a way out of pent-up emotions

Now, we are surely able to distinguish between “normal” and “problem” anger. Each of us gets angry at some people, things, and events, which is entirely normal. Normal anger makes you aware of the gap between your needs and efforts. The feeling of anger can also motivate you to work hard to meet your needs or surround yourself with people who can help you achieve your goals. Problem anger, on the other hand, is a nonproductive anger cycle. Anger yielding very short-term benefits at the expense of long-term losses and disadvantages. Acute episodes of anger very often can cause severe health risks. Physicians mostly come up with a yes to answer questions like, can emotional stress bring on the stroke? Or does emotional and physical stress are known to provoke ischemic events? Let us have a graphical view of a genuinely futile nonproductive cycle of anger (Fig. 4.2).

Suppose a person in a painful negative situation tries to change the non-modifiable factors of the environment or becomes impatient to see the results of efforts he made to change the situation. In that case, he will eventually fail and get trapped into a vicious nonproductive cycle, causing increased pain, irritability, distraction, depression, anxiety, insomnia, lack of work, and feeling of ease and pleasure.

4.8 Factors Controlling Manifestation of Anger

Four major aspects influence the way we respond to any negative situation, including anger:

1. Knowledgeable responses
2. Credence systems
3. Comatose motivators
4. Individual variance

4.9 Anger as a Knowledgeable Response

This factor is of prime importance because we learn about emotions from our mother's lap. The care, empathy, and warmth are transferred from a mother to child and become part of basic instinct. In addition to that, a child also idealizes his mother in difficult and stressful situations. It is rightly said, "brave moms, brave kids." Childhood and teenage experiences are often imprinted on our mind and lay the groundwork for our future behavior patterns. Another approach to learned behavior is that "A person getting favorable results from a past behavior will definitely continue practicing it." Thus, our early experiences of others' anger manifestation and reactions to our anger will determine our future behaviors.

4.10 Anger and Our Belief Systems

According to rational emotive behavior therapy (REBT), a cognitive approach to explaining behavior suggests that our perceptions and beliefs about a particular situation affect our response. It is not the event; it is the thinking pattern that makes us angry. For example, a student fills an online teacher's performance evaluation and rates the evaluation with a B due to poor comprehension of the subject. Instead of considering a constructive approach, the teacher explodes upon reviewing the assessment by the student and grades her back with C. In the example mentioned above, the teacher is sure of the belief system that a person's worth is determined by what others think of him and not by the actual credentials she holds. Such persons are the most sensitive and problematic members of our society. Problem anger is more common in individuals with black-and-white thought patterns with rigid thinking, allowing no room for even constructive criticism. In the given example, the teacher might think that the student has questioned her credibility or internally wishes to improve but has already put in maximum effort. The student review might not be according to her expectation. These internal perceptions result in an anger outbreak that comes into view as unjust to the student who has just been trying to give his genuine opinion.

4.11 Anger and Comatose Motivators

Self-awareness is something not common in the modern world of hustle. A person might not be completely aware of all their desires, fears, and motivation. The **Freudian model** of psychology describes such longings and fears as unconscious motivators. These motivations actually carve a thought pattern that indulges emotions in the meshwork and leads to positive or negative behaviors.

A person preoccupied with feelings of fear due to some awful past experience will develop an angry personality to use it as a strategy and limit further self-damage (instrumental anger). A person with a dependent personality disorder has a preoccupation with blaming others and high demand for retribution, so anger will be a basic approach to meet the desires. A very angry, unmanageable child at school might behave so because of a history of fear of separation of parents due to death or family breakdown. Such children are found in deliberate fights with other adults, including teachers in school, to test their relationship in fear of being abandoned again.

The fear of loss predominates everything, and a child becomes very irritable, picky, and angry. Unconscious motivators are a point of interest for individuals whose anger triggers remain undiagnosed and unresolvable for years because the root cause is unknown. Identifying underlying motivators can help understand the behavior and modify it.

4.12 Anger and Individual Differences

The literature presents strong evidence that human brain anatomy and physiology contribute to a greater or lesser extent in driving emotional reactions. Emotion, in the neurobiological aspect, is linked to the reply of neural tracks by which individuals allocate force and valence to objects and locations in the environment and interior states. Differences in emotional states occur with a discrepancy in neurobiological systems that process stimulus triggering emotions and also influence emotional outputs. Hippocampus, amygdala, prefrontal cortex (PFC), and anterior cingulate cortex are the brain structures that process emotions (Bevilacqua and Goldman 2011).

The person having difficulty feeling and interpreting emotions has different neurological circuits than the one who is very sensitive and emotional. However, healthy expression of emotion is possible by increasing emotional literacy and awareness. Other factors that might be the reason for interindividual differences in anger manifestation and control are stress, love relationships, workload, physical health, and drug abuse. These external factors influence emotions again partially or entirely depending on the internal factors mentioned above (genetics and neurobiology of emotions).

Depending upon the triggering factor and underlying approach to processing anger, the manifestation can be of the following forms:

1. Displacement
2. Repression
3. Suppression
4. Ineffective expression
5. Effective expression

4.13 Displace Danger

Anger displacement expresses anger and agony toward a person or object other than the real trigger, and this is called anger displacement. This might occur in situations when a person suffering from an anger episode does not have the authority or power to express the emotional baggage on the real focus of anger. A student scolded by a teacher in a university in the presence of the whole class, hitting his younger brother at home, is an example of anger displacement. In such cases, emotion pent-up is released, and the doer feels relaxed. However, it is likely to spoil relationships with people you have chosen to be victims of your displaced anger.

4.14 Repressed Anger

The term repression came from the concept that if a person is unaware of the unconscious motivators. The unconscious brain is implicit in being able to stock up memories and control behavior, devoid of informing our conscious. For example, repressed anger is a form that triggers emotional turmoil and associated physiology in our body but of which we are unaware. Anger outbursts can be the case when an individual fails to channel the emotions properly. The management, in this case, would be helping the individual to bring the unconscious triggers and emotions into conscious awareness.

4.15 Suppressed Anger

The anger which is not expressed by choice and is retained is called suppressed anger. According to social and moral values, frequent expression of anger is considered wrong and inappropriate. The cultural values of some communities even do not support the use of loud tones and the expression of negative emotions in families. For instance, we are always encouraged to thank you and express gratitude when we receive a gift, even if we do not like it. True feelings are often masked and not expressed if they have the potential to hurt the other person. Persons with a habit of suppressing anger end up being frustrated and confused. The verbal expression can be controlled; however, the nonverbal expression of the body (body language) can communicate a clear signal that we are annoyed. Consequently, it is important to learn self-assured ways to articulate feelings. Strong negative feelings, if not communicated, can result in a blind rage.

4.16 Ineffective Expression

Anger expressed ineffectively or suppressed leads to an irrational episode of anger outrage that we often regret later. This anger outburst can involve both verbal and physical abuse. Verbal expression of problem anger includes condemning the person and calling them bad with abusive language. For example, a person manifesting problem anger can use the following verbal expressions, “I hate you; I simply can’t stand you anymore”; “I will never be able to trust you again”; “My head is boiling, probably I will hit you with something”; “Leave! Right Now! You Idiot.” When we are in an angered state, adrenaline-associated physiology change occurs, making it even harder to keep sane. Another form of problem anger is when you do not actively participate in outrage; instead, you plot revenge behind their backs. This type of expression also harms you by wasting a lot of energy and time. Moreover, problem anger can lead to some real health concerns.

4.17 Effective Expression

Effectively expressed anger gives you the prospect to learn and manage your issues. Anger can be expressed in a way that does not harm the self-respect of the opponent. We can put our concerns firmly but with room for discussion. Not everyone is born with a similar mindset as yours; respecting a different perspective definitely creates opportunities for growth and learning. The citation, I disapprove of what you say, but I will defend to the death your right to say it, from Voltaire summarizes the situation well.

Feelings can be articulated without being offensive and blaming the other person, and transformation in behavior can be requested positively. As far as internal factors are concerned, we can work to manage them as well. So, let us discuss some important points for anger control and management.

4.18 Food and Nutrition

Many psychologists and clinical dietitians are strong believers that simple carbohydrates contribute to provoking anger. This is mainly because simple carbohydrates, also known as low glycemic foods, do not stay long in the blood. Instead, they give a surge in the bloodstream, and after dropping concentration, they leave you in a hypoglycemic state. When blood sugar level drops too much and is not refueled, your body compensates by releasing adrenaline and cortisol, the same hormones released when you feel threatened. These hormones make you overly sensitive to others’ negative remarks and actions, and they initiate your body’s fight-or-flight response, even though you are not actually facing a real threat. Have you ever heard the word “hanger”? It’s an amalgamation of two words, hunger and anger, and it refers to the kind of irritability you may experience when you are hungry. All this information brings us to two recommendations we would like you to consider:

- If you become angry more often, watch your diet. Eat lower glycemic load foods, i.e., whole bran, brown rice, and leafy vegetables.
- Discuss your conflicts and problems after meals, when blood glucose levels are stable and adequate. It turns out that there is wisdom in that old piece of advice to eat a healthy breakfast before going to work or school.

4.19 Forgiveness

Forgiveness is a process, and it takes some time to occur. It is not just a switch to turn on and off the light. It involves a slow mind shift that allows you to understand the person who has harmed you and partly remove yourself from the sufferer's role. Forgiveness stimulates peace of mind and body and makes one life smooth and easy-going, and one can make better decisions in life with a peaceful mind and body. It involves lessening the frequency, intensity, and duration of anger, bitterness, and thought of vengeance. In this way, forgiveness primarily benefits the forgiving person.

4.20 Forgiveness and Religion Islam

The Holy Quran emphasizes quite on forgiveness, which is defined as ignoring the misdeed of a person who has done maltreatment by insulting you, committing physical blitz against you, or damaging the property you owe. Islam considered the concept of revenge (e.g., in form of Qisas), but granting forgiveness is considered way more. It is really difficult for one to avoid revenge, but it can only be done with the help of Allah. Former president of the Islamic Society of North America, Dr. Muzzamil Siddiqi, emphasized on the importance of mercy and forgiveness of Allah. Therefore, Islam encourages Muslims to choose the path of forgiveness.

If we study the history of Islam, we go through many examples of absolution and mercy. For example, in 630 A.D, Mekkah was conquered by Muslims led by the Holy Prophet Muhammad (SAW). When the Holy Prophet and Muslims entered Holy Kaba, Holy Prophet announced general forgiveness for everyone. Holy say of PBUH, those who shelter in Holykaba are safe, those who shelter in the house of Abu Sufyan are safe, and those who remain confined to their houses are also safe, is the clear depiction of this matter.

Another example of mercy from the life of the Holy Prophet Muhammad (saw) is quite relevant when Holy Prophet shows a great gesture of forgiveness towards an old lady who used to throw garbage on the Holy Prophet Muhammad (saw) when he walked by her house.

The very first step in forgiveness is to uncover the anger. One must have complete knowledge of what anger is? We can try to define anger by the following questions.

- What is the intensity of your anger?
- What is the depth of your anger?

- What is the frequency of your anger?
- What is the duration of your anger?
- What are the aggravating factors of your anger?
- What are the relieving factors of your anger?

But still, if you do not understand your anger completely, you can discuss your emotions and feelings with some close ones, family members, and supporting friends to get the depth of your anger. The thing important here is to discuss your feelings and do not let them be ignored or try to hide them. After all, it is not good to react to them. One just has to acknowledge their feelings.

The second step in the model of forgiveness is to decide whether you want to forgive or not? If someone keeps on thinking about bitter events and irritable thoughts, all you get is excessive anger and agony. Excessive anger can deteriorate mental and physical health badly. For better health and life, one must bring anger to an end. Here are some questions to make it easier.

- If you do not take vengeance, what might happen to your anger?
- What advantages might you get if you clearly decide to stop anger and forgive?
- How much time and effort does it take to keep your anger going?
- Is your anger beneficial for you?
- Do you feel less angry, and you experience less insomnia?
- Being less angry, would you eat better?
- Being less angry, would you have better relationships?
- If you are less angry, would you perform better in school?
- Having less anger, would you pursue your career more efficiently?

Although what makes you angry and how justifiable your anger is, it ultimately becomes real toxic for your mind and body peace. We have to reconsider our decisions and plan activities in line with our mental peace for better health.

It is important to remember that forgiveness is not an overnight process. The forgiveness process works differently for each person. However, we can conclude that people who forgive stay happy and move on in their lives. On the other hand, they experience more minor problem anger issues and remain unforgiving.

4.21 Management of Physical Symptoms of Anger

We can alleviate our angry emotions with commonly named techniques:

- Relaxation technique

“Hey calm down! Be easy. All is well.” These words are very simple and easy to call, but getting the real state of relaxation is relatively harder. So the below description will target some anger lowering techniques and paths to achieve it easily.

4.22 Calming Down Fight or Flight

Humans are very complex creatures in this habitat of earth. Every human has different brain development and growth, so every human mind interprets and evaluates situations differently. However, human beings are the old passenger of fight and flight situations. Here are some additional factors to consider. In our daily life routine, we have gone through many unforeseen circumstances which may impact one's life directly or indirectly. But the important thing is that we have to recognize whether the situation we are going through is life-threatening or not. Most of the time, it is not. We mostly get angry at being insulted, fooled, misjudged, disregarded, or treated badly by someone.

Human beings are different from animals because we have problem-solving systems, e.g., rules, regulations, and constitution. Also, we can bring our matters to teachers, parents, lawyers, police officers, and other law enforcement agencies. Because of these reasons, it is best to avoid fight or flight situations and go towards a win-win situation for you and others.

4.23 The Relaxation Response

The human body also exhibits a relaxation response like the fight and flight response. When fight or flight responses occur, there is a rush of adrenaline in our bodies. Similarly, when a relaxation response is triggered, some brain chemicals are released, which decreases the tone of muscles and makes them relax. Also, it decreases heart rate and helps in dropping blood pressure. It also helps in decreasing respiratory efforts. Once the body gets relaxed, you can see things more clearly, make judgments more easily, and pursue your life more positively. So, it is important to learn relaxation techniques to remain calm and composed in a situation. Additionally, relaxation techniques give long-term health benefits.

4.24 Progressive Muscle Relaxation

In 1930, Edmund Jacobson, an American physiologist, developed a technique known as the progressive muscle technique. This technique helps people relax by contracting and relaxing different muscle groups of the body. This is an effortless and common technique even a nonspecialist can efficiently perform. But it is important to consult your physician first to rule out muscle-related pathologies, orthopedic diseases, or other ailments that this technique could aggravate. After practicing this technique many times, you will be able to bring on a relaxation response while facing the anger triggering factors.

You need a private room and a free time slot of 30 minutes during which nobody disturbs you. There should be no distraction in the room like turning off the cell phone. The room should be semi-dark, and the environment must be fully comfortable. Progressive muscle relaxation is recommended to be performed in your most comfortable state, such as wearing loose clothing with shoes off and being seated on a relaxing chair or bed.

4.25 Steps

- Sit on a relaxing chair or bed.
- Extend your legs fully.
- Legs should not be crossed.
- Close your eyes and take a few deep breaths.
- Inspiration should be done from the nose and expiration from the mouth.
- Then start contracting and relaxing the specific group of muscles.
- Contraction and relaxation should be done in sequence, i.e., moving from head to feet or from feet to head.
- Each group of muscles should be gone through the phase of relaxation properly.

Other beneficial techniques that can aid in anger management include meditation, yoga and exercise, simple deep breathing, rhythmic breathing, hydration therapy, massage, prayer, and chanting. To conclude, the path to power is not dominance over others but the ability to speak up for oneself. The critical distinction is the difference between aggression and assertion (Hara Estroff Marano).

4.26 Summary: Essentials of Anger Control and Management

Components of anger	Behavior, feelings, thinking, and physiology
Basic triggers of anger	Self-worth preservation, insecurity of basic needs, basic convictions
Functional types of anger	<ul style="list-style-type: none"> • A response to frustration or bad past experiences • A mode of receiving what we want • A discharge of unexpressed emotions
Factors controlling manifestation of anger	<ul style="list-style-type: none"> • Learned responses • Belief systems • Unconscious motivators • Individual differences

Manifestation of anger	<ul style="list-style-type: none"> • Displacement • Repression • Suppression • Ineffective expression • Effective expression
Consequences of problem anger	<ul style="list-style-type: none"> • Effects on physical health • Effects on family life • Effects on mental ill-health • Effects on friends and friendships • Effects on schooling or work-life • Effects of anger and the law • Effects on the general quality of life • Financial effects of anger
Components of anger control and management	<ul style="list-style-type: none"> • Food and nutrition • Forgiveness • Relaxation techniques

Multiple Choice Questions

1. **A negative behavior leads to negative emotions and thinking, which ultimately give rise to another negative behavioral event. Choose the correct approach to justify the statement.**
 - (a) Psychodynamic
 - (b) **Behaviorist**
 - (c) Cognitive-behavioral
 - (d) Displacement approach

2. **A term used to describe a person who has attained the level of madness, leaving all logical reasonings behind in anger, is called**
 - (a) Outrage
 - (b) **Blind rage**
 - (c) Adrenaline rush
 - (d) Hanger

3. **The body prepares itself by the release of clotting factors and ensure survival in case of bleeding injury during an episode of anger outrage with the aid of _____**
 - (a) **Cortisol**
 - (b) Adrenalin
 - (c) Nor-adrenalin
 - (d) Dopamine

4. **A cognitive approach to explaining behavior suggests that our own perceptions and beliefs towards a particular situation affects our response**

- (a) Theory of planned behavior
 - (b) **Rational emotive behavior therapy**
 - (c) Cognitive behavior therapy
 - (d) Behavior therapy
5. **The very first step in process of forgiveness is**
- (a) Defining forgiveness
 - (b) Deciding forgiveness
 - (c) **Uncovering Anger**
 - (d) Understanding bad behaviors
6. **A person preoccupied with feelings of fear due to some awful past experience will develop an angry personality to use it as strategy and limit any further self-damage. This type of anger is called**
- (a) Cathartic anger
 - (b) **Instrumental anger**
 - (c) Normal anger
 - (d) Suppressed anger
7. **If you become angry more often, watch your diet and eliminate**
- (a) High protein foods
 - (b) High fiber foods
 - (c) **High glycemic load foods**
 - (d) High fat foods
8. **Contraction and relaxation in PMR should be done for at least 30 minutes in sequence starting from**
- (a) Eyes
 - (b) Neck
 - (c) **Head**
 - (d) Arms
9. **Brain structures that carry out the processing of emotions mainly involve**
- (a) **Amygdala**
 - (b) Cerebellum
 - (c) Pons
 - (d) Medulla
10. **Point of interest for behavior management in individuals in which triggers to anger remain undiagnosed and unresolvable for years is**
- (a) Individual differences
 - (b) Belief system
 - (c) **Unconscious motivators**
 - (d) Learned responses

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Chapter 5

Mathematical Presentation of the Anger



Hashim Talib Hashim, Ali Talib Hashim, and Yahya Dhiya Tuama

5.1 Introduction

The anger's reactions in the human brain, it is a regular force in the brain. It is created when anyone have an action. From the experiences, we found out that this force is two types:

1. The expected anger's reaction for the day
2. The current severity of anger

During a multi studies conducted on more than 1500 participants from more than 15 countries. We have created some mathematical relationships to find the anger's severity and its expected occurrence for the day based on some factors that we found them to determine these reactions.

There were a reliable and valid questionnaire conducted among these participants after it was tested for reliability. The results then were analysed statistically, and the results were gathered, and we reached three laws from these results that will be discussed later.

The expected anger's reaction for the day: it depends on the sleep's hours and the proportion of emotional sense of the person. That we can find it from a simple test for anyone. The test includes ten choices (nine choices are colors and the last is the nonchoice). The colors are (black, white, red, green, blue, yellow, purple, indigo, and orange). I put a proportion for every color depending on its λ . These proportions started with $1/9$ to $9/9$ but the nonchoice is $(-1/9)$.

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The current severity of nerve: It is the current nerve of the person. It depends on blood pressure and the number of heartbeats. The relationship between them is direct. So we can make a device like a watch to measure this nervous reaction depending on the blood pressure measured from the wrist and heart rate measured from the same position. It is used to know the causes of stroke, heart attack, and neurologic or nervous disorder.

5.2 The Laws

1. *The first law:* Everyone have a force in his brain, it is called “the anger’s reaction” which comes when this person has an action. This force equals the action, but in the opposite effect.
2. *The second law:* The severity of anger’s reaction is inversely proportional with both numbers of sleeping hours during the day and the proportion of emotional sense of the person.
3. *The third law:* The time of continuation of the anger’s reaction is inversely proportional with two numbers, which are the severity of nervous reaction and the nervous constant.

I have found out the nervous constant which is $(143957 * 10^{-3})$, and it is a fixed value used to find out the duration. The colors test looks like an eye test, in this shape (Fig. 5.1):

1. Black: $\frac{1}{9}$
2. White: $\frac{9}{9}$
3. Red: $\frac{2}{9}$
4. Green: $\frac{3}{9}$
5. Blue: $\frac{4}{9}$
6. Yellow: $\frac{5}{9}$

Fig. 5.1 The color test fro the anger’s reaction law



- 7. Purple: $\frac{6}{9}$
- 8. Indigo: $\frac{7}{9}$
- 9. Orange: $\frac{8}{9}$
- 10. No choice: $-\frac{1}{9}$

5.3 The Equation Design

We have created two equations, one for finding the severity of the anger and the other one for the duration as follows:

We must take the absolute severity of the nerve because time cannot be negative (INsl). We put a unit for the nervous severity; I called it H_{in} and its symbol is (H_n).

The symbols of the words in my laws are:

- Anger severity: *As*
- Continuation time (Duration): *Ct*
- Nervous constant: *H*
- Beauty sense proportion: *Bp*
- H_{in}: *H_n*
- Sleep time: *St*

The severity of nervous reactions:

$As \propto 1 / Bp \dots\dots\dots As \propto St$
 We get the main law which is: $As = \frac{St}{Bp}$
 The unit of *St* is min.
 The unit of *Ns* is *H_n*.

Duration of the reactions:

$Ct \propto 1 / H \dots\dots\dots Ct \propto |As|$
 We get the main law which is: $Ct = \frac{|As|}{H}$
 The unit of *As* is *H_n*
 The unit of *Ct* is min

Table 5.1 shows the results for some of the participants that we have applied on these laws to find the reliability of the tests.

The ratios are defined in three categories: the first is natural, the second is moderate, and the third is abnormal.

- 1. <300 *H_n*: normal
- 2. 300 – <500 *H_n*: mild

Table 5.1 The percentages and results for the participantrs used in the realiability test

	Age	The color	Sleeping hour	The species	Nervous status	Continue time
1	3	Don't	6	Male	Nervous	4.5 min
2	6	White	8	Male	Don't	12 s
3	8	Blue	9	Female	Don't	5 s
4	12	Red	5	Male	Nervous	1 min
5	14	Black	5	Male	Nervous	1.5 min
6	15	Yellow	8	Female	Don't	10 s
7	16	Orange	4	Male	Nervous	9 s
8	17	Green	8	Male	Don't	8 s
9	18	Green	7	Male	Middle	6 s
10	19	White	9	Female	Nervous	2 s
11	21	Black	6	Female	Don't	2 min
12	16	Indigo	10	Female	Don't	4 s
13	16	Indigo	9	Male	Middle	4 s
14	16	Yellow	8	Male	Middle	25 s
15	33	Orange	9	Female	Middle	16 s
16	33	Red	4	Male	Nervous	2 s
17	35	Red	6	Male	Nervous	15 s
18	37	Red	5	Male	Nervous	15 s
19	41	Red	5	Male	Nervous	16 s
20	44	Violet	8	Female	Don't	6 s
21	47	Violet	8	Female	Middle	5 s
22	48	Don't	7	Male	Nervous	11 min
23	49	Don't	3	Male	Nervous	7 min
24	50	White	5	Male	Don't	3.5 s
25	52	Yellow	6	Female	Don't	14 s
26	54	Red	11	Female	Nervous	15 s
27	55	White	6	Male	Don't	2 s
28	59	Black	4	Male	Nervous	32 s
29	60	Don't	7	female	middle	27 s

3. 500 – <2000 Hn: moderate
4. >2000 Hn or negative value: severe

In Chap. 7, we will apply these laws on practical examples to find out how we can find the severity and analyze it.

Chapter 6

The Cognitive and Sociological Sciences Behind Anger



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6.1 Introduction

In behavioral and neurobiological sciences, a “feeling” is a term that refers to various mental experiences associated with optimized life conditions (Alia-Klein et al. 2020). If you are angry, you are not alone. Even though rage is a particular and

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almost universal emotion, it is not studied in depth yet (Alia-Klein et al. 2020). Anger is often sparked by something that is seen as threatening or unpleasant. Anger comprises a variety of internal states that can spread and grow positively, no matter the provocation or initial situation (i.e., unfair treatment within the family environment) (Fig. 6.1). Unlike other animals, humans do not just show how angry they are by how much they fight back. We show a wide range of nonverbal and vocal signs that can be easily recognized as anger by both ourselves and others. There are many parts to anger:

- Arousal
- Cognition
- Emotion



Fig. 6.1 *The Relatives I*, Oil on canvas 100 × 70 cm, Polina Simou, Chianciano Art Museum Biennale, Tuscany Italy (Leonardo Award' Special Mention for Excellence'), 2013. (With permission from P. Simou courtesy)

Outward displays include facial expressions, body threat displays, vocal prosody, and words that match the person's internal experience. These words and phrases are used to show how the person is feeling (e.g., feelings of being "angry," "enraged," and so on). Therefore, anger can be felt and shown in many different ways, and any potential self-control must be applied in several directions. Rage control is becoming more critical in modern society, unlike in ancient times, when anger expression may have been used to establish power and choose leaders. To get good results, one must keep their anger under control. But when anger grows, people may not keep their emotions in check, so their angry outbursts can turn into more aggressive actions. This aggressiveness can be so quick as taking the "low road" of brain activity that it does not show any signs of escalation or cognitive inhibitions (Alia-Klein et al. 2020).

People have known for a long time that their health is negatively affected by their feelings of rage. According to Buddhism, rage is included in the Three Poisons of the Mind (Alia-Klein et al. 2020) and should be avoided. Regarding psychosomatic disorders, anger and hostility have gotten much attention. They are regarded as health-risk behaviors (Chida and Steptoe 2009). It is recognized in the scientific literature that there is a difference between animosity and wrath and violence. The American Psychological Association (Chida and Steptoe 2009; Williams 2017) described aggression as "a verbal or physical behavioral pattern displayed in screaming, intimidation, or physical attacks"; *violence* as "a negative attitude or cognitive trait directed toward others"; anger as "an emotional state characterized by feelings ranging in intensity from mild irritation or annoyance to intense fury"; and aggressiveness as "an aggressive verbal or physical behavioral pattern manifested in yelling, intimidation, or physical assaults." Hostility, fury, and violence have a variety of adverse health implications, including heart disease, diabetes, bulimia, and traffic accidents, which are discussed in the present research (Gellman and Turner 2013).

It is becoming more and more common in today's culture to see angry people, and these manifestations have a significant impact on interpersonal connections. A great deal of attention has been expressed in the scientific literature about the health hazards of these activities. Patients or therapists should not neglect the manifestation of these dangers because it can have serious health repercussions (Chida and Steptoe 2009).

Anger is one of the most contentious basic emotions, confirming its existence and relevance during development, notably in humans. Anger and rage-related behaviors serve various functions, and the intricacies of violent behavior are frequently correlated to social and cultural backgrounds. Recent advancements in clinical psychodynamic and developmental research have given us a new perspective on how rage influences and leads to numerous facets of human behavior. According to developmental studies, psychophysiological, cognitive, and social development lag behind the predetermined fury and rage sequence in the first 2 years of life. Additionally, anger may indicate a lever for overcoming an obstacle, establishing differentiation, interacting within social relationships, or creating bonds (Gellman and Turner 2013).

Naturally, higher brain processes are required for mental distinction in humans. Undoubtedly, the meaning underlying individual behaviors is finally comprehended on a social and cultural level. Simultaneously studies on psychopathic disorders emphasize everyday life experiences and accurately interpreting and responding to fundamental concerns about rage as a core emotion (Van Kleef 2009; Williams 2017).

Finally, some seek to live a life guided by spiritual ideals but cannot control their anger at times. As a result, they damage others, violate Hinduism's primary principle of nonviolence and ahimsa, and create fresh freshness and negative karmas to deal with in the future. This insight is directed at those attempting to moderate their anger, if not completely erase it from their action pattern. Since the early ancient philosophers, better comprehension and regulation of anger could be achieved considering the threefold nature of humans (Zimprich and Mascherek 2012): (A) the spiritual, (B) the intellectual, and (C) the physical-emotional.

The physical-emotional nature of animals contains the proclivity to grow enraged and injure others. Spiritual living aims to learn to control these animal tendencies and the ramifications of the intellect and ego pride to show one's spiritual nature.

Learning to regulate rage is an essential component of mastering one's inherent nature that the Tirukural Indian text on ethics devoted an entire chapter to it. It is, in fact, the chapter that comes before "Avoidance of Injuring Others," implying that we must first manage our wrath to practice nonviolence successfully. The Tirukural warns that anger leads to a slew of problems. It kills the smile on one's face and the joy in one's heart. It will annihilate you if left unchecked. Even familiar persons who might intervene get burned, and it is easy to injure others (Figs. 6.1 and 6.2).

People show their anger in very different ways. It is fun for people who are not competent to be angry at other people and explode this anger in various aggressive and violent ways. To get what they want from life, they use anger and violence. Even though they are self-defined as law-abiding, many people could be outraged by words or deeds. Instead, they live a life full of anger, incapable, or unwilling to escape.

6.2 The Social Effects of Anger Depend on How Strong People Think It Is

The social consequences of emotions research look into how people's reported emotions affect how they interact with each other. It is based on social-functional theories of emotion, such as the emotions as social information (EASI) model (Van Kleef 2009) and other theories. According to this model (Van Kleef 2009), emotions serve social roles by causing others to feel emotions and giving others information about one's feelings, attitudes, and intentions. Based on this idea, negotiation experts have looked into how emotional displays can affect negotiations (Sinaceur and Tiedens 2006; Adam and Brett 2018).



Fig. 6.2 *The Relatives II*, Oil on canvas 100 × 70 cm, Polina Simou, 2016. (With permission from P. Simou courtesy)

Research shows that angry negotiators get more concessions from their counterparts than angry negotiators who do not show anger or contrary emotions, presented as powerful and menacing by their counterparts. As a result, anger is a warning sign that the disagreement will worsen, and the negotiation is about to come to a standstill until the other person starts to give up more (Sinaceur and Tiedens 2006; Williams 2017; Adam and Brett 2018).

Several times we judge, undo, taunt, comment caustically and intervene in the lives of others, trampling down and ruining dreams, thoughts, or even free will, because we can do it. And when someone else dares to see through our actions, then a defensive catapult dissolves the critical foundations of human relationships, friendships, or even brotherly feelings and affinities. Our human circle consists of those chosen to be connected and proceed with us. When there is no moral courage

and dignity, when good actions and love do not define people, they tend to become similar in ugliness and wickedness, embracing each other in misery and self-projection of their “black” ego (Fig. 6.1).

6.3 The Neurobiology Behind Anger

In genetically informed studies, it has been found that anger control is more likely to be passed down than anger itself or as a state or trait. If we look at polymorphisms or whole-genome associations with anger, you have to have many people and many genes. This means that very little can be said except that more research is needed to figure out how anger comes from genes. While anger can be so hard to separate from its common outcome and other unpleasant feelings, it is hard to learn about its specific dynamics and neurology without separating it from these other feelings. Right-sided EEG is more common because people run away when they are afraid of something, making them more likely to be afraid of that thing. In a comparative study, researchers found more activity on the left side of the brain when people were angry. This activation was linked to a person’s tendency to be angry and angry when provoked.

Anger and trait anger involve many different parts of the brain, probably linked and forming a giant network. It is unclear whether specific emotions are linked to specific parts of the brain or general brain networks. Recent morphometric studies found that parts of these networks were not very stable. Anger can make a person self-controllable with an intensive need to fight back. Therefore, anger could be very addictive, and these brain networks are used to control anger-related choices and behaviors, not to be destructive. The language used to show rage shows how hard it is to balance strong emotions with self-control.

6.4 Appraisal Outsets of Anger

There has been a significant amount of early research into the mental representations of somatic reactions in angry people. According to the findings of many studies, participants experienced increases in cardiovascular and muscular activity, followed by a hot flush to the face. This latter finding is compatible with the widely held belief that rage is a “hot” emotion. Many modern academics have begun investigating how events outside people’s bodies affect their emotions. People become enraged when they assign significance to their current condition. This so-called appraisal-based anger theory claims that people only become angry when they interpret things differently. According to appraisal experts, the event that led to the circumstance must be viewed as an offense or abuse. People become enraged when they perceive themselves or another person as the source of the mistreatment or blame themselves or another person for the mistreatment. Anger can be either

self-directed or other-directed. There are numerous theories regarding how to construct an appraisal formula. They all agree that an appraisal's structure and procedure should be unique. Many people have conducted extensive research to see how these various recipes compare. This study reveals that assessment formulations can explain how individuals feel angry, no matter how many various ways they state it.

6.5 The Psychology of Anger

Anger can be a variety of emotions. First, people become enraged to avoid experiencing pain. People turn their suffering into a rage because it feels better to be furious than hurt. Finally, people can transfer their anguish into fury, whether consciously or unintentionally.

Rather than just hurting, being furious offers several advantages, the most important of which gives you something to accomplish. People who are in pain are more likely to think about it. On the other hand, those enraged consider harming those who have wronged them. Shifting your focus away from yourself and toward someone else is one way to turn grief into rage. One does not have to worry about how one feels and cope with things for a short time. Instead, consider how you may retaliate against the people who have angered you. Making yourself furious can help you hide that you are terrified or find a scenario scary. When people are angry, they have a sense of justice, authority, and moral superiority that they do not have when they are sad. When someone is simply in pain, this is not the case. People who are enraged are enraged for a reason. **“Those who have harmed me have done something wrong and should be punished,”** individuals remark. It is unusual to become enraged at someone who has not done any harm.

Angry is a social emotion in which people communicate their feelings. One constantly targets one's rage (even if that target is ourselves). Anger makes you want to strike back and defend yourself by beating the person whom you believe is hurting you. Anger-inducing ideas and painful feelings make you desire to act and fight back.

6.6 Anger and Health Risk Behaviors

Ischemic Heart Disease

Goldel Hill et al. are concerned about the behavior, claiming evidence linking unpleasant feelings to illnesses including atherosclerosis and coronary heart disease. The stimulation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system that occurs when we are furious can directly impact cardiovascular disease. When the sympathetic nervous system is aroused, it overproduces corticosteroids and catecholamines, leading to cardiovascular disease. A surge of stress hormones can start a chain reaction that includes hemodynamic

changes in the body, metabolic changes in the blood vessels, and irregular heartbeats, among other things. Anger can encourage the adoption of a destructive lifestyle in addition to sustaining it (Golden et al. 2006).

In contrast to constructive reasons, anger may also be driven by deconstructive reasons (e.g., to justify someone's sentiments or raise the intensity of someone's anger). Because of this, fury manifestations increase the possibility of the development of coronary heart disease, while others have discovered that rage manifestations can have a preventive impact in certain situations. One of the objectives of a study conducted in Canada and published in 2010 was to identify potential health implications associated with the types of rage manifestations that people experience. A total of 10 years was spent following the participants revealing that decreased constructive anger in men and higher destructive anger justification in men and women are associated with an increased risk of coronary heart disease (CHD) (Davidson and Mostofsky 2010). Women who have already had a coronary event appear to have a better prognosis if they restrain their anger and express it positively (László et al. 2010). According to Vella and Friedman (2009), aggressive people are prone to cynical attitudes, leading to the individual participating in repetitive anger exploration and other related behaviors. Situations demanding anger restraint may be more common in hostile individuals' daily lives than ones allowing for rage outbursts. Those who restrain their anger exhibited more visible carotid artery stiffness and intima-medial thickness, both of which are subclinical indicators of coronary heart disease, compared to those who express their anger (Vella and Friedman 2009).

Another study has linked sentiments of rage and animosity to an increased CHD and a poor prognosis in those who already have these diseases. Chida et al. did a meta-analysis in 2009 using data from 25 research on CHD risk and 19 studies on persons who already had the condition. According to the study, anger and hostility were connected to cardiovascular disorders in both healthy and CHD groups. Men are more sensitive to rage and hate during CHD episodes than women, showing that men are more susceptible to these emotions, increasing the likelihood of developing and dying from coronary artery disease (CAD) (Alia-Klein et al. 2020). A study conducted with 223 patients and published in 2000 sought to identify whether social support, furious expression, and anger were associated with increased CAD morbidity and death. Each patient was given three self-report questionnaires to complete, including emotional and social support items, the State-Trait-Anger-Expression Inventory, and the Cook-Medley scale of negative thoughts about people who are not suitable (Angerer et al. 2000). The patients were observed for a total of 2 years. After 2 years, 162 of the 223 patients underwent an angiographic follow-up, which was deemed adequate. According to the study's outcome, patients with CAD and limited emotional and social support who express their anger openly might face a significant risk of disease progression (Angerer et al. 2000).

Additionally, research has investigated the association between rage outbursts and high blood pressure levels. In a study published in 2004, 26 hypertension and 15 normotensive individuals took part in a role-play interaction that was both neutral and anger-evoking in nature, and their blood pressure was measured as a result. When it comes to coping with social relationships, it has been discovered that

hypertension patients have weak social abilities. This conclusion was confirmed by the observation in the laboratory that hypertension patients used negative verbalizations during contentious contacts, which corroborated the findings in the field. Furthermore, compared to the normotensive controls, they made less eye contact and were seen as less assertive in their behavior. Conclusion: According to the authors, hypertension is associated with a loss of social skills, particularly during an aggressive outburst of wrath (Larkin and Zayfert 2004).

Bulimic Behavior

Negative emotions have long been suspected of playing a role in bulimic behavior. One of the more unpleasant emotions experienced by bulimic individuals has been characterized as rage. The researchers discovered that personality factors like impulsivity might impact the link between negative emotions and eating disorders. Explanatory theories for binge eating disorders frequently highlight the importance of personal characteristics, including perfectionism, neuroticism, obsessive-compulsiveness, and impulsivity (Engel et al. 2007).

Researchers have discovered that higher mean antecedent anger could be associated with a higher likelihood of binge eating and vomiting among participants (Engel et al. 2007). In addition, the researchers discovered that impulsivity was associated with a reduced link between anger variability and the risk of bingeing on food. After controlling for rage variability, researchers discovered that persons with high levels of impulsivity were more likely to turn to binge eating than those with medium or low levels of impulsivity (Engel et al. 2007). Binge eating was less common among those with low impulsivity; as anger became more unpredictable, the likelihood of binge eating increased (Engel et al. 2007). It should come as no surprise that the authors discovered that the possibility of vomiting after a binge-eating episode is significantly increased in bulimic people (Engel et al. 2007).

Diabetes

Anger has been associated with type 2 diabetes mellitus (T2DM) development through two plausible mechanisms (Alia-Klein et al. 2020): its relationship with poor health behaviors, which leads to obesity, and [14] sympathetic nervous system activation, leading to inflammatory response driven by interleukin-6 (IL-6). In addition, anger has also been connected to type 1 diabetes development (Golden et al. 2006). Golden et al. presented a study in 2006 that looked into the link between rage proclivity and T2DM (Golden et al. 2006). Over 11,615 people between the ages of 48 and 67 who were previously nondiabetic were tracked for 6 years to see if they developed type 2 diabetes. Individual trait anger temperament scores were not linked to diabetes risk. Still, individuals with the highest anger temperament scores

had the most significant risk of T2DM development than those with the lowest (Golden et al. 2006). Trait anger's persistent, severe, and explosive traits, like those of CAD, may play a more significant role in diabetes development. It has also been proposed that lifestyle reasons explain this link, implying that an angry temperament has a higher impact on behavioral and physiological alterations that contribute to obesity and, as a result, diabetes (Golden et al. 2006). Rage that lasts a long time might reveal unhealthy habits (smoking or higher consumption of calories), contributing to central obesity and T2DM (Golden et al. 2006).

A second technique is to activate the sympathetic nervous system because an excess of catecholamines might modify insulin sensitivity and trigger a chronic inflammatory response triggered by interleukin-6 (Golden et al. 2006).

Driving Anger

Anger has been recorded internationally to be involved in an automobile accident. Sullman's study points out that getting irritated while driving seems very common, and enraged drivers might present dangerous behavior. Disorientation, losing control, and final crashing have already been correlated with higher percentages of crash events in simulation studies (Sullman et al. 2007).

Adolescent

Anger expression and repression have been linked to the development of unsafe lifestyle practices in teenagers (Musante and Treiber 2000). School children presenting high levels of anger and simultaneously weak cognitive processing abilities reveal a high risk for establishing poor relationships, poor academic development, and severe health problems. Additional studies have also discovered the association of anger suppression with increased drinking of caffeinated beverages and less physical activities (Musante and Treiber 2000).

6.7 Causes of Anger

Along with other elements such as socioeconomic difficulties, overbearing nature, genetic issues, and neurotransmitter depletion such as serotonin, the surrounding publicly polluted environment always plays a significant role in eliciting one's rage.

It is related to a lack of prior experience, acquired behavior, genetic predispositions, and a lower capacity for decision-making or problem-solving (Hendricks et al. 2013). In the latest studies, psychologists identify five internal sources of anger (Hendricks et al. 2013):

- Emotional reasoning: Some people are innocent and emotionally rational, and as a result, they frequently become angry and perceive these things as personal attacks.
- Poor tolerance for frustration: At some point in everyone's life, they will encounter a low tolerance for annoyance. The assertion is associated with stress-related anxiety, which reduces our tolerance.
- Unreasonable expectations: Sometimes, people establish overly high demands without fully understanding the circumstances.
- Inability to get their way or have others behave a specific way reduces people's tolerance for irritation and causes them to get upset and angry.
- People-rating: Having a reason to be upset activates pejorative labeling, dehumanizes others, and makes it easier to be angry at others.

Concerning extrinsic factors, psychologists have compiled a list of hundreds of events that lead people to become furious and summarized them as follows:

- Verbal abuse is one method of attacking other individuals.
- People endanger other people's necessities such as family, life, and career.
- As a result of environmental circumstances in their lives, their degree of tolerance for irritation decreases.
- Both external and internal sources play a significant influence in recognizing and addressing anger issues. Yet, the following elements invariably tend to reduce one's irritation tolerance level (anxiety/stress, physical and mental pain, substance abuse/alcohol abuse, everyday irritations).

6.8 Parasympathetic Nervous System vs. Sympathetic Nervous System Anger Response

Parasympathetic nervous system (PSNS) enables the neurotransmitter acetylcholine to be released, which helps to prevent the arousal of anger by neutralizing stress hormones and allowing the body to relax and quiet down. People with dominant PSNS reactions have a lower risk of heart disease; therefore, type A personalities have a higher risk of heart disease since their PSNS responses are weaker and they spend less time relaxing throughout their life (Hendricks et al. 2013).

6.9 The Social Sides of Anger

Almost everyone has feelings of wrath from time to time in response to social situations, whether it is traffic congestion or a coworker's insensitive remark. For the most part, negative feelings and sensations can be characterized as temporary, stimulating, and then dissolving into positive emotions. However, this is not the general rule; anger could be a chronic disease for some people (Fredrickson 1998).

Stress is a regular phenomenon that has been associated with rage. Researchers identify that a range of stresses raised the risk of facing frequent incidents of anger and hostility in the years after the events. For example, chronic stresses, such as financial and marital problems, make people more likely to experience regular emotions of wrath. Respectively, the personal experience or testimony of a violent incident or assault may also be linked to later fury outbursts.

Anyone who has ever been angry will recognize the signs of the proclivity to say things that are best left unsaid.

According to Roman philosopher Seneca, anger is a “short madness” that leads to self-destruction – “quite like a falling rock which breaks itself to pieces upon the very object which it crushes.” It is our “most terrible and wild passion” and “fundamentally immoral,” in his opinion, and “no plague has cost the human race more dearly,” he claims.

If this is the case, we should be concerned. The painful period of the global COVID-19 pandemic and the repetitive social lockdowns might increase the risk of anger explosions, resulting in a 40% increase in divorce inquiries in the United Kingdom (Arora et al. 2020). Even in the greatest of circumstances, a disagreement with coworkers or a family member can lead to decisions we later regret. Here are some points mentioned which are the significant advantages of anger:

- **Constructive Disagreement.**

When one decides to convey your anger to others, having a sense of perspective will be very helpful. Recent evidence shows that controlled expressions of anger can successfully impact people’s minds; moderately upset individuals perform better in negotiations and confrontations (Sinaceur and Tiedens 2006). “**If your purpose is to confront someone – to be forceful and assert control,**” Ford adds, “**then anger may assist you in doing so**” (Ford 2009). In addition, Ford discovered that people who score high on emotional intelligence tests are more prone to foster sentiments of rage before contradistinction. This correlation is also linked to increased well-being, where the individual shows a fit of controlled anger on stressful occasions (Ford 2009).

- **Psychological Separation.**

When people are overwhelmed by angry attitudes or emotions and do not know what to do, try utilizing these psychological tactics will lead to calming down their thoughts. For persons with severe aggressive tendencies, cognitive behavioral therapy is concerned necessary. However, new research reveals that even small changes in behavior can significantly impact. Therefore, psychological distancing could be a valuable method for managing emotions and making better behavior judgments.

- **The Spark of Creativity.**

An outburst of rage can also stimulate more imaginative thinking. When given a brainstorming challenge, angry people present more creative and varied answers than persons primed to be sad or neutral in emotion. Arousal increases appear to super-charge the mind, making connections that are not possible in other emotional states, such as happiness or sadness. Although the initial surge of creative energy

looks to wear off fast, the benefits of doing so should be considered whenever you encounter an aggravating impediment at your place of employment. Even if it is due to unjust feedback from others or an unexpected technological glitch, the unpleasant sensations of dissatisfaction may catalyze success.

- **Mobilization.**

According to a recent study, anger and delivering a burst of energy have been shown to improve accuracy in NBA players. In addition, players' reactions to free throws following a "clear path foul," in which an opponent intentionally contacts a player seems to result in a significant performance improvement.

If traditional beliefs of rage were correct, their frustration after the foul would have harmed their accuracy during the free throw, yet the opposite was true. The players were more likely to succeed after an egregious foul than after previous free shots that had not occurred in such a difficult situation.

6.10 How to Control Anger?

Anger is normal and can be a good thing if it helps you work through problems or issues at work or home, even if you do not like it. However, anger can be a problem if it leads to aggression, outbursts, or even fights. When one gets angry, it is essential to learn to control it so one does not say or do something one will regret. Before one gets angry, one can use specific ways to control one's anger. Lights and flares. There are eruptions and blasts. Anger words have a fire quality to them. Scientists could also be able to explain why this is so.

The brain region amygdala has already been studied and associated with emotions, including anger, which is engaged when angry and acts aggressive or unfriendly. Dougherty's studies on people with major depressive illnesses reveal why someone becomes angry. One of his findings from these investigations explains that some of these patients exhibit irrational outbursts of rage out of character and inappropriate for the occasion. For example, people can yell or throw items. "We wanted to see how those reactions functioned." When these people's despair is over, their angry outbursts usually stop. Understanding the link between the two conditions could help us understand them and treat them better.

"Healthy people become furious," Dougherty adds, "but they can manage it before acting on it." In sad and prone to angry outbursts, there is a "brake" in the brain that does not work. In a different study, the orbital frontal cortex, a portion of the brain that deals with emotions, did not work in those with severe sadness and anger attacks. Instead, the amygdala's activity increased, and violent outbursts began.

The patient must also acknowledge that they have experienced angry outbursts and that anger is a source of concern. In addition, the patient must use an anger thermometer to assess and evaluate the severity of their rage over time.

Here are some points mentioned which describe how to control and relax oneself in an anger situation:

- **Relaxation.**

Deep breathing and relaxing images can help calm down if one feels angry. These simple tools can help you do this. In addition, some books and courses can help you learn how to relax. By releasing and letting go of internal stress, patients can control their rage through deep breathing. Selecting a comfortable chair, gazing downward, closing your eyes, and concentrating on your body, beginning with your feet, is the first stage of a deep breathing exercise.

Gradually increase the intensity of your muscle activities to sustain peak pressure and then release it. Raise both shoulders toward the ears, fists, forearms, and biceps tensed. Tend your neck, jaw, forehead, and facial muscles first, followed by your chest and abdominal muscles, and then your feet. Stop being so pessimistic. If anger is the predominant emotion, begin a regular exercise regimen by going for a brisk walk or engaging in other fun physical activities. Exercises aid in the release of endorphins and the reduction of tension. Change irrational views to rational beliefs using the A-B-C-D model to challenge and change illogical beliefs to reasonable ideas (Deffenbacher et al. 1990).

6.11 Changing the Way You Live

Sometimes, the things that are right in front of us make us angry and frustrated. So many people, problems, and responsibilities can make you feel angry. Break for yourself. Take some time for yourself during the day when you face a stress increase. People who work rule that “**nobody talks to Mom unless the house is on fire**” when she comes home from work. Afterward, she feels better able to deal with her kids’ requests without getting angry and then yelling at them.

Recognition of Aggression Cycle

Any person must be aware that the aggression cycle includes three distinct phases: escalation (Fig. 6.1), explosion (Fig. 6.2), and post-explosion. The individual should recognize any generated escalation period to limit as much as possible reaching the explosive, aggressive phase. If anger is allowed to build up, the forthcoming explosion phase will produce an uncontrollable rage expressed in many ways.

Typically, the last phase is characterized by negative repercussions of the explosion, which have an adverse impact on social life, family relationships, friend relationships, and workplace collegiality; notifying the authorities; property damage; and feelings of guilt, shame, and regret (Deffenbacher et al. 1990).

Changing the Way of Thinking

This means that one has to change the way one thinks. Angry people are more likely to curse, swear, or speak in very colorful terms that show what they are thinking inside. When one is angry, one's thoughts can become wildly overblown and dramatic. Try to think of things that are more rational instead of these. For example, instead of saying things like "Oh, it is terrible," say, "Understandably, I am angry, but it is not the end of the world, and I will not get better by getting angry." Logic is better than anger because anger can quickly become irrational even when suitable. So, use cold, complex logic to make sure one is being honest with oneself. Remind oneself that the world is not out to get one. One is just going through some rough times in one daily life. Do this every time one gets angry, and it will help one get a more balanced view of things. Angry people often want things: fairness, appreciation, agreement, and the willingness to do things their way. We all want these things, and when we do not get them, we feel hurt and disappointed. Angry people want these things, and when their demands are not met, they become angry. As part of their cognitive restructuring, angry people need to be aware of their demanding nature and turn their expectations into wants. A better way to say what one wants is to say, "I would like." When one cannot get what one wants, one will feel normal emotions like frustration, disappointment, and hurt, but not anger. Anger can be a way to avoid feeling hurt, but that does not mean the hurt goes away.

Communication Is Better

The angry person tends to come to and act on wrong conclusions. If a person has a heated conversation, slow down and think about answering. You do not need to say the first thing that comes into your head, but it is also crucial to pay attention to what the others have to respond to.

6.12 Conclusion

In general, suppressing anger and excessively expressing it can have a detrimental effect on the body and result in poor health. Therefore, it is vital to understand how to vent anger successfully and how to do so in a healthy and socially acceptable manner. Individuals who can control their anger well are more likely to develop successful, assertive skills and live longer. In addition, it is crucial to understand the physiological implications of fury, especially considering the potential for physical injury caused by this emotion. Understanding how to regulate our anger can effectively profoundly affect our relationships, professions, and, most importantly, our health. As a result, and because scientific evidence has linked anger to various health

risks, therapies for treating or preventing these diseases should incorporate pharmaceutical and psychological elements.

Multiple Choice Questions

1. Anger can be felt and shown in many different ways, and any potential self-control must be applied in several directions in:
 - (a) Humans and animals
 - (b) Only in animals
 - (c) Only in humans
2. EEG is more common because people run away when they are afraid of something, making them more likely to be afraid of that thing.
 - (a) Right-sided
 - (b) Left-sided
 - (c) In the whole brain
3. Researchers found more activity in the when people were angry in a comparative study.
 - (a) Right side of the brain
 - (b) Left side of the brain
 - (c) In the whole brain
4. are more susceptible to rage and hate during coronary heart disease, increasing the likelihood of developing and dying from coronary artery disease.
 - (a) Men
 - (b) Women
 - (c) Men and women
5. An angry temperament has a higher impact on behavioral and physiological alterations that contribute to
 - (a) Cancer
 - (b) Depression
 - (c) Obesity and diabetes

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Chapter 7

Applications of the Anger's Law



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Example 1

A man has slept 8 h during the night, and when the color test applied, he choose the red one. Can you expect his A_s and the duration for the next day?

Answer:

$$A_s = \frac{St}{Bp} = \frac{8 \times 60 (\text{min})}{\frac{2}{9}} = \frac{480}{0.222} = 2160 \text{ Hn}$$

So based on this value, it is sever and needs further assessment.

$$C_t = \frac{|A_s|}{H} = \frac{2160}{143957 \times 10^{-3}} = 150.044 \text{ min} = 2.5 \text{ h}$$

It is 2.5 h which represents the duration for the anger.

Example 2

A man has slept 2 h during the night, and when the color test applied, he choose the purple one. Can you expect his A_s and the duration for the next day?

Answer:

$$A_s = \frac{St}{Bp} = \frac{2 \times 60 (\text{min})}{\frac{6}{9}} = \frac{120}{0.666} = 180 \text{ Hn}$$

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So based on this value, it considered normal.

$$Ct = \frac{|As|}{H} = \frac{180}{143957 \times 10^{-3}} = 1.25 \text{ min} = 0.02 \text{ h}$$

It is 0.02 h which represents the duration for the anger.

Example 3

A man has slept 5 h during the night, and when the color test applied, he choose the white one. Can you expect his As and the duration for the next day?

Answer:

$$As = \frac{St}{Bp} = \frac{5 \times 60 (\text{min})}{\frac{9}{9}} = \frac{300}{1} = 300 \text{ Hn}$$

So based on this value, it is mild and needs no assessment.

$$Ct = \frac{|As|}{H} = \frac{300}{143957 \times 10^{-3}} = 2.0839 \text{ min} = 0.034 \text{ h}$$

It is 0.034 h which represents the duration for the anger.

Example 4

A man has slept 5 h during the night, and when the color test applied, he choose the black one. Can you expect his As and the duration for the next day?

Answer:

$$As = \frac{St}{Bp} = \frac{5 \times 60 (\text{min})}{\frac{1}{9}} = \frac{300}{0.111} = 2700 \text{ Hn}$$

So based on this value, it is sever and needs further assessment.

$$Ct = \frac{|As|}{H} = \frac{2700}{143957 \times 10^{-3}} = 18.755 \text{ min} = 0.312 \text{ h}$$

It is 0.312 h which represents the duration for the anger.

Example 5

A man has slept 8 h during the night, and when the color test applied, he didn't choose. Can you expect his As and the duration for the next day?

Answer:

$$As = \frac{St}{Bp} = \frac{8 \times 60 (\text{min})}{-\frac{1}{9}} = \frac{480}{-0.111} = -4320 \text{ Hn}$$

So based on this value, it is very sever and needs further assessment.

$$Ct = \frac{|As|}{H} = \frac{4320}{143957 \times 10^{-3}} = 30.0089 \text{ min} = 0.5 \text{ h}$$

It is 0.5 h which represents the duration for the anger.

Example 6

A man has slept 3 h during the night, and when the color test applied, he didn't choose. Can you expect his As and the duration for the next day?

Answer:

$$As = \frac{St}{Bp} = \frac{3 \times 60 (\text{min})}{-1/9} = \frac{180}{0.111} = -1620 \text{ Hn}$$

So based on this value, it is very sever and needs further assessment.

$$Ct = \frac{|As|}{H} = \frac{1620}{143957 \times 10^{-3}} = 11.2533 \text{ min} = 0.187 \text{ h}$$

It is 0.187 h which represents the duration for the anger.

Example 7

A man has slept 3 h during the night, and when the color test applied, he choose the red one. Can you expect his As and the duration for the next day?

Answer:

$$As = \frac{St}{Bp} = \frac{3 \times 60 (\text{min})}{2/9} = \frac{180}{0.222} = 810 \text{ Hn}$$

So based on this value, it is moderate and needs further assessment.

$$Ct = \frac{|As|}{H} = \frac{810}{143957 \times 10^{-3}} = 5.6266 \text{ min} = 0.09 \text{ h}$$

It is 0.09 h which represents the duration for the anger.

Example 8

A man has slept 13 h during the night, and when the color test applied, he choose the indigo one. Can you expect his As and the duration for the next day?

Answer:

$$As = \frac{St}{Bp} = \frac{13 \times 60 (\text{min})}{7/9} = \frac{780}{0.222} = 1002 \text{ Hn}$$

So based on this value, it is moderate and needs further assessment.

$$Ct = \frac{|As|}{H} = \frac{1002}{143957 \times 10^{-3}} = 6.966 \text{ min} = 0.116 \text{ h}$$

It is 0.116 h which represents the duration for the anger.

Example 9

A man has slept 12 h during the night, and when the color test applied, he choose the black one. Can you expect his As and the duration for the next day?

Answer:

$$As = \frac{St}{Bp} = \frac{12 \times 60 (\text{min})}{\frac{1}{9}} = \frac{720}{0.222} = 6480 \text{ Hn}$$

So based on this value, it is sever and needs further assessment.

$$Ct = \frac{|As|}{H} = \frac{2160}{143957 \times 10^{-3}} = 45.0134 \text{ min} = 0.75 \text{ h}$$

It is 0.75 h which represents the duration for the anger.

Example 10

A man has slept 1 h during the night, and when the color test applied, he choose the blue one. Can you expect his As and the duration for the next day?

Answer:

$$As = \frac{St}{Bp} = \frac{1 \times 60 (\text{min})}{\frac{4}{9}} = \frac{60}{0.222} = 135 \text{ Hn}$$

So based on this value, it is sever and needs further assessment.

$$Ct = \frac{|As|}{H} = \frac{2160}{143957 \times 10^{-3}} = 0.9377 \text{ min} = 0.015 \text{ h}$$

It is 0.015 h which represents the duration for the anger.

Chapter 8

Anger in Ancient Greek Tragedy



Polyxeni Simou

8.1 Introduction

Anger/wrath (μῆνις) is the first word we meet in the first piece of ancient Greek literature and Western literature, Homer's *Iliad* (2022a). Achilles, one of the best ancient Greek heroes, is very angry with Agamemnon, king of Mycenae and leader of the army of the Achaeans that has gone to conquer Troy, as he has deprived him of his loot, Briseis. This dispute initiates the plot of the *Iliad* and becomes the keystone and inspiration of the whole piece of art.

Anger is a powerful emotion, and “emotions are good tools for thought,” as Susanna Braund and Glenn Most argue (Braund and Most 2003). They are considered a fundamental characteristic of humans, and that is why in recent years, the study of emotions is no more considered unscientific, and emotional intelligence has come into the center of attention and has become an essential parameter in psychology. Ancient Greek philosophers Plato, Aristotle, Epicurus, and the Stoics have explored the role of emotions in our lives, and modern scholars research passions in antiquity. Ancient anger, in particular, seems to attract the interest of many modern scholars and provokes a lot of discussions (Braund and Most 2003). Especially in ancient tragedies, anger or rage plays a crucial role. Stephen Leighton (2003) writes that “for various reasons, anger seems well suited to a central role in the tragedy and what makes something a tragedy.” Dave Ronalds (in Critchley and Ronalds 2012), referring to the Canadian poet Ann Carson, writes that she wonders why tragedy exists, and she answers that there is a tragedy because there is rage. But why is there rage? For her, because there is grief. Then, Ronalds wonders why is there grief? In his opinion, the answer must be because there is war. Astonishingly, anger is the cause of the plot in every tragedy, the power that stimulates almost every character's behavior.

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Many questions arise when you come to explore the nature of this emotion. Is anger an individual or a social phenomenon? Does it have different characteristics in different eras, societies, ages, genres, and statuses, or is it just the expression of anger that changes in different situations or circumstances? Is there a vocabulary of anger? How does the body express anger? What are the causes of anger? What are the consequences? And why does Aristotle, in his *Poetics*, seem to exclude anger from the experience of tragedy, highlighting only the role of fear and pity as essential for catharsis? (Leighton 2003). Can anger lead to catharsis? And whose anger? The actors or the audiences?

This chapter will offer some answers and light based on how anger is presented and expressed in ancient Greek tragedy.

8.2 Ancient Greeks' Perception of Anger

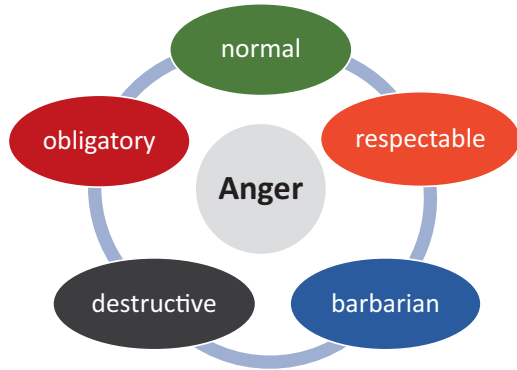
Ancient Greeks and Romans talked and wrote a great deal about anger (Harris 2001). Orators, philosophers, and tragic poets described their perception of anger. Greeks had a lot of different words to express different kinds of anger. *Cholos*, *orge*, *ira*, *menis*, *kotos*, *chalepotēs*, *aganaktein*, *thymos*, and *lussa* are some of them. Aristotle is one of the first philosophers who gave great attention to emotions and tried to explore their nature. He has defined *orge*-anger as “the desire, accompanied by pain, for perceived revenge for some perceived slight to oneself or one’s own, the slight not having been deserved” (Harris 2001). For him, anger is a *pathos*, so it happens to us involuntarily.

In most cases, anger and mostly *orge*, which is more intense than anger, in other words, extreme anger, are followed by a desire for revenge (an insult/offense against a person’s honor has proceeded, Cairns in Braund and Most 2003) and only when this desire is satisfied the angry person can find peace. “In antiquity, a desire for appropriate revenge or vengeful punishment was in the eyes of most people entirely respectable, even obligatory, and not a cause for embarrassment or shame” (Braund and Most 2003).

The Athenian tragedy is a “space” where the inner state of the heroes is represented, and sometimes “this inner experience is dominated by anger” (Harris 2001). In this way, anger is a protagonist in several tragedies. *Medea*, *Hippolytus*, *Philoctetes*, *Heracleidae*, *Bacchae*, *Electra*, *Hecuba*, and *Prometheus Bound* are some of these “angry” tragedies.

Of course, things differ between men and women, as they differ between kings and slaves. The first, men and kings, have the right to get angry, while the second, women and slaves, have to control this feeling. The opposite means they are unable to control themselves. When it concerns women, there are a lot of stereotypes. Deianeira says in Sophocles’ *Trachiniae* (1992g), “It is not sensible for a decent woman to be angry” (552–553), as anger for women indicates a weak character. In the *Seven against Thebes* (Aeschylus 1992e), Eteocles calls the hysterical women of the chorus “hateful things to anyone with self-control” (186) (Konstan 2007).

Fig. 8.1 The anger's character in Ancient Athens



Harris (2001) argues that women are the irascible sex and that angry emotions are feminine. Moreover, according to Aristotle, “no one gets angry at someone when it is impossible to achieve revenge,” and so you cannot get angry at someone superior in power than you (Konstan 2007). Related to this option is the idea that anger is judgmental, that is to say, that being angry is putting oneself in a judge position, and only the powerful ones can get angry (Harris 2001).

It is unclear if ancient Greeks believed that anger was acceptable (Fig. 8.1). It seems they struggle “to determine the essentials of anger” (Potegal and Novago 2010). In the first written tragedies, anger and revenge seem ordinary and necessary behavior. In later tragedies, such emotional situations are considered destructive, especially for the city’s sake, as they often lead to murders. The angry person is not able to make the right decision. Kings and leaders must have a clear mind to decide rationally and wisely. Extreme anger and extra tension are associated with uncontrolled emotions, a barbarian’s characteristic.

Anger is also related to monarchical rulers like Agamemnon, Menelaus, Creon, or Oedipus and is criticized negatively. Again, in some cases, the strength of orge-anger is associated with madness or mental instability. In the ancient Greek tragedy, *Prometheus Bound* (Aeschylus 1992d), anger relates to sickness and is an object of disapproval. In *Medea* (Euripides 1992m), the chorus expresses the same idea. Anger is “terrible” and “hard to cure” (520–521). In *Oedipus Tyrannus* (Sophocles 1992d), “anger natures are painful for the people who possess them” (Harris 2001). In Braund and Most (2003), in an attempt to realize why ancient Greeks talked so much about anger, Harris concludes that this probably happened because the notion of depression was unknown to them (Fig. 8.2). On the other hand, Harris (2001) also argues that Athenians felt it was wrong to control anger as this could lead to unacceptable softness. One wonders if this is why they had included the teaching of Homer’s epic works—*Iliad* and *Odyssey*—in their educational system. What were the consequences of such amount of anger, presented in these works, on the soul of young Athenians? And what was the purpose? Different texts imply different answers. For example, we are not even sure if Homer himself reproves Achilles’ anger when he presents him taking revenge for Patroclus’s death by transmitting Hector’s corpse. Finally, Danielle Allen in Braund and Most (2003) suggests that



Fig. 8.2 Anger's related notions

anger occasionally means “sexual desire” and is related to fertility in high classical Greek (orge and orgasm have the same etymology and linguistic origins).

8.3 Divine Anger

Divine anger or anger of the gods, in other words, is a common situation in antiquity, and it can be hazardous. Potegal and Novago (2010) write that “Anthropomorphically jealous or vengeful gods are found in several elaborated mythologies.” It is not a coincidence that in Greek mythology, thunder and lightning are the symbols of Zeus, the king of gods. In most dramas, gods get angry with humans and show their domination: Athene with Ajax, Aphrodite with Hippolytus, Hera with Hercules. The three men suffer from the goddesses. Ajax and Hercules lose their minds because of them. They are possessed by mania, a kind of madness that does not let them realize what they are doing. So, Ajax kills the animals believing he is killing the Achaeans, and Hercules kills his wife and kids, believing they are the wife and kids of his enemy Eurystheus. After Aphrodite’s devious plans, Hippolytus becomes the victim of Phaedra, his father’s wife, who accuses him of rape because he denies her love. The plot of the three tragedies, *Ajax* (Sophocles 1992b), *Hippolytus* (Euripides 1992g), and *Hercules Furious*, is based on the goddesses’ anger for the heroes. Ajax was arrogant, with high self-esteem, and disrespectful to Athene, Hippolytus did not want to fall in love, and for Aphrodite, this attitude was a red flag. Hera was mad at Hercules as he was the child of Zeus with another woman. Another common element in these three tragedies is that anger

causes guilt for the victim of the anger. All three men feel guilty about their behavior, although they are not responsible for it. Hero's guilt is a common theme in tragedies, and it is part of what constitutes the identity of the tragic hero. Especially in Euripides, it is also part of his criticism of gods, as he does not always believe in divine justice (Euripides' *Hercules Furious*, introduction, 1992i).

Philoctetes is also a tragic hero who suffers from Hera's rage toward Hercules at first and toward him afterward. Philoctetes had helped Hercules and Hera wants to take revenge. So, when the Greek fleet is leading toward Troy and stops at the island of Limnos to visit Athene's temple, she misleads Philoctetes, and he goes very close to the temple. There is a sacred poison snake that bites him. His wound could not be cured, and Philoctetes suffered from the sharp pain. He remains on the island for 10 years in pain until Hercules saves him. His adventures are represented in Sophocles' *Philoctetes* (1992f).

Probably, one of the angriest gods is Dionysus in *Bacchae* (Euripides 1992b). He is angry with the king of Thebes, Pentheus, because he does not want to accept the new religion that Dionysus represents. Dionysus is insulted by Pentheus. The admission of *hybris* is made from the first moment in the drama: "We have insulted the god" (Biniaris 2018). So, the god avenges himself on his detractors. *Bacchae* and all the women of Thebes, Pentheus' mother Agave included, are possessed by religious mania and ecstasy. In a bacchian ritual, they worship Dionysus. But this madness leads to an exceptional kind of cannibalism. The women want to eat the god to open up to god and become one with him. Pentheus meets a horrible death. He is slaughtered, devoured, and lacerated by his bacchant mother, a "maenad." He becomes "a holy sacrificial lamb" in the name of human freedom (Biniaris 2018).

Gods can and must be angry sometimes because they are responsible for the moral rules, so in such cases, anger is presented in a wholly positive way. However, in the last three decades of the fifth century, there has been a critique against anger that suggests that gods have to be wise and control their anger (Harris 2001).

In ancient Greek tragedies, gods can also intervene and cause humans' anger and follow revenge, like Apollon in Sophocles' *Electra* (1992c), who urges Orestes to kill his mother and get revenge for his father's murder. In Euripides' *Bacchae*, anger was imposed in *Bacchae* and Agave by Dionysus, but it mirrors his rage. The question, of course, is should gods get angry? The tragic poet in *Bacchae* argues through Cadmus, "Gods should not imitate the anger of humans" (Harris 2001).

8.4 Masculine Anger in Ancient Greek Drama

Ancient Greek drama is the history of men's anger and its consequences. In *Iliad*, Agamemnon refused to allow Apollo's priest Chryses to ransom his daughter, and the god got furious with him and inflicted a plague on the Achaean army. Agamemnon gets angry after Achilles' pressure to give back the priest his daughter and violently takes Achilles' trophy, Briseis. Achilles gets so angry that he is ready to kill Agamemnon. The goddess Athene intervenes, and Achilles instead decides to

withdraw from the battlefield. At a moment in the epic, Patroclus, Achilles' dear friend, decides to replace him in the battle, and he gets killed by the Trojan prince Hector. Now Achilles directs his orge toward Hector, and he kills him and vandalizes his corps. That is why Hecuba is so angry at him and wishes to eat his raw flesh. And Hector's father Priam has a silent rage that makes Achilles feel afraid of the orge of gods against him, so he decides, finally, to take care of Hector's body and return it to his father. However, this war started because the Achaean army was angry with the Trojans, especially Paris, who fell in love with Helen and stole her from her husband, Menelaus.

Odyssey (Homer 2022b) is a tale of retribution tied to a tale about the anger of the god Poseidon for Odysseus, who blinded his son Polyphemus (Harris 2001). Then, Odysseus is angry with Penelope's suitors, wanting to kill them. Revenge is usually the result of anger, and extreme anger in antiquity, most of the time, inevitably leads to murder. In Homer's epic, the men's honor is interrelated with anger. So, a man, a hero, a warrior must be irascible when his honor is dishonored. Between men, the expression of anger in a violent way is a power game, an expression of superiority. And yet is a kind of justice for inappropriate, unsatisfactory, insulting behavior. Through this lens, anger is the reason that orators most frequently ask for the punishment of the wrongdoers. Justice and anger would thus define one another (Braund and Most 2003).

In *Seven Against Thebes*, the audience watches a quarrel between the two brothers, Eteocles and Polyneices, sons of Oedipus. This bloody fratricidal strife, this bitter hostility between the two brothers, is also described in *Foinisses* (Euripides 1992d). This anger is a family affair. It comes from their father, Oedipus. However, Ronalds (in Critchley and Ronalds 2012) has a different view of this drama. He proposes a controversial explanation of Oedipus' behavior in *Oedipus Tyrannus*. He argues that Oedipus was terrified and then angry because he discovered the truth about his origins. When he meets an old man at a place where three roads join one road, at Phocis, he argues with him because none of them gives way to the other. They both unleash anger toward each other, and Oedipus murders the older man who, it turns out, to be his father. According to Ronalds (in Critchley and Ronalds 2012), Oedipus is an "arsehole" as he was first blinded by his anger and made a wrong choice. When later Oedipus learns that he has married his mother and has given birth to children with her, he gets angry again and blinds himself as he does not want to see the reality he has created.

On the other hand, Tuminas (2016) argues that Oedipus is an ancient Titan, and people like him do not exist nowadays. He is ready to search his past and face the truth. At first, he gets angry with everyone around him because he is suspicious. He believes they conspire against him and want to blame him. He searches everywhere except himself to put the blame. He gets angry with Apollo and thinks his prophecies are unfair and unjust (Trubotchkin 2016). This is a result of his deprived, lost Ego. An Ego that does not know and cannot take responsibility for his actions. A person who feels this way is angry. Oedipus gets furious with the oracle Teiresias because the latest reveals to him his "buried self." He mirrors his subconscious (Ramphos 2016). But then, the glorious king accepts his fate. He is powerless, and

he feels unworthy and guilty. He realizes his defeat, his humiliation, he is horrified by his atrocity, and he judges himself and (self) punishes himself. For Tuminas (2016), this is the greatness of the man. Through this wisdom, self-knowing, and heroism, he is transformed into the man he should be.

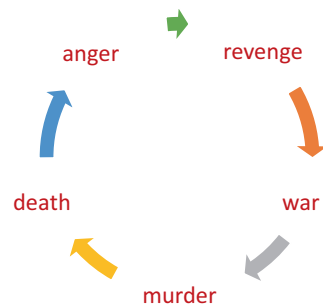
Eteocles and Polyneices are re-enacting the violence of their familial background. The agreement between them and their father is that both of them will be kings of Thebes and change the crown each year. Eteocles takes the crown first, but he refuses to give it to his brother when the time comes. So, Polyneices brings the leaders of Argos against Thebes to demand his throne. A civil war starts, and Eteocles considers his brother a traitor. Their angry exchange is best represented in the drama mentioned above, Euripides' *Foinisses*. More details about this story can be found in Sophocles' *Oedipus at Colonus* (1992e), *Oedipus Tyrannus* (1992d), and *Antigone* (1992a).

Anger, revenge, war, murder, death. A vicious circle that never breaks (Fig. 8.3).

In Euripides' *Supplices* (1992o), the story goes on. The old women of Argos, whose sons died in the battle outside the gates of Thebes, come to Theseus, king of Athens, and his mother Aethra and ask to help them take from Creon the dead bodies of their men to bury them. Theseus is not angry at the beginning, and he wants a peaceful solution, but when Creon denies giving the bodies, he decides to take revenge in the name of the sons of the Seven in an attempt to bring justice and be human. He starts a war against Thebes, and he wins Creon.

However, the most incredible family story of anger in ancient Greek tragedy is the story of Agamemnon and his family, the Atreid's story. The first who wrote about this story was Homer. Eight tragedies are based on this story: Aeschylus' *Agamemnon* (1992a), *Choephoroi* (1992b), and *Eumenides* (1992c), Sophocles' *Electra* (1992c), and Euripides' *Orestes* (1992n), *Electra* (1992c), *Iphigenia in Tauris* (1992l), and *Iphigenia in Aulis* (1992k). This is a story of conspiracies, murders, revenge, and punishments. The curse has its origin in Tantalus, who slaughtered his son Pelops and offered his flesh as a dinner to the gods of Olympus, trying to test their intelligence. Pelops was brought back to life by the gods, who got extremely angry with Tantalus, and Tantalus was punished. Then, Pelops got married to Hippodamia by killing her father. One of Pelops sons was Atreus, Agamemnon's father, and another was Thyestes Aegisthus' father. The two brothers

Fig. 8.3 The vicious circle of anger



were in antagonism about the throne of Mycenae. Thyestes seduced Atreus' wife, and Atreus, to take revenge, killed Thyestes' kids, and offered him a dinner with his kids' flesh. Thyestes cursed Agamemnon's family, and later, he and his son Aegisthus managed to take the throne of Mycenae. Sometime later, Agamemnon manages to send Thyestes and Aegisthus to exile and take the throne (Mitta 2022).

When Agamemnon has to leave for the Trojan war, the story of anger and blood in his family continues with more murders. Agamemnon has killed the goddess Artemis' deer. She is furious, and she withdraws the winds from blowing, so the Achaeans' fleet cannot sail to Troy. Agamemnon has to sacrifice his daughter Iphigenia to the goddess to satisfy her, to allow the sailing. Clytemnestra, Agamemnon's wife, gets furious with him. Agamemnon stays in Troy for 10 years. Clytemnestra and Aegisthus become lovers. They are both angry with Agamemnon; they both wish to take revenge; they both want to kill him. When he returns from Troy, arrogant, the great winner of the war, with Kassandra on his side as a trophy and his lover, he is the perfect target. Clytemnestra has persuaded Aegisthus to kill him. Aegisthus wants to take revenge for his brothers' murder of Atreus, satisfy his lover, and get rid of Agamemnon. So, he kills him. Agamemnon in Troy desecrated the temples of the gods and violated divine and human laws, and before that, he sacrificed his daughter. He has to be punished. His death was a result of blood rivalry. As the oracle, Calchas warns the victory which is succeeded with crime leads to crime (Aeschylus' *Choephoroi*, introduction, 1992b).

The curse reaches the fifth generation; the kids of Agamemnon. Orestes must take revenge for his father's murder. Behind Orestes, Electra is the one who pulls the strings. She is the one who is the angriest. She feels pain as she is the one who is obliged to live in her mother's and her lover's house and bare all the shame because of their attitude and behavior. Orestes kills his mother and Aegisthus, and he is pursued by Erinyes, who are angry at him because matricide is against the laws. In *Eumenides* (Aeschylus 1992c), Athene has to appease the Furies/Erinyes'

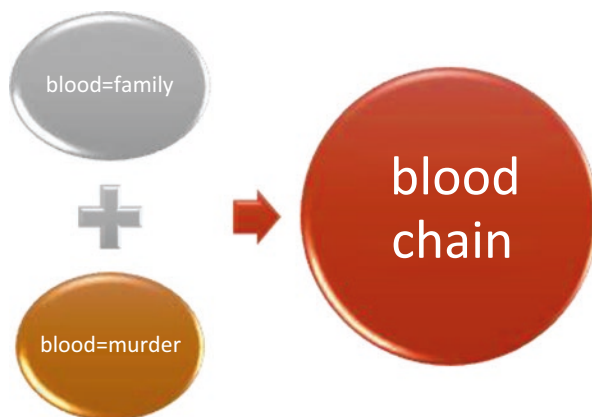


Fig. 8.4 The blood chain

rage to let Orestes go. Only when Orestes goes to trial and is acquitted the “blood chain” can be broken, and the family drama and the bloody strife can end (Fig. 8.4).

Masculine anger is met in other tragedies too. *Prometheus Bound* (Aeschylus 1992d) is probably the drama where anger is explored and discussed the most. Prometheus is a rebel, a hero, a Titan. His conflict with Zeus symbolizes the conflict between progress and tradition. He is the mentality against the dark forces of materiality. Zeus is angry at him because he disobeyed the divine laws and offered humanity the fire (like Adam’s and Eve’s apple), the way to improve and produce civilization. He gave people hope and helped eliminate death’s fear (259–261). His punishment must be tremendous. In Aeschylus, gods decide about everything, are above men, and are responsible for people’s actions. Divine law is above human law, and when this condition is disrupted, the world becomes unbalanced. Zeus is the total masculine symbol. When he is angry, the punishment is disastrous. Prometheus contemned Zeus’ authority at first, as the god Hephaistos underlines in *Prometheus Bound* (31–32) and then showed disrespect for Zeus’ rage. This is an enormous event in antiquity as the tragic poets present it. So, he is bound on a rock with chains for eternity, and an eagle comes every day to eat his liver, which re-borns daily, so he cannot die and the torture is eternal. The chorus in the tragedy commenting on Zeus’ character says that he has a hard heart, never feels compassion, is always angry, and always thinks he is right (173,198–199). Prometheus talks about Zeus’ “black anger” (202). But Prometheus is very angry, too. The god Ocean advises him to stop being angry to save himself from torture (327–328). He also advises him to stop talking and telling the truth because this makes Zeus more furious (341). He also suggests that if he changes the way of his talking and becomes mild and soft, he could manage Zeus’ anger (391–392). But Prometheus is determined. He talks about “chariots of fire” (380), meaning chariots of anger that will come from the deprived ones, even if everything is turned to ashes by the king of gods. He confronts Zeus, who, in his eyes, is a tyrant, and he denies being his slave; he denies being afraid and bow before the king (966–976). “Duel,” in the meaning of antagonism and competition between men in ancient tragedy, is a common situation and mirrors the ideals of an era. A lot of anger, a lot of violence. *Prometheus Bound* is a tragedy full of anger vocabulary, full of the sounds of thunder, full of lightning. Prometheus, at the end of the tragedy, gives the full image. As no one of the two males is willing to bend, the result will be an echo of abyss and groans, circles of fire and dust in the sky, winds fighting each other, welkin and sea shocked, and disaster which will make people feel horror. An injustice is taking place (1094–1107).

In Sophocles’ *Ajax*, anger produces appalling effects on individuals. At first, Athene is angry because Ajax is too proud to accept her assistance in the battle. He declared everywhere and each moment that he does not need god’s help, and this is an arrogant behavior, this is *hybris*. So, she blurs his mind. Ajax is angry, and this has consequences, especially for his family. Ajax is angry because he was not awarded the armor and weapon of Achilles. He feels dishonored. So, he wants to die because he cannot find a reason for existence. “It’s a shame for a man to ask for a long life when he cannot see/imagine any change in his unhappiness,” he says

(473–474). And again, “the nobleman has to live in honour and die in honour” (479–480). He thinks he has failed, so he gets angry with himself. His wife Tecmessa tries to persuade him that he has more duties than being a strong man and warrior. He has human duties toward his family, wife, and son. But the giant Ajax has his own philosophy and turns his anger against himself and commits suicide. At the beginning of the tragedy, an explosion of his anger is represented by Athene, when she says to Odysseus that Ajax burst his anger on droves of animals thinking they were his co-warriors (51–64). He tears the animals into pieces. Tecmessa describes the scenes as highly violent (232–244). Blood and more blood. If Athene had not interfered, Ajax would have tortured and killed the Trojan war heroes, including Odysseus. Athene is angry with him. The Atreid and the other warriors are also angry with him. The chorus is afraid they will ask for revenge. Men rivalry again. Who is the bravest? The chorus calls Ajax irascible (222). Ajax is overwhelmed by mania. He is not logical anymore, and Athene makes him crazier. He feels like a coward when he realizes what he has done. He feels ridiculous killing the animals instead of men. This is another reason he wants to die. This tragedy also presents anger in correlation with emotionally charged language and sound. Ajax is groaning and screaming. He is in despair. He cannot recognize himself. He talks about death, punishment, madness, disaster, and unhappiness.

The anger continues in this tragedy over the dead body of Ajax, with Teuktrus, his friend, who wishes to bury his body. Menelaus forbids him to do so. He sees Ajax as a traitor who wished to kill the Achaeans. There is a quarrel, and Teuktrus insists on burying Ajax, so Agamemnon takes over, and the “battle” continues between them now. The crisis is resolved at this point by Odysseus, who acts as a pacifier. The exciting thing is that anger seems almost unstoppable in every tragedy, and when it stops, it happens after a long, long disastrous journey.

Finally, in Euripides’ *Alcestis* (1992a), Admetus’ father Pheris turns against him. Admetus must die unless someone else decides to die in his place. The only one who accepts to do this is Alcestis, his wife. When Pheris comes for Alcestis’ funeral, Admetus attacks his father and calls him a coward (717) because, in his mind, he should have offered to sacrifice and die because he is old. Pheris also accuses him of being a coward who left his wife to die instead of him (696–698). He has become his wife’s killer. “You have found a nice way to stay alive, persuading each time your partner to die for you” (699–701), he says to him. And also, “Dying for you would be a mistake” (710). There is an intense quarrel between father and son, a quarrel that scholars cannot decide if it is miserable and tragic or ridiculous. A father who loves his life and feels he has done everything he could for his son and a son who is superficial, vain, dishonest, selfish, and hysterical (Euripides’ *Alcestis*, introduction 1992a). Kott (1987) argues that they are both cowards who fight against each other in a Brechtian way. The son is like the father. Neither the old nor the young want to die. They both let the woman die, and Pheris calls her an idiot for this decision. But the question that arises, in the end, is if Admetus was worthy to die for (Hose 2011).

8.5 Female Anger in Ancient Greek Drama

Female rage is common in ancient Greek epics and dramas and part of what was thought to be the excessive emotionality of women. That is to say that uncontrollable rage seems to be a female matter and an extra disadvantage for women. In *Eumenides*, we can see the anger of Erinyes, the archaic spirits of family vengeance. Erinyes are female. (Braund and Most 2003). Athene, the goddess in Oresteia, has to pacify the Furies'/Erinyes' rage for Orestes (Harris 2001). Aristophanes mocks women's anger in *Lysistrata* (1992b) and *Ecclesiazousai* (1992a). Hecuba in *Iliad* XXIV expresses her desire to eat Achilles' raw flesh because he killed her son Hector and behaved to his corps in a savage and unrespectful way. Sophocles' young *Antigone* is very angry with her uncle and king of Thebes, who forbids the burial of her brother Polyneices. The chorus referring to orge argues that citizens must control angry emotions and public behavior for the city's sake (Harris 2001). Again, in *Iliad*, Aeneas is trying to advise Achilles about his wrath. He says, "as we were women who get angry." Clytemnestra and Medea are probably the angriest women in ancient tragedies, but both for powerful reasons. Women are more often in situations of subordination and are oppressed, which produces anger. Of course, their rage is considered inappropriate by several philosophers and scholars, and these women are labeled and presented as monsters, as the general idea is that a woman should be ready to bear anything and have self-control.

The ancient tragedy also illuminates the profile of the descent woman. Tecmessa in *Ajax*, Jocasta in *Oedipus Tyrannus*, Antigone in *Oedipus at Colonus*, Chrysothemis in *Electra*, and Ismene in *Antigone* know and mirror the social place of the woman in antiquity and are probably what was expected as the ideal of a woman. They are calm and gentle and can control not only their own anger but can manage other people's anger (Harris 2001). Ajax advises his wife, when she tries to prevent him from acting with anger, violently, that silence is a beauty, jewelry to women (293). And she stops talking.

Sophocles' work, though, is two-sided. Chrysothemis confronts her sister when she asks her to help kill their mother and her lover, "You are a woman, not a man. Your hand is small and powerless in front of our enemies' hands" (*Electra*, 998–999). The same tells Ismene to Antigone, "We were born women, not to go against men" (*Antigone*, 61–62). Two pairs of sisters. The one fearless and angry, the other submissive and "comme il faut."

However, women's anger is explored mainly through four female characters. *Medea*, *Hecuba*, *Electra*, and Clytemnestra. *Medea* is the great love and revenge tragedy. In this play, anger is against logic. Medea is madly in love with Jason. She has destroyed all her past; left her country, Colchis, and family; and even killed her brother to be with Jason and live with him. But Jason betrays her, humiliates, and dishonors her by planning to marry another woman, the daughter of Creon. As the nanny at the beginning of the play says, "now everything has turned against her, and her love has become bitter hate" (16). And later, "because her soul is mad and cannot forgive injustice" (38–39), and "she will not stop being full of rage until she

burns someone with her thunders...” (93–94). She needs revenge (Konstan 2007). Her attitude and behavior are considered “masculine” (Harris 2001). She is full of black sorrow and black anger. She is too violent and ruthless. She murders Jason’s bride-to-be and his father-in-law and consciously becomes the killer of her children to take revenge on him. At the same time, she declares, “we were born women incapable of performing noble actions, but such skilled architects of every kind of harm” (446–447). Her anger is justifiable, but Jason addresses her and says she should not behave this way. If she ceases her anger, she will have profit (615). She should “bear the wishes of the stronger” (449). But Medea is strong and feels strong. She was a queen in her country and behaved like a queen, although in the eyes of ancient Greeks, she was a barbarian with a disastrous uncontrolled orge. According to Jason, she is a “lion thirsty for blood” (1342). This tragedy is full of the words anger and orge. Probably the most “permeated with orge” (Harris in Braund and Most 2003) tragedy than every other tragedy.

On the opposite side is the timid, good, naïve Deianeira in *Trachiniae*, who has to face her husband’s unfaithfulness too, but feels that she has no right to be angry, and she does not know how to be angry. She has the correct attitude of a woman of her time, but she is in despair, so she sends him a tunic dipped in a love potion which turns out to be a fatal poison that kills him (Konstan 2007). Her act is probably a result of untold, subconscious anger, but it is unintentional at the same time. It is then her sons’ anger for what she did that drives her to suicide. The difference between Medea and Deianeira is that the second does not feel dishonored, and that is why she does not consciously ask for revenge. She fulfills her socially assigned role. She is afraid of Hercules, who has all the power. She is vulnerable and helpless. She cannot go against the dominant male. “The capacity for anger depends on status,” according to Konstan (2007), who bases his opinion on Aristotle.

On the other hand, Hecuba is the queen reduced to a slave. She has lost all her family in the Trojan war and takes revenge for her last son’s Polydorus death. With other enslaved Trojan Women blind Polymestor, the Thracian king who was supposed to protect her son but instead violates the laws of guest friendship and becomes his killer. And then they kill his sons. Here, we have a group of angry women who lost their country, families, and lives, and now they are taken as slaves to another world. Grief and despair lead to atrocity. Hecuba has lost her values, self-respect, and everything that makes her human. It is a psychological distortion. She is transformed from a passive victim to a relentless abuser (Euripides, *Hecuba* (1992e), introduction). It is possible that in the face of Polymestor, she takes revenge on all Greeks. The blind Polymestor, toward the end of the tragedy, feels her joy for taking revenge, and Hecuba admits it. Revenge brings her joy after all the pain she has suffered (Konstan 2007). It is not so strange that Agamemnon is presented to feel sympathy for Hecuba, and that is why we cannot be sure to what degree ancient Greeks condemned women’s anger. Of course, Hecuba has every right to be angry, and no one can question how justified she is to have such intense and violent feelings for the killers of her children and how fair is her retaliation (Harris in Braund and Most 2003). “Injustice hurts,” writes Karagiannis (2010) commenting on Achilles orge and its results in his homonymous psychology book.

In *Trojan Women* (Euripides 1992p), Hecuba mourns constantly. She feels like a shadow, like a dead woman. She wishes to be dead in her despair, burnt like Troy (1294–1295). She considers Helen responsible for her disaster. Her passive sorrow becomes hate when she sees her in front of her. She expresses her anger by asking Menelaus to slaughter his wife for what she has caused and enact a new law for all the women who abandon their husbands (1141–1143). Hecuba is in so much pain and has faced so much violence that she cannot be human anymore.

Euripides' *Electra* is also justified for her anger. This anger is not the product of unreasoning passion. She wishes to slaughter her mother and then die (281). She cannot bear that she goes to bed with her father's killer. Euripides' *Electra* has been married to a farmer, and she lives in poverty on a homestead. She is in permanent mourning which calls her brother like a siren's song (Papakonstantinou 2018). Normally, she wants revenge, and that is why she needs Orestes. She must restore justice and bring purification. However, she cannot become the killer. She is the abettor. She puts the sword in her brother's Orestes hand, and later in the plot, Dioscuri blame Apollo for the crime. Euripides is against matricide. Electra has stormy hate, she imposes the murder on Orestes, while Clytemnestra is represented with less hard nature and more human (Euripides, *Electra*, introduction). At the end of the play, Electra and Orestes feel guilty for their horrible action and are presented as moral wrecks over their mother's dead body. Electra cries, "like fire, the miserable me, fell over the mother who gave me birth" (1182–1184).

Sophocles' *Electra* has feelings, which keep on changing, and psychological transitions. She is even more soft at the begging of the play than Euripides' *Electra*. She tries to resist the murder. She is also calm when her mother Clytemnestra gets angry herself. But, her mother has killed her father and has made her a prisoner in her own house and prevented her from marrying to eradicate her generation. She is not really a member of the royal family anymore, and she has to take orders from her mother's lover. So, in cold blood and a very intense and calculated manner, she urges Orestes to the murder (Harris in Braund and Most 2003). In her consciousness, there is not a moral dilemma (Sophocles, *Electra*, introduction). "The mother that gave birth to me is my worst enemy," she says (261–262). Aegisthus "is a scoundrel, a coward, a man who knows only to fight women" (300–302). Electra is in endless mourning (232), and she becomes aggressive and intractable and "gives birth to wars" (219). She is a deprived woman with no identity. Her identity is now that she is the daughter of a murdered king who asks for revenge. Her lamentation becomes her weapon; as she is a woman, her anger passes through her lamentation and becomes her way to resist. Instead of solving the problem, she intensifies her fury in this way. In this tragedy, Sophocles tries to find a path from "savagery to domestication, from the subterranean to the celestial, from blood to discourse." He wishes to close "the dark cycle of blood." But Orestes comes as the "black hunter" (as in the ritual of Athenian adolescents) and must succeed in a dark task. Kill his prey, which in this case happens to be his mother (Karakantza 2018; Vidal-Naquet, 1998 in Karakantza 2018). Electra shouts, "hit again if you can" (*Electra*, 1417, in Winnington 2016). In this tragedy, there is no resolution yet for the house of Atreus. Anger brings anger, violence brings violence, and the lament goes on (Papakonstantinou 2018). Electra and

Orestes stay alone with their crime in the end. And Orestes concludes, “keep away from women who feel the war” (1243).

Finally, Clytemnestra is the heroine that has not a tragedy called after her name. However, she seems to be always present as the center of anger. She is the protagonist in six of the eight tragedies about the troubles of Atreid’s family. Clytemnestra is so angry with Agamemnon that she does not even bury him properly. She tears his body; she wipes her bloody hands on his head; she organizes dances and sacrifices to the gods who saved her (Seaford, 1985 in Papazoglou 2018). The first thing that makes Clytemnestra angry is the lie that her husband tells her. He intends to sacrifice Iphigenia and calls her and her mother in Aulis, pretending that he intends to marry her to Achilles. The two women reach Aulis in complete joy, and when they get there, they hear the news. First comes the sorrow, then the despair. They feel devastated. At first, they beg for mercy from Achilles, Agamemnon, and all the Achaeans, but no one listens. Achilles gets angry, but later on he compromises. Then, Iphigenia gets angry, and Clytemnestra gets angry. The mother has taught her daughter to resist. Men have stupid goals: to become winners of the war. “Why does Menelaus not sacrifice his own daughter?” Clytemnestra shouts (1201). After all, his own wife was unfaithful. And it is at this point that comes to the lust for revenge. Clytemnestra now has poison in her blood. Memories of ancient murders and ancient sins overflow her mind (Toibin 2019). In *Iphigenia in Aulis*, her monologue, when she addresses her husband, is so eloquent and tragic: accumulated grief, complaints, disappointment, anger, hate (1146–1208).

The next step is to plan his murder in every tiny detail. She waits for him to come back from Troy. She puts a guard to wait for him and give her the signal when he arrives. When Agamemnon arrives, she pretends to be happy. She declares in front of the chorus of the old men of Argos that there is not a better joy for a woman than to greet her husband, who returns alive from the war (*Agamemnon*, 579–582). She pretends to be a loyal woman, like a dog that never sleeps waiting for its master (585–586). When she sees him with his new lover, she gets even more furious. But she has self-control. She even invites Cassandra into the palace as an inevitable duty (1009). She prepares his bath. She lies to him the way she did to her. And then she kills him precisely as he did to her daughter. Exactly as Cassandra’s prophesy. She admits she has lied before and boasts about her crime. “You cannot prepare death for your enemy unless you pretend to be his friend” (1350–1351). She is, in essence, in the heart of revenge. She feels the drops of his blood on her like deadly dew (1366). Aeschylus represents perfectly the zenith of anger and the joy of revenge. The chorus calls her a daimon and a woman with a masculine soul (1446–1452). Clytemnestra admits that she is not Agamemnon’s wife anymore, but the eternal daimon, the same who prepared Atreus dinner for his brother with his children’s flesh. She believes that her action finally brought justice to the palace.

In Sophocles’ *Electra*, Clytemnestra has a monologue where she passionately defends her action. “Justice killed him, not me alone” (528), she cries about Agamemnon. And wonders “Why did he sacrifice her? (534) Was he disgusted by his children? (544) Wasn’t he a bad and mindless father?” (546). The chorus realizes her anger. But her daughter Electra is angry at her. She does not support her. On the

contrary, she talks to her in a very angry vocabulary. Clytemnestra now gets angry with her daughter. The vicious cycle again. The one accuses the other of having no shame. Clytemnestra is disappointed with Electra and Orestes because they cannot sympathize with her. She was also afraid of them and felt that this fear “sucked the hot blood from her soul” (785–786). When she hears the rumors that Orestes is dead, she feels free (787). But, Clytemnestra, even dead, is angry. In *Eumenides*, her phantom appears and asks for revenge. When Erinyes fall to sleep, tired of chasing Orestes, she wakes them up to continue their duty. She complains “nobody is getting angry for me” (101), meaning that no one cares for her. And then, she asks Erinyes to “blow a breath of death over him, melt him with your breath... chase him and destroy him” (136–139). She is not a mother anymore. She is a woman who cannot resist what she thinks is injustice and shouts for revenge.

Three more heroines deny the role of the wise woman in antiquity. The vengeful Alceme who dominates the last scene of the *Heracleidae* (941–1052) (Euripides 1992h), *Antigone* who condemned herself to death, and Creusa in *Ion* (Euripides 1992j), whose anger almost led to her son’s murder. Alceme wants to take revenge on Eurystheus for the humiliation of her son Hercules and for all the problems he caused to her whole family. She is determined to kill her “enemy” (965), as she calls him, despite the opposite opinion of the chorus. Chorus clarifies to her that the unwritten moral law is that you cannot kill someone you capture alive in the battle (966). Alceme is ruthless and talks about hate and justice. When the chorus argues that no one would kill Eurystheus, Alceme says with a lot of courage, “I would; and I believe that I am someone worthy” (973). How brave was she to talk like this in the patriarchal society of Athens?

Antigone has been almost an idol for many generations since it was written. The heroine is young, passionate, and ethical. She has the power to confront her uncle Creon when he orders her not to bury the dead body of her brother Polyneices. The punishment for disobedience is death, and she knows it. She is so angry at him. She is not afraid to dispute his authority. At the beginning of the play, she calls him “general” (8) and not king. Then he calls him ironically “our good Creon” (31), and when she faces him, she tells him that he is not god to give her orders and that his orders are not superior to the gods (453–455). Creon gets mad at her behavior, too. He proclaims that if he does not punish her, she will be the man and not him (484–485). Even if she is her sister’s daughter, he will send her to death (486). Creon makes another character of the tragedy get angry at him; his son Aemon who will marry Antigone. Aemon insults his father. He tells him that his head is empty, that he is wondering about his mental health (754–755), that he only talks and never listens (757), and that he will govern an empty city (739). Creon calls him the slave of a woman (746). According to Steiner (2001), the Greek tragic words are deadly; they can wound the spirit and soul, and kill the human body. It is evident that *Antigone* is a tragedy full of conflicts. Conflicts between men and women, young and old, dead and alive, society and individual, and people and gods. *Antigone* is a revolution. In *Antigone*, anger and devotion to family and divine laws become a requiem. Antigone’s song (kommos) is a song to herself. Her soul suffers in silence for the life she is not going to live. But she is above everything and above her anger in the end.

Creusa in *Ion* is an entirely different heroine. She is the victim of Apollo. He forced her to sleep with him, and she got pregnant with Ion. Creusa describes the rape scene, and her scream is heard loudly, “Oh! mother” (893). Apollo also forced her to keep the pregnancy secret from her father, and when she gave birth to the child, she abandoned it to die because of her shame. After many years, when she meets her son, she thinks that he is the son of her present husband with another woman. She is totally justified to be angry. We do not know what would have happened if Creusa was not influenced by her faithful servant, an old man who lives with her and loves her like her father (812). We cannot really be sure if Creusa gets angry or if she gets only unhappy. The old man makes his own story. He believes that Xuthus, Creusa’s husband, has deceived her. So, he insists that she must find a way to kill father and son before they kill her (845–846). Creusa wonders how she can win those who are more powerful (973). The old man urges her to burn Apollo’s oracle, to slaughter her husband and “his” son. Creusa loves her husband, so she tries to poison her son, who gets furious and wants to kill her when he realizes her plans. A misunderstanding created and supported mainly by the old man leads to idle anger and revenge and a controversial story about anger.

One significant point here, to conclude, is that this attitude toward women led to the exclusion of women from political life and did not allow them to be independent personalities with the right to get angry when they should be (Harris 2001).

8.6 Causes of Anger

Potegal and Novago (2010) wonder what the gods were angry about. In *Prometheus Bound*, we meet Zeus’ anger toward Prometheus. Prometheus was disloyal disobedient and Zeus punished him most cruelly. Gods get angry when their power is challenged, and their worship is insufficient. It is the same case in *Odyssey* with Odysseus and Poseidon. Hera is always angry with Zeus’ lovers and punishes them and their kids. In antiquity, goddesses were angry because male gods had betrayed them, their sexual advances had been rejected, humans have outraged their dignity, or failed to honor them (Harris 2001). They do not want anymore to be treated with disrespect.

The initial idea behind gods’ anger was that if you are a dominant person or a leader or someone powerful precisely like gods, you have to behave this way. Gods, moreover, are responsible for “the observance of the norms of human conduct” (Harris 2001). Only later did Athenians start to realize that anger could be disastrous for the city’s affairs.

As ancient tragedies have taught us, mortals get angry for several reasons. When they are oppressed, when they are not free, when they cannot do what they wish, when they are close to heartless people. Anger is also the result of expectations that did not come true, injustice, pain, hate, passion, betrayal, lies, disrespect, shame, spite, insults, murder, atrocity, brutalism, and immortal actions.

8.7 Murder as the Result of Anger: The Central Theme of Tragedies

In most ancient tragedies, we have a murder committed by a family member (Belfiore 2000). As mentioned above, anger leads to revenge and revenge to a murder. In 17 tragedies, violent actions against a family member are commonplace. In most cases, parents kill their children, or children kill their parents. In seven tragedies, parents intend to murder or actually murder their kids. In Aeschylus' *Eumenides*, Clytemnestra urges Erinyes to punish her son Orestes, in Aeschylus' *Ion*, the mother wishes to kill her son, in *Medea* and in *Bacches*, the mother is the killer. At the same time, in *Hercules Furious*, *Iphigenia in Aulis*, and *Hippolytus*, the father is the murderer. In five tragedies, the child murders the parent. In Aeschylus' *Choephores* and in Sophocles' and Euripides' *Electra*, Orestes kills his mother, and Electra urges him to do so. In *Oedipus Tyrannus*, Oedipus kills his father, even without knowing. In two tragedies, *Seven Against Thebes* and *Foinises*, the brother kills his brother, Eteocles and Polinices, and in *Iphigenia in Tauris*, Iphigenia, without knowing intends to kill her brother Orestes. Finally, in *Prometheus Bound*, Zeus tortures his uncle Prometheus and in *Antigone*, Creon orders to kill his niece Antigone while his son Aemon wants to kill him. In *Agamemnon* and *Trachinae*, the wife Clytemnestra murders her husband, Agamemnon.

In seven more tragedies, murders are committed or will be committed. The idea is similar in *Helen* (Euripides 1992f), *Hecuba*, *Philoctetes*, Aeschylus' and Euripides's *Supplikes* (Aeschylus 1992f; Euripides 1992o), *Oedipus in Colonus*, and *Heracleidae*. Murder or wishes for murder follow anger.

8.8 Conclusion

Anger dominates tragedy. It correlates with deep sorrow, a feeling of injustice, despair, hate, a wish for death, mourning, and revenge. Angry people cry, shout, and mourn, and their hearts are black, heavy, and mad. Sometimes they lose their consciousness, the hot blood spreads through their breast, and they faint. Other times they lose control, become violent, and commit murder. Cannibalism is the zenith of this brutality. A great disaster will follow if anger hits a house (*Medea*, 129–130).

As Leighton (2003) argues, anger in ancient tragedy “is to be portrayed by characters, felt by actors and expressed in the language of characters.” The question is if anger is to be felt by spectators of a tragedy. Aristotle has not included or allowed for anger to have a place akin to that of fear and pity probably because “anger on the part of an audience is at odds with responses of fear or pity. Thus, including anger would risk the very success of the form of tragedy, structured as it is in terms of fear and pity” (Leighton 2003).

Classical Greek texts, comic and tragic, investigate in-depth the emotion of anger. Classical dramatic poets wonder whether external factors or irresistible

forces cause anger and look for man's responsibility in such situations. They examine how inappropriate this emotion is for the sake of the individual, family, and the city. The answer is that it is a liberating emotion on some occasions and other times a disastrous one that leads to war, murder, and death. So, anger and rage should be restrained. It seems that catharsis comes in the end for the heroes who take revenge, but there are times when death follows as their punishment. Anger is more suitable for the gods and the powerful, so when people traverse the limits, *hybris* is committed. And even though they are right to be angry, unwritten divine laws do not allow it, especially in tragic theatre. Leighton's (2003) question remains, of course. How does the audience feel? Is there a difference between the ancient audience and the modern audience? Is catharsis the end of the story, or is it the beginning of new thinking that comes to the surface?

Trying to explore these questions, working on ancient and modern tragedies, with a drama group of teenagers 15–16 years old, one of them admitted: "After all this work on anger through the dramatic texts and theatrical exercises, all the anger for everything in my life abandoned me at least for one week." Is this catharsis? It remains to be further explored.

Multiple Choice Questions

1. Which is the first word in *Iliad*?
 - (a) Revenge
 - (b) Wrath
 - (c) Sorrow
 - (d) *Hybris*
2. According to Dave Ronalds (2012) rage exists because:
 - (a) It is a necessary element for change
 - (b) Otherwise tragedy would not exist
 - (c) Humans cannot control themselves
 - (d) There is war
3. Which ancient tragic hero says that it is inappropriate for a woman to be angry?
 - (a) Achilles
 - (b) Prometheus
 - (c) Hecuba
 - (d) Deaneira
4. Which ancient tragic hero suffered from Aphrodite's anger?
 - (a) Ajax
 - (b) Electra
 - (c) Hercules
 - (d) Hippolytus

5. Dionysus in *Bacchae*:

- (a) Wants to be the king of Thebes
- (b) Is angry with Pentheus without a serious reason
- (c) Wants to establish a new religion
- (d) Is angry with *Bacchae*

6. Gods in ancient tragedy:

- (a) Are responsible for moral rules
- (b) Never get angry
- (c) Are not allowed to be angry
- (d) Punish the heroes who get angry

7. Odysseus suffers because:

- (a) Polyphemus is angry at him
- (b) Poseidon is angry at him
- (c) Athene is angry at him
- (d) He always wants to take revenge

8. Electra's lamentation:

- (a) Solves the family problem
- (b) Is a way to resist
- (c) Is unreasonable
- (d) Is a way to push her brother to kill their mother

9. According to Clytemnestra, to prepare someone's murder:

- (a) It is necessary to plan every tiny detail
- (b) You must have the support of your friends
- (c) You have to pretend to be friends with the one you want to murder
- (d) You must not be afraid.

10. Injustice:

- (a) Has nothing to do with anger in ancient tragedy
- (b) Led Oedipus kill his father
- (c) Makes Iphigenia wish to kill her brother in *Iphigenia in Tauris*
- (d) Can be the cause of revenge

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Chapter 9

An Integrative and Holistic Approach in Premenstrual Syndrome and Premenstrual Dysphoric Disorder Management



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9.1 Introduction

Premenstrual syndrome (PMS) and premenstrual dysphoric disorder (PMDD) is a medically unexplained disorder that occurs with physical and psychological symptoms presenting during the luteal phase of the menstrual cycle end within a few days after the onset of menstruation (Abay et al. 2019).

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Worldwide, the prevalence of PMS is remarkably high, and its causes are still unclear and are multifactorial (Abay et al. 2019; Hofmeister and Bodden 2016). PMS is associated with significant lifestyle, personal and social relationships, impairment, and compromised work performance (Masoumi et al. 2016). As per ACOG, “premenstrual syndrome as a clinical illness categorized by the cyclical presence of somatic and psychobehavioral symptoms not related to any organic disease and appear during the 5 days prior menses in each of the three before menstrual cycles and subsides within 4 days of the onset of menstruation, without reappearance until at least day 13 of the cycle” (Buddhabunyakan et al. 2017; Freeman 2011). As per 2020, ICD-10-CM, diagnosis code N 94.3 includes premenstrual tension syndrome, and the synonyms are premenstrual syndrome. The association with the menstrual cycle cyclicity and timing are the two key features of PMS as per the ICD-10 diagnosis and necessitates only one distressing symptom for a diagnosis of PMS (Halbreich 2004). As per DSM-V (diagnostic and statistical manual of mental disorders, fifth edition), PMDD is another common premenstrual syndrome and for diagnosis of PMDD as a “depressive disorder not otherwise specified” that highlights cognitive-behavioral and emotional symptoms (marked irritability or anger, marked anxiety, markedly depressed mood) with minimum five of eleven prespecified indications limited to the luteal phase for at least two consecutive menstrual cycles are required (Danis et al. 2020; Shah et al. 2008). PMS is related to more than 200 symptoms complexes with multiple phenotypes, genotypes, subtypes, and various pathophysiologic events (e.g., serotonin, gamma-aminobutyric acid) that begin with ovulation (Braverman 2007). Women with PMS tend to towards significantly lower quality of life, parenting problems, legal problems, increased absenteeism from work, suicidal ideation, decreased work productivity, social isolation, impaired personal and social relationships, and more frequent visits to the hospital (Buddhabunyakan et al. 2017; Masoumi et al. 2016). Further, PMS women are prone to dyspareunia, sexual dissatisfaction, and sexual desire and excitement dysfunctions.

This chapter aims to understand better the etiopathogenesis, clinical features, diagnosis, contemporary, and integrative holistic approaches of PMS management. To retrieve the information related to premenstrual syndrome and PMDD, a thorough literature survey was undertaken using various scientific databases such as ScienceDirect, PubMed, Web of Science, Scopus, Google Scholar, and other databases. The terms searched were premenstrual syndrome, PMDD, PMS, premenstrual syndrome and complementary and alternative medicine, an overview of premenstrual syndrome, management and PMS, PMS, and integrative approach. In addition, we reviewed papers published from 1989 to 2021 in the English language. Only full-length papers were included.

9.2 Etiology

The precise etiology of PMS is unclear and multifactorial though its incidence is very high (Agha Hosseini et al. 2008; Khayat et al. 2014). However, several etiologies have been suggested, such as diet (calcium, magnesium, vitamin D), insulin-like growth factor 1, drugs, lifestyle, central neurotransmitters, prostaglandins (Khayat et al. 2014), genetic vulnerabilities (Huo et al. 2007), and a result of an interaction between reproductive steroids (see Fig. 9.1) (Freeman 2011; Malvika and Supriya 2019).

Sex Steroids and Their Metabolites

Women with PMS/PMDD are more subtle to normal cyclical hormonal fluctuations. The most reasonable theory is serotonergic dysregulation with reduced serotonergic function in the luteal phase (Freeman 2011; Halbreich 2004). Studies have revealed that reduced serotonin uptake by platelets and whole blood serotonin levels (lower 5HT) during the luteal phase has been confirmed by women with PMS (Ataollahi et al. 2015; Masoumi et al. 2016; Zheng et al. 2007). In the neurobiology of PMDD, alteration in endorphins, serotonin, and γ -aminobutyric acid (GABA) with estrogen and progesterone metabolites having an interface with GABA-A receptor complex

Diet	<ul style="list-style-type: none"> • The association with ovarian hormones and vitamin B6 and calcium deficiency. • Excessive consumption of salt, foods high on carbohydrates, fat and protein
Neurotransmitters	<ul style="list-style-type: none"> • Serotonergic dysregulation • Reduced γ-aminobutyric acid (GABA) receptor sensitivity
Lifestyle	<ul style="list-style-type: none"> • Sedentary life • excessive caffeine intake, alcohol abuse and cigarette smoking
Sex steroid and their metabolites	<ul style="list-style-type: none"> • Altered allopregnanolone causes PMS in stress ful condition and amygdala reactivity.
Genetic vulnerabilitis	<ul style="list-style-type: none"> • The role of the gene coding for serotonergic 5HT 1A receptor and estrogen receptor alpha gene (ESR 1) has been documented.
Somatic symptom	<ul style="list-style-type: none"> • Changes in renin-angiotensin levels also increases progesterone, Dopamine D receptor, oestrogen receptor antagonist are effective in mastalgia, Progesterone is agonist of aldosterone

Fig. 9.1 Etiology of PMS and PMDD

(Malvika and Supriya 2019). Studies have established that in response to stressful events, a neuroactive progesterone metabolite, allopregnanolone alteration, has been demonstrated in PMS women (Kleinstäuber et al. 2016). Cortisol, melatonin, thyroid hormone, and relaxin are the other hormones that also have a role in the pathophysiology of PMDD (Malvika and Supriya 2019).

Central Neurotransmitter

Due to estrogen and progesterone hormone discrepancies, sodium and water retention may occur. Furthermore, progesterone affects the return of blood because of the venous wall sagging, and also it is aldosterone agonist inducing natriuresis. In addition, during the luteal phase of the menstrual cycle, the breasts edema may be related to mastodynia, as epithelial cell proliferation is exaggerated (Tacani et al. 2015).

9.3 Epidemiology

Prevalence

According to the epidemiological surveys, at least one symptom of PMS has been experienced by 85% of reproductive-age women. Premenstrual dysphonic disorder (PMDD), the severe form of PMS, is experienced by 2.5–3% of women (Masoumi et al. 2016). However, several studies have confirmed a wide variation of prevalence of PMS in different countries and cultures. For example, a prevalence of 23–34% and 71–73% in non-western cultures and western countries were reported in a cross-cultural study in 10 countries, including 14 culturally diverse areas (Padhy et al. 2015).

The first systemic review and meta-analysis of PMS suggest that the worldwide pooled prevalence of PMS is 47.8%, with the highest in Asia and lowest in Europe (Direkvand-Moghadam et al. 2014). As the prevalence varies concerning the definition used, the population studied reported the highest incidence in Asia (98%), followed by American women (41%), Arabian women (37.5%), Japanese women (17.5%), and lowest in Europe (10–12%) (Padhy et al. 2015; Tacani et al. 2015). The difference in the study population and the use of various measurement tools are essential factors for the variances in reported prevalence. Another cross-sectional trial, University in Karachi, among female students reported a 79.5% prevalence of PMS (Mohib et al. 2018).

PMS is a comparatively under-investigated area of psychiatry in India (Fernández et al. 2019). Hence, generally scarce data are available despite Indian population lines about 1/6th of the world's female population and the largest adolescent female population (Padhy et al. 2015). The reasons for underdiagnosis are as follows:

physicians deliberate it has a simple cultural and social paradigm and not a real disease or unable to establish a diagnosis of PMS, and women do not consult a physician for the PMS symptoms (Fernández et al. 2019).

Risk Factors

The risk factors reported for PMS and PMDD have been erratic and contrary. Common risk factors are summarized in Fig. 9.2. In addition, various risk factors such as the experience of traumatic events, high body mass index, and stress play a role in the etiology of PMDD (Malvika and Supriya 2019).

- *Age and Ethnicity:* PMS is more likely identified in adolescents and can begin 2 years post menarche (Mishell 2005). Masho et al. (2005) suggested PMS was more prevalent among younger women (between 18 and 24 years). Early age of menarche and nulliparity are also associated with an increased risk (Freeman 2011). According to a population-based study, whites compared to African Americans reported were more than twice PMS symptoms (Masho et al. 2005).
- *Biological Factors:* They do not provide enough explanation for premenstrual distress however play an important role in PMS (Kleinstäuber et al. 2016). The study of twins indicated that the concord for PMS in monozygotic twins was twice as compared with dizygotic twins (Condon 1993).
- *Dietary Factors:* An increased risk of developing PMS has been associated with excessive consumption of salt, foods high on carbohydrates, fat and protein, red meat (Ataollahi et al. 2015; Frackiewicz and Schiovitz 2001).

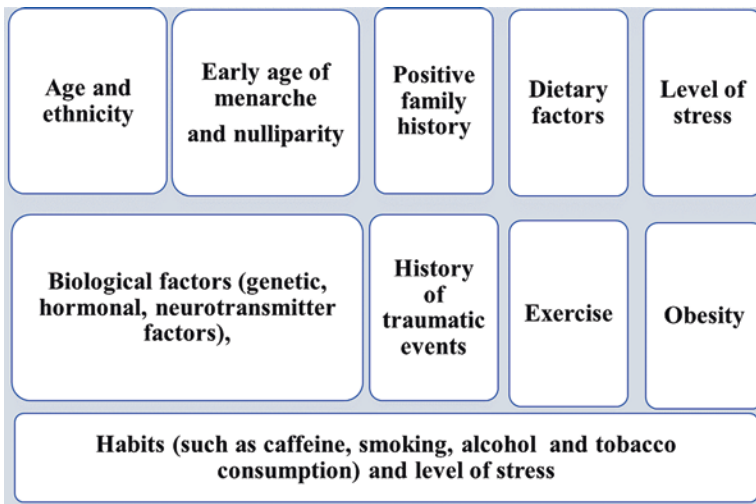


Fig. 9.2 Risk Factors of PMS/PMDD

- *Family history*: A positive correlation has been noted among women with PMS family history in mothers (70% vs. 37% of daughters of unaffected mothers) (Braverman 2007).
- *History of Traumatic Events*: A prospective cohort among young women reported a history of traumatic events like severe accidents, childhood sexual abuse, and the physical threat that increased the odds of developing PMDD (Perkonig et al. 2004).
- *Personal Habits*: The occurrence of PMS has a strong correlation with women who have a history of excessive caffeine intake, alcohol abuse, and cigarette smoking (Ataollahi et al. 2015; Frackiewicz and Schiovitz 2001). This suggests that smoking can modify menstrual function by increasing the risk of irregular menstruation amenorrhea and dysmenorrhea. Furthermore, according to a case-control study, it is stated that smokers are more expected to have PMS and PMDD depending upon the amount and duration of tobacco consumption as tobacco is known to decrease the activity of the monoamine (MAO) enzyme that degrades serotonin (Fernández et al. 2019).
- *Obesity*: Obesity is a dependent variable associated with PMS, and obese women were 2.9 times more expected to have PMS than underweight women. It promotes chronic inflammation and adversely impacts renin-angiotensin-aldosterone function and increases the risk of hypertension (Masho et al. 2005). The use of oral contraceptives and regular physical activity has been identified as protective factors against PMS (Freeman 2011).

9.4 Diagnosis

A complete medical and psychiatric history must be elicited to diagnose PMS and PMDD as no laboratory diagnostic tests are available. As per the diagnostic criteria for PMS, according to the ACOG Practice Bulletin 15 of 2000, minimum one of the somatic symptoms (abdominal bloating, breast tenderness, headache, swelling of extremities) or affective symptoms such as anxiety, anger, depression, confusion, irritability, outburst, and social withdrawal. Further, the presence of PMS symptoms in the absence of hormone ingestion, any pharmacologic therapy, or alcohol use or drug, and the symptoms should persist during two cycles of prospective recording (Freeman 2011; Halbreich 2004).

PMS is categorized into “PMS-A, PMS-C, PMS-D, and PMS-H.” PMS-A includes irritability, nervous, and tension anxiety; PMS-C involves headaches and may also be accompanied by increased appetite, fatigue, palpitations, desire for sweets, and tremors; PMS-D includes symptoms such as depression, forgetfulness, tearfulness, insomnia, confusion, and PMS-H and is most frequently related with edema and comprises water retention, bloating, swelling, breast tenderness, and weight gain (Tacani et al. 2015). As per the APA (2013) guidelines, the diagnostic criteria for PMDD are at least five symptoms must be present, one or more from

affective symptoms, and one or more from somatic symptoms. Further, these symptoms should be severe enough to interfere with daily activities.

Various Tools Used for Diagnosis of PMS and PMDD

The most precise way to diagnose PMS and PMDD are prospective questionnaires as patients have been found to significantly overrate the cyclical nature of symptoms when persuasively, they are unpredictable or simply aggravated during the luteal cycle (Hofmeister and Bodden 2016). The description of the tools is summarized in Table 9.1.

9.5 Management of Premenstrual Syndrome

For the management of PMS, there is no single effective treatment generally accepted. Hence, a multidisciplinary team implementing an integrated, holistic approach is recommended. Further, the type, number, and severity of premenstrual symptoms also vary from person to person. Hence, an individualized management plan should be pragmatic (Abay et al. 2019).

The initial step embraces lifestyle changes and diet regulation, patient education and counseling (teaching to women self-screening, creating awareness) about PMS, and methods of coping with stress. Complementary alternative therapies and cognitive behavioral therapy are implemented in the second step. The third step is initiated with pharmacological treatment if the problem continues, and in the fourth step, surgical treatment is applied (Abay et al. 2019; Masoumi et al. 2016) (Fig. 9.3).

Initial Step

Patient Education and Counseling

The initial step for managing PMS symptoms includes patient education and counseling. Relaxation is a stress management method, a non-pharmacological prevention for PMS management (Kimiyaee Asadi et al. 2016). Social support from influential people such as family members and friends can be provided as a psychological, emotional-oriented method, and informative support can prevent women (Rezaee et al. 2016). Reproductive health professionals still face a challenge to educate men about PMS as they do not have adequate information on the adverse effects of the PMS in women.

Table 9.1 Various tools/scales used for diagnosis of premenstrual syndrome

S. No.	Tool	Description
1.	<i>Premenstrual symptom screening tool (PSST)</i>	It is a retrospective screening tool assessing the severity of PMS symptoms (Bosman et al. 2018)
2.	<i>Premenstrual syndrome scale (PMSS)</i>	The premenstrual syndrome scale comprised 40 questions with three subscales (physiological, psychological, and behavioral symptoms). This 5-point Likert-type scale consists of 40 items. The interrater reliability of the scale is reported between 0.81 and 0.97 (Padmavathi et al. 2014)
3.	<i>Premenstrual tension syndrome (PMTS) scale: It consists of two specific scales; premenstrual tension syndrome observer-rating scale (PMTS-O) and premenstrual tension syndrome self-rating scale (PMTS-SR)</i>	The PMTS-O rates the severity of PMS symptomatology across 10 domains (on a scale of 0–4 in 8 domains and 0–2 in 2 domains), with a maximum score of 36. The PMTS-SR consists of 36 items relating to overall PMS symptomatology, with each item rated as either 0 (not present) or 1 (present), giving a maximum score of 36. A PMTS total score greater than 27 indicates severe PMS symptoms; between 18 and 27 of moderate symptoms and between 10 and 17 mild symptoms and a score of less than 10 would indicate a lack of premenstrual syndrome (Malik et al. 2018)
4.	<i>Premenstrual tracker sheet</i>	It is a beneficial diagnostic tool for PMS. The patient is asked to document the duration and timing of her symptoms. Various studies have proposed that maintaining a symptom tracker sheet by the patient can be helpful later in the management of PMS
5.	<i>DSM-V-based symptom diary</i>	It is a retrospective screening tool for diagnosing severe PMS and PMDD. The questionnaire contains 30 items on a 4-point rating scale, ranging from 0 (not true at all) to 3 (absolutely true). Of these 30 items, 27 cover the 11 symptom sections specified in the DSM-V criteria. The authors found adequate to good internal consistency for psychological impact (Cronbach's $\alpha = 0.91$) and functional impact ($\alpha = 0.88$) (Janda et al. 2017)
6.	<i>Chinese Hamilton depression rating scale (CHDS)</i>	It has 17 items with a total score range from 0 to 50 has fair reliability and validity in assessing the severity of symptoms of depression. The resultant generalized α of 0.92 indicates excellent interrater reliability. Also, the obtained reliability coefficient value of 0.714 indicates satisfactory inter-item consistency (Zheng et al. 1988)
7.	<i>Shortened premenstrual assessment form (PAF)</i>	It is a retrospective questionnaire that provides guidelines to help each woman define her premenstrual period and its duration and the severity of the PMS symptoms. The shortened (10-item version) PAF has a high internal consistency and reliability as compared to the 20-item version PAF (Allen et al. 1991)
8.	<i>Calendar of premenstrual experience (COPE)</i>	It is a simple, prospective inventory for the diagnosis of PMS. The test-retest reliability was high, $r = 0.78$, $p < 0.0001$ in two consecutive menstrual cycles (Mortola et al. 1990)

(continued)

Table 9.1 (continued)

S. No.	Tool	Description
9.	<i>Daily record of severity of problems (DRSP)</i>	DRSP was developed to assess the DSM-IV criteria for PMDD and the severity of symptoms and impairment at various menstrual cycle phases. It provides sensitive, reliable, and valid measures of the symptoms and impairment criteria for PMDD (Endicott et al. 2006)
10.	<i>Visual analogue scales (VAS)</i>	It is a validated scale length of 10 cm with 0 (no pain) on the one end and 10 (the maximum imaginable pain) on the other end. This scale is widely used in pain-related studies, and its validity and reliability have been confirmed. This scale can assess all the subjective parameters relating to PMS. VAS scores are interpreted as 0 = none, 1–3 = mild, 4–6 = moderate, and 7–10 = severe (Malik et al. 2018)
11.	<i>Penn daily symptom rating (DSR)</i>	It is a self-administered checklist enquiring 17 symptoms rated on a Likert scale of 0 (not at all) to 4 (very severe). The scale is short and reliable, valid with good internal consistency, and used in a primary care setting (Padhy et al. 2015)

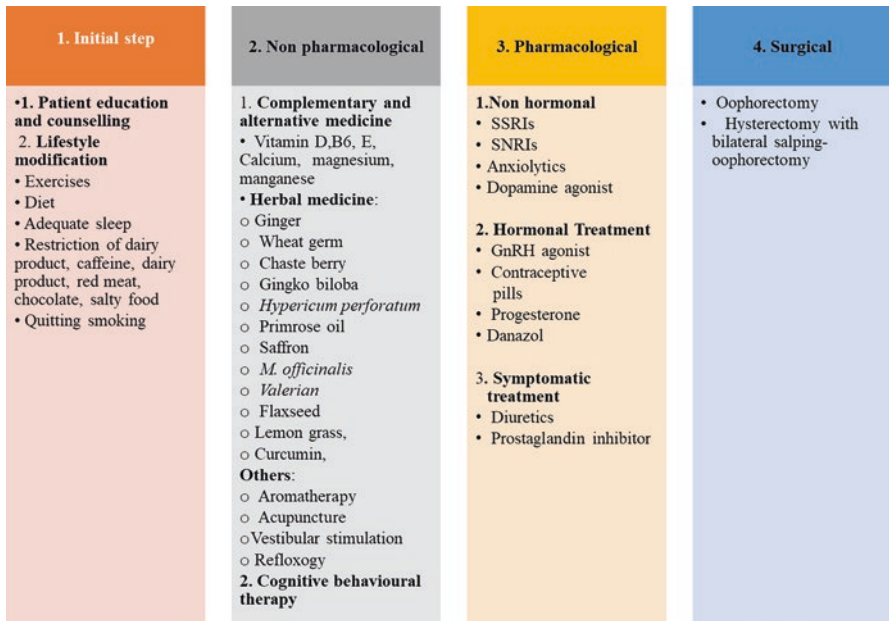


Fig. 9.3 Management of PMS/PMDD

Lifestyle Modifications

It has been suggested from current studies that restricting the consumption of caffeine, dairy products, red meat, chocolate, salty foods, cigarette smoking, alcohol,

change in lifestyle, and regular exercise plays a role to reduce PMS symptoms (Ataollahi et al. 2015). In one controlled study, a reduction in PMS symptoms was noticed in women who jogged about 12 miles a week for 6 months, whereas women who did not do exercises experienced any improvement of symptoms (Frackiewicz and Shiovitz 2001). Voluntary control of the muscles through relaxation training comprises numerous methods and techniques to lessen tension and anxiety. To date, various methods have been implemented for meditation, hypnosis, relaxation, including exercise, etc., generally with the same results (Padmavathi et al. 2014). The effects of aerobic exercise at different intensities in premenstrual syndrome have already been studied (Vishnupriya and Rajarajeswaram 2011). Good quality and adequate sleep to reduce fatigue and depressive mood for at least 8 h a day are recommended. Clothing that is not tight should be chosen in case of general oedema. Comfortable and supportive shoes are advised for pedal edema, and supportive bras and elastic waistbands are recommended in engorged breasts (Abay et al. 2019).

Nonpharmacological Treatment

The second step includes nonpharmacological treatment. It includes complementary and alternative treatment (dietary supplementation, herbal medicine, and others) and cognitive and behavioral therapy.

Complementary and Alternative Medicine

Dietary Supplementation with Vitamins and Minerals

Many women desire effective and safe nondrug approaches to PMS therapy, such as dietary supplements. Chia seeds, walnuts, and flax seeds (1 spoonful/day) are rich in omega-3, and fatty fish should be added to the diet. Consuming calcium-rich foods such as green leafy vegetables, milk, and yogurt is recommended. The consumption of pulp, high level of protein, and complex carbohydrates and beans, barley, whole grain bread, brown rice, and lentils are recommended and can reduce psychological symptoms and craving symptoms. Nuts, whole rain cereals, dried fruits, and oily seeds are also preferred (Abay et al. 2019).

- *Carbohydrates*: The mood symptoms of PMS were improved in preliminary studies with a formulated carbohydrate-rich beverage that increases tryptophan levels improved (Freeman et al. 2002).
- *Calcium and Vitamin D*: During the menstrual cycle, vitamin D fluctuation has been noted. Thys-Jacobs et al. reported that calcium (daily administration of 1200 mg) and vitamin D (1600 IU) administrated group experienced a significant decrease in premenstrual migraine severity in compared to the placebo group ($p < 0.05$) (Thys-Jacobs 2000). A large, multicenter trial reported that elemental

calcium, 1200 mg per day, was effective in fatigue, water retention, pain, reducing depression, food cravings, and insomnia in PMS symptoms (Thys-Jacobs et al. 1998).

- *Vitamin B6*: A cofactor in serotonin synthesis, vitamin B6 (pyridoxine) is frequently useful to treat PMS. However, conflicting results have been shown, and it is considered to be of limited benefit. Nevertheless, a meta-analysis reported that to improve the overall PMS symptoms, vitamin B6 was better than a placebo (Dolatian et al. 2002; Masoumi et al. 2016, Wyatt et al. 1999).
- *Vitamin E*: Researchers have demonstrated that physical and mental symptoms of PMS were significantly improved after vitamin E supplements in an RCT (Mandana and Azar 2014).
- *Magnesium*: It has been hypothesized that magnesium affects the regulation of serotonin and other neurotransmitters and may reduce PMS symptoms. Several small, RCT, and double-blind studies have determined the effect of magnesium supplementation on various PMS with promising results (Walker et al. 1998).
- *Manganese*: One small, non-placebo-controlled study has demonstrated increased mood and pain symptoms during the premenstrual phase has been experienced in women who take low dietary manganese (Penland and Johnson 1993). Therefore, the benefit of this supplement in the treatment of PMS remains uncertain. The daily dose intake recommended is 1.8 mg. However, to prevent PMS, 6 mg/day has been recommended daily (Frackiewicz and Shiovitz 2001).
- *Combination Therapy*: Dolatian et al. (2002) found that the efficacy of vitamin B6 (40mg), vitamin E (100 mg), and placebo on PMS in 93 patients in Tehran had a similar effect in the treatment of PMS. A study recommended combining vitamin B6 and calcium to reduce the PMS symptoms (Masoumi et al. 2016).

Behavioral Therapies

Cognitive behavioral therapy, training in coping skills, and relaxation techniques lessen stress or ease coping and hence may help to reduce PMS symptoms. In addition, PMS patients who experience cognitive therapy have been shown to experience substantial improvements in home management, partner relationships, and mood ((Frackiewicz and Shiovitz 2001).

Complementary and Alternative Medicine

Nowadays, complementary and herbal medicines are commonly used to treat chronic gynecological conditions such as menopausal symptoms, PMS, and dysmenorrhea. They are reliable, economical, and safe and have fewer side effects than contemporary medicines (Ataollahi et al. 2015; Sultana et al. 2022). Research studies on various alternative/complementary/herbal therapies are summarized in Table 9.2.

Table 9.2 Clinical trials on herbal medicines

Auth.	Type of study	Pat. age (Y)	Incl. Crit.	Type and durat. of inter.	Con. group	Outcome	Result	Adv. event	Phyt. chem.	Pharm. actions
Stevinson and Ernst (2000)	Prospective, open, uncontrolled, observational study	18–50 y patients	Self-reported premenstrual syndrome symptoms for over 6 months self-reported impairment of occupational, family, or personal functioning	Hypericum perforatum tablets for two complete menstrual cycles (1x 300 mg hypericum extract per day standardized to 900 mg hypericin) (n = 19)	–	Primary: Daily symptom report, a checklist of 17 premenstrual symptoms. Secondary: Modified, self-report, social adjustment scale used for assessing occupational, social, and personal functioning and the hospital anxiety and depression scale	Significant reductions in all outcome measures	No adverse event	Hypericin, inhibits MAO enzyme, acts as an antidepressant hyperforin act as SRI	Neuroprotective, antidepressant, antiangiogenic, anti-inflammatory wound healing and anti-nociceptive effect. Antioxidant

Agha Hosseini et al. (2008)	Double-blind, placebo, RCT	20–45 y patients	Regular menstrual cycles and experience of PMS symptom (according to the current diagnostic criteria proposed by the American College of Obstetrics and Gynecology) for at least 6 months	Capsule saffron 30 mg/day (15 mg twice a day) for a two menstrual cycles ($n = 25$)	Capsule placebo (twice a day) ($n = 25$)	Primary: Daily symptom report secondary: Hamilton depression rating scale	Effective in relieving symptoms of PMS. A significant difference was observed in the total premenstrual daily symptoms and Hamilton depression rating scale	No adverse effect	Crocin and saffronal of saffron inhibit the reuptake of dopamine, norepinephrine, and serotonin	Antidepressant, antispasmodic, anticancer agent, and memory enhancer
Ozgoli et al. (2009)	Single-blind, placebo, RCT	18–30 y unmarried, female students	Regular menstrual cycles of 21–35 days, not being affected by known physical or psychological disorders (e.g., hypothyroidism, mood disorders) and not taking any special medications (e.g., warfarin, anti-depressants, oral contraceptives), or other herbal medicines	<i>G. biloba</i> L. tablets (containing 40 mg leaf extracts) three times a day from the 16th day of the menstrual cycle to the 5th day of the next cycle for 2 cycles ($n = 45$)	Placebo ($n = 45$)	Daily symptom rating questionnaire Beck's depression inventory	Significant decrease after treatment in the overall severity of symptoms and physical and psychologic symptoms in both ginkgo (23.68%) and placebo (8.74%) groups ($p < 0.001$)	Not reported	Quercetin is an effective inhibitor of histamine release. Bioflavonoids are stress modulator	Anti-inflammatory, anxiolytic, antidepression

(continued)

Table 9.2 (continued)

Auth.	Type of study	Pat. age (Y)	Incl. Crit.	Type and durat. of inter.	Con. group	Outcome	Result	Adv. event	Phyt. chem.	Pharm. actions
Khayat et al. (2014)	Double-blind, placebo RCT	18–35 y	Regular menstrual cycles (21–35 days,) being single, not on any medication lacking sensitivity to ginger, nonalcohol, no smoking, and not having stressful events in the last 3 months	Two ginger capsules 250 mg/12 h (7 days) before menstruation to 3 days after menstruation (n = 35) for three cycles	Placebo (n = 35)	Daily record questionnaires the severity of PMS uses three items, including mood symptoms, physical symptoms, and behavioral characteristics	Reduction of the severity of mood and physical and behavioral symptoms of PMS	Not reported	Sesquiterpenoids, with (-)-zingiberene. Sesquiterpene lactones (SLs) are responsible for their anti-inflammatory activity	Immunomodulatory, antitumorigenic, anti-inflammatory, antiapoptotic, antihyperglycemic, anti-lipidemic and antiemetic actions (Rehman et al. 2011)
Saki et al. (2015)	Triple blind RCT	18–30 y	Regular menstrual period with the 24–35 intervals, without any other physical, illness, the record of pacifier's intake, mental disorders especially depression, and anti-depressants intake and hormone drugs	Primerose (<i>Oenothera biennis</i> L.) oil for three months (n = 40)	Placebo (n = 40)	DSM IV-TR standard questionnaire	Symptom severity in both the primerose and placebo group was significant reduced	Not reported	Linoleic acid (L/A) and gamma linoleic acid (GLA) facilitate the prostaglandin E1 synthesis. Omega-3 (linoleic acid) treatment of diseases related to serotonin reduction such as depression, mood symptoms	Anti-inflammatory, immune regulatory

Akbarzadeh et al. (2015)	Double-blind, placebo RCT	High school girls	Score < 23 from the GHQ, gaining a score > 20 from the premenstrual syndrome screening tool (PSST), not using vitamin supplements during the study, not having used hormonal drugs such as oral contraceptive pills at least 2 months of regular menstrual cycle and suffering from other diseases such as thyroid, diabetes, and mental disorders	<i>M. officinalis</i> essence (1200 mg) daily from the first to the last day of their menstrual cycle for three cycles (<i>n</i> = 50)	Placebo (<i>n</i> = 50)	GHQ-28 questionnaire and the PSST	M. officinalis capsules were effective in the reduction of somatic, psychological, and social symptoms	Not reported	Triterpenoids (ursolic and oleanolic acids) accountable for the inhibition of rat brain GABA transaminase (Shakeri et al. 2016)	Anxiolytic, anti-depressant spasmolytic, sedative, antioxidant, immunomodulatory antiviral, and antispasmodic
Zamani et al. (2012)	Double-blind, placebo RCT	Women of reproductive age	Regular menstrual cycles (25–34 days) and fulfills DSM-IV criteria for PMS	<i>Vitex agnus</i> (40 drops of in a glass of fruit juice) orally before breakfast from the sixth day prior to menses until menstruation, for six consecutive cycles (<i>n</i> = 62)	Placebo (<i>n</i> = 66)	Penn daily symptom reports and VAS score for symptoms	Considered as an effective and well-tolerated treatment for the relief of symptoms of mild and moderate PMS	No adverse effect	Flavonoid Casticin phenols, tannin, α-pinene, limonene, β-caryophyllene, sabinene, and β-farnesene	Antioxidant, chemopreventive, immunomodulatory and cytotoxicity, antimicrobial, antifungal, antimitoceptive, opioidergic, antiepileptic, neuroprotective

(continued)

Table 9.2 (continued)

Auth.	Type of study	Pat. age (Y)	Incl. Crit.	Type and durat. of inter.	Con. group	Outcome	Result	Adv. event	Phyt. chem.	Pharm. actions
Hafeeza et al. (2014)	Single-blind RCT	13–40	The regular menstrual cycle was included in the study irrespective of marital status and parity	<i>Vitex agnus castus</i> seed 1 gm and <i>Mentha piperita</i> distillate (Arq Pudina) 36 ml were administered orally twice daily, 10 days before menstruation in every cycle for three consecutive months	Placebo (n = 30)	PMTS-O PMTS-SR	Significant reduction in the premenstrual tension syndrome scale scores was observed in the test group than compared to control group ($p < 0.01$)	Not reported	Flavonoid Casticin phenols tannin, α -pinene, limonene, β -caryophyllene, sabinene, and β -farnesene	Anxiolytic, antioxidant, chemopreventive, immunomodulatory and cytotoxicity, antimicrobial, antifungal, antimociceptive, opioidergic, antiepileptic, neuroprotective

Auth.	Type of study	Pat. age (Y)	Incl. Crit.	Type and durat. of inter.	Con. group	Outcome	Result	Adv. event	Phyt. chem.	Pharm. actions
Ataollahi et al. (2015)	Triple-blind RCT	20–45 y	The body mass index of 19.8–26, having no night shifts, regular menstrual periods with 21–35 day cycles and 3–10 day bleeding period, no use of antidepressants, hormones and contraceptives, and vitamins in the past 3 months	400 mg capsules of wheat germ extract, three times a day between the 16th day of the menstrual cycle to the 5th day of the next menstrual period for two consecutive month ($n = 50$)	Placebo ($n = 50$)	Beck depression inventory (BDI) and symptom record (DSR)	Wheat germ significantly reduced physical symptoms (63.56%), psychological symptoms (66.30%), and the general score (64.99%)	Not reported	Magnesium, zinc, calcium, selenium, sodium, potassium, phosphorus, chromium, antioxidants including beta-carotene (for vitamin A), vitamin E, vitamin C, vitamin B12, vitamin B6, thiamin, riboflavin, niacin, folic acid, iron, amino acids, and enzymes. Linoleic acid reduces PMS symptoms	
Malik et al. (2018)	Single-blind, placebo RCT	18–45 y	Regular menstrual cycle (21–35 days) with PMS symptoms and had minimum PMTS score ≥ 10 and VAS score ≥ 1	666 mg of N. jatamansi orally, BID for the 15 days prior the expected date of menses, until the onset of the next menstrual cycle for two cycles ($n = 30$)	Placebo ($n = 30$)	PMTS-O PMTS-SR and VAS	Significant reductions in the premenstrual tension syndrome scale and VAS scores were observed in the test group than compared to the control group ($p < 0.01$)	No adverse effect	Sesquiterpene jatamansone inhibit GABA and MAO	Antidepressant neuroprotective activity. Prevent cognitive impairment and neurodegeneration

(continued)

Table 9.2 (continued)

Auth.	Type of study	Pat. age (Y)	Incl. Crit.	Type and durat. of inter.	Con. group	Outcome	Result	Adv. event	Phyt. chem.	Pharm. actions
Khanam and Sultana (2020)	Single-blind, placebo RCT	18–45 y	The regular and spontaneous menstrual cycle of 21–35 days, 122 presenting with signs and symptoms of premenstrual syndrome for at least three menstrual cycles as per ACOG guidelines, i.e., having at least one of the following affective (depression, angry outbursts, irritability, anxiety, confusion, social withdrawal) and somatic (breast tenderness, abdominal bloating, headache, swelling of extremities, development of symptoms during the 5 days prior menses in each of the three prior menstrual cycles were included to participate in the study	1000 mg of <i>P. vulgaris</i> . Two capsules twice daily from day 16 of the menstrual cycle to day 5 of the next cycle for three consecutive cycles (<i>n</i> = 30)	Placebo (<i>n</i> = 30)	Primary: PMSS, premenstrual tracker sheet secondary: EQ-5D-5L) health questionnaire treatment satisfaction questionnaire for medication Morisky medication adherence scale	A significant decrease (<i>P</i> < 0.0001) in the severity of somatic, psychological and behavioural symptoms of PMSS score, duration of PMS symptoms, and improvement in EQ-5D-5L index value in the polybody group than the placebo group	Not reported	Polypodin A and polypodin B bioflavonoid, tannin, phenols	Stress modulator, antidepressant, antioxidant, Immunomodulator, analgesic, neuroprotective, anti-inflammatory, antioxidant properties, effects on the rennin-angiotensin system, and increase 5-hydroxytryptamine in the brain

A systematic review included RCTs of acupuncture and herbal medicine for PMS/PMDD between 2002 and 2012, and screening 8 studies in acupuncture and 11 studies in herbal medicine were identified. Hand acupuncture and moxibustion, traditional acupuncture, and traditional acupuncture technique with auricular points were different techniques selected for analysis. In herbal medicine, studies on *Cirsium japonicum*, *Elsholtzia splendens*, *Hypericum perforatum*, *Ginkgo biloba* L. *Vitex Agnus castus*, and *Xiao yao san* were recognized. Experimental groups with acupuncture as well as herbal medicine treatment had significant improvement with no adverse effect in PMS/PMDD. The authors concluded that acupuncture and herbal medicine treatments showed a 50% or better reduction of symptoms than the initial state in PMS/PMDD (Jang et al. 2014).

Role of Phytochemicals/Molecules on Psychosomatic and Behavioral Symptoms of PMS/PMDD

The role of some phytochemicals/molecules in psychosomatic and behavioral symptoms of PMS/PMDD are summarized as available in vitro and in vivo studies. Studies reported that saffron showed an antidepressant effect against fluoxetine and imipramine through a serotonergic mechanism in treating mild to moderate depression (Agha Hosseini et al. 2008; Noorbala et al. 2005). Crocin and safranin are two significant components of saffron that inhibit the reuptake of dopamine, norepinephrine, and serotonin (Karimi et al. 2001). Early in vitro research proposed an antidepressant activity due to hypericin present in *H. perforatum*, through the inhibition of the monoamine oxidase (MAO) enzyme. Furthermore, studies reported that hyperforin phytochemical present in *H. perforatum* could inhibit the reuptake of serotonin, noradrenaline, GABA, dopamine, and L-glutamate (Oliveira et al. 2016).

Ginkgo is a monoamine oxidase (MAO) and thromboxane A2 methyltransferase inhibitor that increases catecholamines and other neurotransmitters release and decreases the reuptake of these molecules, improving mood and symptoms of depression. Furthermore, the phytochemical quercetin present in Ginkgo is an effective histamine release inhibitor. Therefore, Ginkgo reduces the severity of PMS/PMDD symptoms Ginkgo. Ginkgo's bioflavonoids are mainly known as stress modulators, hence used as an anxiolytic medicine and lead to the significant decrease of symptoms such as tension, irritability, labile mood, and anxiety. Ginkgo improves brain blood circulation and enhances memory and concentration as proven by several studies as it has vasodilator properties and stimulates blood circulation. (Ozgoli et al. 2009).

Ginger has anti-inflammatory properties and inhibits the metabolism of cyclooxygenase and lipoxygenase, preventing the production of prostaglandins (Khayat et al. 2014). Phytochemical investigations revealed that the *M. officinalis* plant contains volatile compounds, phenolic acids, flavonoids, and triterpenoids (Shakeri et al. 2016). *M. officinalis* can reduce the symptoms of PMS through the GABAergic system (Akbarzadeh et al. 2015).

The key mechanisms anticipated for this plant's extensively debated neurological effects are stimulation of the acetylcholine, acetylcholinesterase (AChE) inhibitory activity, GABAA receptors, and inhibition of matrix metalloproteinase-2. *M. officinalis* methanolic extract and its main component rosmarinic acid (RA) in an in vitro study (rat brain) showed GABA-T inhibitory activity as anxiolytic and could mildly inhibit monoamine oxidase (MAO)-A, inhibition as antidepressant. In addition, AChE inhibitors increase the duration of action and level of acetylcholine in brain. This cholinergic effect can improve Alzheimer's disease and frequently in the form of memory and learning deficits and cognitive impairments in schizophrenic patients (Shakeri et al. 2016).

Chamomile is used as an effective herbal medicine for a vast range of PMS physical and psychological symptoms. In a systematic review on chamomile between 1990 and 2019, eight RCTs out of 27 studies were included as per the inclusion criteria. Chamomile has therapeutic properties such as antispasmodic effects (quercetin, luteolin, matrisin, apigenin, metoxicomarin, and phytoestrogens); anti-inflammatory effects (α -bisabolol and chamazulene); and anti-anxiety effects (flavonoid, glycine), hence useful to relieve PMS symptoms. The author concluded that chamomile is effective for the treatment of PMS (Khalesi et al. 2019).

Relation of PMS/PMDD with Oxidative Stress and Effect of Herbal Medicine

A variety of reproductive health ailments such as endometriosis, preeclampsia, and recurrent pregnancy loss are implicated by excess reactive oxygen species (ROS), which can lead to cell damage and death. Hence, the theory that free radical-induced oxidative stress causes PMS is also determined by this evidence (Frankel et al. 2021).

Estrogens and progesterone in healthy women act as antioxidants. In PMS cases, oxidative damage to the polyunsaturated fatty acid-rich neuronal membrane is supposed to cause inappropriate, increased prooxidant activity. Therefore, they modify the GABAergic system, and dysfunction perhaps leads to the PMS symptoms. An additional source of oxidative damage in the neuronal membrane probably is catechol estrogens (products of estrogen conversion), which produce oxygen radicals (Granda et al. 2021) (Fig. 9.4).

Current research finding suggests some evidence of efficacy in supplementation with other vitamins (such as vitamin B6, vitamin D, vitamin E, and magnesium) or (Frankel et al. 2021) herbals such as *P. vulgare*, *Vitex agnus castus*, *Hypericum perforatum*, *saffron*, *G. biloba L.*, *Zingiber officinalis*, *M. officinalis*, and *N. jatamansi* summarized in table possesses antioxidant and anti-inflammatory properties, alter the hormonal, or oxidative stress profile of women experiencing PMS and improve their symptoms. This suggests that altering nutrient levels may be a relatively simple palliative for a complex gynecologic condition.

H. perforatum extract has antioxidant properties, and it has been proven to inhibit brain malondialdehyde (MDA) formation, "modulating also the activity of glutathione levels and GPx without any change on any of the measured oxidative stress indices protecting rat brain from elevated oxidative status due to the administration

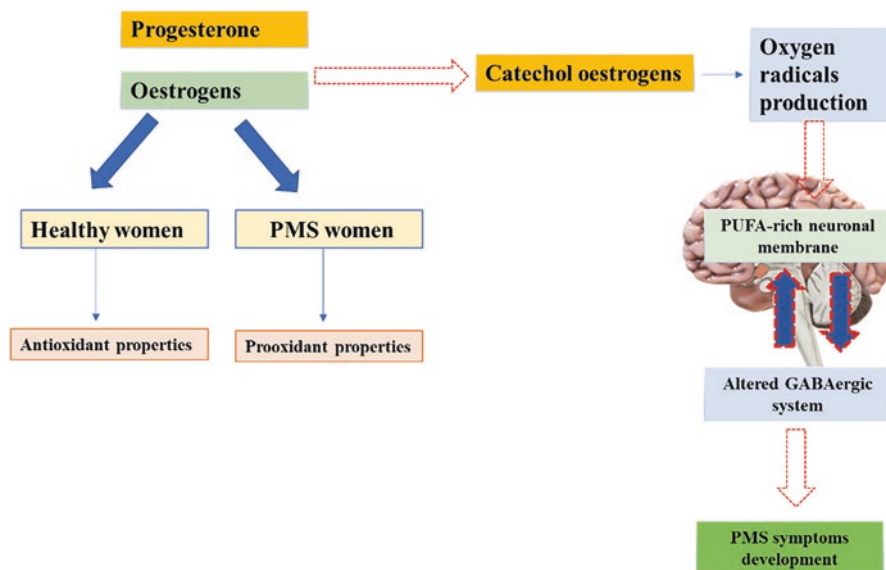


Fig. 9.4 Potential mechanism of the role of oxidative stress in PMS development. (Granda et al. 2021)

of anti-depressants” (Oliveira et al. 2016). Ginger is a strong antioxidant substance and may either mitigate or prevent the generation of free radicals (Khayat et al. 2014).

The antioxidant activity of *M. officinalis* extracts is attributed to the presence of phenolic acids, mainly hydroxycinnamic acid derivatives such as rosmarinic acid acetylcholinesterase inhibitory guided fractionation of the *M. officinalis* extract revealed those fractions containing rosmarinic acid (RA) derivatives to be more potent compared with other fractions (Shakeri et al. 2016).

Relation of PMS/PMDD with Inflammation and Effect of Herbal Medicine

After high exposure to progesterone and its metabolite—allopregnanolone (an agonist of γ -aminobutyric acid A receptor (GABA A receptor))—PMS symptoms are seen in the luteal phase. Allopregnanolone via the GABA A receptor has anxiolytic and sedative effects in a healthy person, resulting in an unaffected mood. However, in PMS, it acts in the opposite way which is thought to play a role in premenstrual symptom development (Fig. 9.5).

A systematic review reported some mediators TNF- α , hsCRP, and IL-1 family considered are typically responsible for chronic inflammation and these mediators were higher in PMS cases (Granda et al. 2021). The herbs summarized in the table shows anti-inflammatory property, hence useful in psychosomatic PMS symptoms. Flavonoids found in Ginkgo inhibit inflammatory prostaglandin production through the lipoxygenase and cyclooxygenase pathway, hence acting as an anti-inflammatory (Ozgoli et al. 2009).

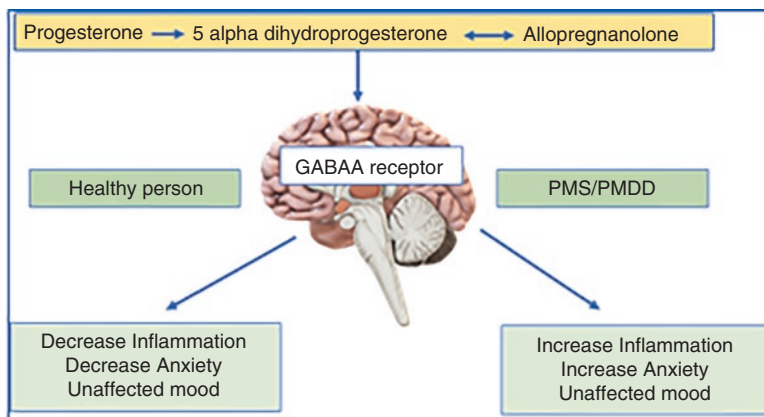


Fig. 9.5 Inflammation in the development of premenstrual symptoms. (Granda et al. 2021)

Alternative Treatment

Aromatherapy

Aromatherapy massage by 2% essential oil of Geranium (*Pelargonium graveolens*) in almond significantly reduced the severity of both mental and physical symptoms of PMS (Morse 1999; Lotfipour-Rafsanjani et al. 2018).

Vestibular Stimulation

A study offers preliminary indication for implementing vestibular stimulation to manage PMS as a nonpharmacological therapy. In ancient times, vestibular stimulation by motion devices was used to treat psychological disorders (Johny et al. 2017).

Pharmacological Treatment

The third step includes nonhormonal, hormonal, and symptomatic treatment for PMS symptoms such as SNRIs, SSRIs, anxiolytics, oral contraceptives, gonadotropin-releasing hormone (GnRH) agonists, and dopamine agonist are widely used for the treatment of the premenstrual syndrome (Table 9.3). The most effective practices to treat cyclic mastalgia and other PMS symptoms include suppressing or eliminating the ovarian cycle with an oral contraceptive, GnRH α , progesterone, and danazol (O'Brien and Abukhalil 1999).

Table 9.3 Pharmacological drug treatment in PMS/PMDD

Pharma. drugs	Relevant Lit.
Nonhormonal	
Selective serotonin reuptake inhibitors (SSRIs)	Among the various treatment modalities, the drug of choice and the first line of treatment for severe PMS/PMDD remain the SSRIs. A strong relationship has been found between the use of SSRIs (specifically, fluoxetine, paroxetine, citalopram, and sertraline) and symptomatic relief in PMS symptoms. A meta-analysis claimed to have found a strong association between the use of SSRIs and symptomatic relief for PMS/PMDD (Shah et al. 2008)
Serotonin-norepinephrine reuptake inhibitors (SNRIs)	Venlafaxine (SNRIs) have been used in women with predominantly psychological symptoms to treat PMDD. However, it is an off-label drug. The effect is accomplished over a comparatively for shorter period (3–4 weeks) and sustained throughout subsequent menstrual cycles (Hsiao and Liu 2003; Padhy et al. 2015)
Quetiapine (Seroquel)	Luteal phase anxiety, irritability, and mood lability in PMS or PMDD women were reduced in the quetiapine group. Quetiapine is an antipsychotic which is prescribed as an adjunctive treatment with an SNRI and SSRI (Jackson et al. 2015)
Anxiolytics and other antidepressants	In a few studies, alprazolam, benzodiazepine, and buspirone showed modest efficacy for PMS. However, alprazolam should be used only when the patient has symptoms limited to the luteal phase as the recognized risk of dependence was noted and there is no history of substance abuse (Freeman 2011)
Hormonal	
Oral contraceptives (OC)	A combined estrogen and progesterone or a progestin-only OC may relieve PMS symptoms by suppressing ovulation and ovarian steroidogenesis (Frackiewicz and Shiovitz 2001). Ovulation suppression has usually been effective for treating PMS symptoms (Zheng et al. 2007). A PMDD trial found that continuous treatment with continuous oral contraceptive use (90mcg levonorgestrel/20mcg ethinyl estradiol) for 112 days in women resulted in the most improvement in DRSP scores (Halbreich et al. 2012)
GnRH agonists	Various GnRH agonists (e.g., Leuprolide) are effective for PMS, with most patients reporting complete resolution of their symptoms during therapy. However, reserved for patients with severe PMS who are unresponsive to therapy, and moreover there are costly (Frackiewicz and Shiovitz 2001)
Progesterone	Until recently, in the late nineties, progesterone administered during the luteal phase as a rectal or vaginal suppository was widely prescribed for PMS. In addition, progesterone is significantly more effective than placebo in reducing breast pain and tenderness (Frackiewicz and Shiovitz 2001; Masho et al. 2005)
Danazol	Significant improvement was seen in premenstrual mastalgia when danazol 200 mg once daily was administered only in the luteal phase (day 14 to day 28) of the menstrual cycle as compared to placebo, for three consecutive cycles (O'Brien and Abukhalil 1999)
Symptomatic treatment	
Bromocriptine	Bromocriptine effectively reduces premenstrual breast tenderness in a dose of 2.5–5 mg daily (Frackiewicz and Shiovitz 2001)

(continued)

Table 9.3 (continued)

Pharma. drugs	Relevant Lit.
Prostaglandin inhibitors	Nonsteroidal anti-inflammatory drugs (NSAIDs) have been used to treat PMS, particularly the physical symptoms. These regimens have included using naproxen sodium and mefenamic acid during the luteal phase and stopping the therapy after the menses begin
Diuretics	Spironolactone, 100 mg/day given from day 15 to 28 of the cycle, has been shown to possess some positive effects on somatic and affective symptoms (Braverman 2007). In addition, thiazides are also prescribed to reduce water retention in patients who are intolerable or do not respond to spironolactone (Frackiewicz and Shiovitz 2001)

Surgical Treatment

Oophorectomy: Surgical removal of the ovaries (oophorectomy) and total abdominal hysterectomy are the most effective technique in treating symptoms (O'Brien and Abukhalil 1999).

9.6 Conclusion

Since PMS can have a devastating impact on a woman's life and work quality, this complex disorder is poorly understood and can be challenging to diagnose. In about 80% to 90% of women, at least one of the PMS signs have been revealed as per epidemiological studies; however, severe syndrome form and premenstrual dysphoric disorder (PMD) is seen in about 2.5% to 3% of women and affect their activities and social communications. The biochemical changes of PMS are supposed to involve neurotransmitters such as cholecystokinin GABA, serotonin, and regulation of the renin-angiotensin-aldosterone system.

The most common symptoms are abdominal pain, appetite changes, back pain, breast tenderness, depressive affect, insomnia, fatigue, headache, edema, irritability, angry anxiety, and outbursts that negatively affect the quality of life. Its diagnosis is based on the time of appearance and the type of symptoms in the menstrual cycle.

The initial step embraces lifestyle changes and diet regulation, teaching women self-screening, creating awareness about PMS, and methods of coping with stress. Complementary alternative therapies and cognitive behavioral therapy are implemented in the second step. The third step is initiated with pharmacological treatment if the problem continues, and in the fourth step, surgical treatment is applied. The review also highlights the effect of oxidative stress, inflammatory response, and involvement of neurotransmitters for psychosomatic and behavioral symptoms of PMS/PMDD. Numerous studies in CAM have proven that herbs are substantial antioxidant, anti-inflammatory, antidepressant, anxiolytic, analgesic, stress modulator, and neuroprotective properties. The pharmacological treatment includes non-hormonal (SNRIs, SSRIs, antidepressants), hormonal (GnRHa, OCP, danazol, and progesterone), and symptomatic (D2 receptor agonist, diuretics, NSAIDs) treatment.

Multiple Choice Questions

1. What does PMDD stand for?
 - (a) Postmenopausal depressive disorder
 - (b) Premenstrual dysphoric disorder
 - (c) Premenstrual depressive disorder
 - (d) Perimenstrual dysphoric disorder

2. What is PMS?
 - (a) Premenstrual syndrome
 - (b) Premenstrual tension
 - (c) Both a and b
 - (d) None

3. What is premenstrual dysphoric disorder?
 - (a) Mild form of PMS
 - (b) Severe form of PMS
 - (c) Both a and b
 - (d) None of the above

4. What percentage of women in the reproductive age group suffer from PMDD?
 - (a) 1–1.5%
 - (b) 2.5–3%
 - (c) 4.5%
 - (d) 4.5–5%

5. What percentage of women in the reproductive age group in the Western culture suffer from PMS?
 - (a) 30–35%
 - (b) 40–45%
 - (c) 71–73%
 - (d) 25–30%

6. PMS is most prevalent in the age group of
 - (a) 25–35 years
 - (b) 45–50 years
 - (c) 50–55 years
 - (d) None of the above

7. The following affective symptoms are seen in PMS except.
 - (a) Anger outburst
 - (b) Anxiety
 - (c) Depression
 - (d) Breast tenderness

8. The following somatic symptoms are seen in PMS except.
 - (a) Headache
 - (b) Abdominal bloating
 - (c) Swelling of extremities
 - (d) Irritability
9. Management of PMS/PMDD includes
 - (a) Lifestyle modification
 - (b) Complementary and alternative treatment
 - (c) Surgical
 - (d) All of the above
10. Pharmacological management of PMS/PMDD is
 - (a) Hormonal
 - (b) Non-hormonal
 - (c) Symptomatic
 - (d) None of the above

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