

Always all the Rage: Anger and its Management

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Abstract

Anger is one of the basic human emotions and every person, almost certainly, has experienced it at least once in their lifetime. Anger arises as a result of a perceived threat, frustration or offense. Neuropsychological research has detected several brain areas responsible for excessive anger expression (e.g., anterior cingulate cortex, insula and amygdala), and poor anger management (e.g., orbital and prefrontal cortexes). Some studies show that neurotransmitters norepinephrine and dopamine also play a significant role in this emotion. Despite its classification as a negative emotion, anger, if properly expressed, can be beneficial to the individual and thus considered as beneficial from an evolutionary standpoint - primarily enabling the angered to resolve conflicts in their favor. If one's anger, however, interferes with everyday functioning, many people decide to seek professional help to prevent further consequences. Since anger cannot be separated from its social environment, anger management approaches range from pharmacological to cognitive-behavioral agents, relaxation therapy, psychodynamic and other approaches. The importance of adequate anger management is supported by the negative consequences of maladaptive anger coping strategies, most notably hypertension and coronary heart disease, as well as deterioration of social relationships.

Keywords: anger, anger management, neuropsychology of anger

Introduction

You just stubbed your little toe on the leg of a chair. You might, of course, blame yourself for being so clumsy and continue with your life as per usual, but it is much more plausible that you would at least let out a little scream. It is possible, based on the severity of the critical hit, that you would curse, perhaps lie down, and try not to cry, or you might even, following Newton's third law of motion, kick the chair over and break its kneecaps. The emotion felt in the described example would be none other than anger itself. Reeve (2018) considers anger one of the primary emotions and, as such, instinctive, universally induced by specific factors and unique to other emotions in its manifestation and physiological pattern. According to Averill's (1983) social-constructionist theory, anger cannot simply be divided into psychological, cognitive, behavioral, or any other aspects - it is unitary and only ever fully understood in its social context. Such social context gives before mentioned elements the singular unitary frame for understanding it as an integrated construct which cannot be replaced by any of them. In other words, before we know the complete reaction of a person as a whole - the circumstances of the onset of this emotion, the thought process which led to it, the physiological and physical response of the body, or the affective response that was triggered, we cannot recognize it as the emotion of anger. Gilam and Hendler (2015) discern three possible factors, stemming from the social context, influencing the onset of anger: a) rational or irrational, direct or indirect physical or psychological threat in the environment, b) frustration caused by goal obstruction, and c) perceived personal offense such as unfair treatment, infraction of norms, or insults towards oneself or one's loved ones or their group. Blair (2011) found that not all norms cause the same level of anger when broken, pointing out that people are most sensitive about conventional and fairness/cooperation norms. Regarding the example from the beginning of the introduction, one might feel anger because a) they interpreted the chair as being a tripping hazard, b) they felt frustrated after hitting and hurting themselves, or c) they inferred that the chair was put in their path and with malicious intent by another person, respectively.

More often than not, anger is easily recognized by observing a person's face - stubbing one's toe on a chair, as previously described, might make one furrow their eyebrows (activating their corrugator muscles, causing the eyebrows to sink and center), squint their eyes (orbicularis oculi pulling the lower eyelid upwards) and purse their lips (orbicularis oris pressing them together; Reeve, 2018). However, it is not just the facial muscles that reveal anger - the whole body tenses up (Berkowitz & Harmon-Jones, 2004). Stemmler (2009) also acknowledges an acceleration in respiration, an increase in blood pressure and heart rate, along with an increase in body temperature as physiological anger responses.

The general, widespread assumption appears to be that anger is condemnable and

should be avoided at all costs. This is not surprising, as anger is known to cause deterioration of social relationships – whether it be with work colleagues, friends, or romantic partners (Lench, 2004). It can also interfere with physical well-being, leading to health problems like hypertension and coronary diseases (Williams, 2009). When a person perceives a threat and reacts aggressively, this conventional anger response is often likened to the emotion itself. However, aggression is neither necessarily caused by anger, nor is anger necessarily accompanied by aggressive behavior (Gilam & Hendler, 2015). Along with the negative consequences anger harbors, those being the deterioration of social relationships, most prominently through mediation of aggressive anger outbursts, or direct physical repercussions of the emotional response, it is, with all of its various expressions, in a sense, a negative consequence by itself. That is, it is frequently considered not just by itself, but as just one aspect, it being a symptom or a manifestation, of a much broader problem, as well. For example, although Intermittent Explosive Disorder, characterized by disproportionate impulsive and aggressive outbursts, is listed in the newest edition of The Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM–5; American Psychiatric Association, 2013), anger and anger attacks are more commonly regarded as a comorbid disorder or as symptoms of other mental disorders, such as post-traumatic stress disorder, major depressive disorder, borderline personality disorder (Lench, 2004), and psychopathy (Blair, 2011). According to Lench (2004), this is the main cause of difficulty with diagnostic separation of anger from mental disorders such as depression and anxiety, and as such furthers the increasingly negative stereotyping of anger as an emotion.

However, anger is not necessarily maladaptive - not every anger-prone person has comorbid disorders relating to depression or anxiety and not everyone expresses their anger in a socially unacceptable manner. According to Berkowitz and Harmon-Jones (2004), anger can motivate towards goal attention, decreasing the chances of a flight response and withdrawal upon encountering an obstacle. Depending on how it is regulated and how the situation is handled, anger can be quite adaptive and largely effective in obtaining benefits without jeopardizing others. One theory that expands on this is the *recalibrational theory of anger* (Sell et al., 2009), which proposes that anger is a neurocognitive product that evolved as a bargaining tactic to ensure a positive outcome for the angered individual. According to this theory, anger appears when a person observes there are not enough resources. Based on the angered person's perception of self-worth in respect to fitness, an evolutionary term referring to capabilities of an individual to adapt, survive and reproduce, they might resort to a withdrawal of benefits, for example refusing to socialize with the "victim" (the one whose resource delivery is regarded as unsatisfactory), or infliction of costs, such as spreading gossip about them, similar to negative reinforcement and punishment in

instrumental conditioning. This reasoning results in the hypothesis that individuals with a greater amount of benefits, and whose cost infliction might be crucial to those surrounding them, regard they should receive more resources, thus having a lower tolerance threshold for the provision of resources. Finally, they should presumably resolve conflicts more easily and with less damage, due to their fitness value. That is, since they are regarded as more evolutionary necessary to their social environment, they should be more seldomly “provoked” and more swiftly indulged once being provoked with inadequate resource provision. This was confirmed in a study by Sell et al. (2009) that investigated these premises in relation to strength and attractiveness, measured, respectively, with lifting strength, self and other perception of strength, flexed bicep circumference, direct measure of arm/chest strength and comparisons with others of the same gender in attractiveness. Results of the self-report measures, measuring variables such as history of fighting, utility of personal and political aggression, entitlement and more, lead these researchers to conclude that the theory could be true, especially for men who consider themselves physically stronger and women who consider themselves more attractive. These two categories angered more easily and felt entitled to better treatment, while men also showed greater proneness to and personal history of interpersonal aggression, as well as, on a more global scale, condoning greater use of military force. However, they also appeared to be more efficient in resolving their conflicts than their less anger-prone counterparts. This is certainly not always the case - anecdotal evidence suggests that it is not only the (self-perceived) attractive women and strong men who get angry and commit violent crimes. There are also other variables, a shortcoming even the authors of the article propose, that might influence the tolerance threshold, such as intelligence, financial status and other. It is possible these other variables might moderate the fundamental process proposed by the recalibrational theory. For example, financial status can strengthen or weaken the relation between strength and tolerance as viewed, and in the study shown, by the recalibrational theory. Still, the conclusions stemming from the theory, compared to real-life cases, seem relatively logical and are a valid argument for the adaptive aspect of anger.

This review will, however, consider the more predominant and initially mentioned, negative side of anger. Firstly, the corresponding neural mechanisms of anger will be revealed. Following the view of biopsychology and neuroscience on adaptive and maladaptive anger, its management will be discussed using several psychotherapy approaches, with a special focus on therapy of cognitively impaired patients following brain injury. Finally, both negative and positive consequences of anger will be considered.

Neural mechanisms of anger

Neuroanatomy of anger. Before the cognitive appraisal and attribution of anger, following the progress of time there occurs, according to Berkowitz (1990), a kind of primitive anger that automatically provokes an associative network including feelings and thoughts, but also more tangible components such as physiological and motor responses. When one thinks of emotions, they think of the amygdala, and such is the case with anger, as well. The core neural system activated in response to threat consists of the medial amygdala, stria terminalis, medial hypothalamus, and periaqueductal gray matter. This seems to be a suitable explanation for both animals and humans, and is posited by the affective neuroscience personality theory (Panksepp & Panksepp, 2013) and its description of the so-called RAGE system, a basic emotion system found in all mammals, which includes the dorsal periaqueductal gray matter, medial amygdala, ventral medial forebrain bundle and the prefrontal cortex, and explains both the neurological and neurochemical basis of anger.

According to Gilam and Hendler (2015), one of the most used paradigms in neuropsychological research of anger is the self-generation of anger by remembering and picturing authentic autobiographical memories marked with and recognized by feelings of anger or immersing oneself in an experiment-generated anger inducing scenario. Some studies pair this paradigm with Positron Emission Tomography (PET), a neuroimaging technique used to create a two-dimensional moving picture of the horizontal slice of the brain in color. Regions identified as crucial using such pairing were the ventral (VPFC) and orbital prefrontal cortexes (OPFC), the anterior cingulate cortex (ACC), the thalamus and hypothalamus, the medial temporal lobe, the insula, regions of the cerebellum and the brainstem, and the temporal poles (Damasio et al., 2000). It is hypothesized that the temporal poles are involved in *mentalizing*, i.e. the assessment of another's emotional state to judge the nature of the event and the other's intent for moderating the anger one ought to be feeling (Denny et al., 2012). They are also, along with the medial temporal lobe, implicated in the recall of declarative information from memory (Squire et al., 2004). According to structural 3D and functional neuroimaging techniques, it appears that during anger control, either via cognitive reappraisal or rumination, brain areas such as the orbitofrontal cortex, the inferior frontal gyrus, the caudate nucleus and the putamen, the insula, the thalamus, and the amygdala are activated. More specifically, the inferior frontal gyrus, along with the amygdala and the thalamus, plays a key role in the continuous negative reappraisal, repetitive thinking focused on the causes and consequences of a past action or situation (Sukhodolsky et al., 2001), also known as *rumination*. In the context of anger, rumination manages, suppresses, and inhibits the intensity and implications of

the anger experience (Martino et al., 2015). The longer a person contemplates the event, the longer they feel anger and, possibly, the higher the intensity of said anger, interfering with processes of emotional and cognitive regulation (Denson et al., 2012). When the participant in an anger-inducing paradigm loses self-control, or perhaps does not have it in the first place, they exhibit aggressive behavior characterized by reduced activity in the ventromedial prefrontal cortex, and an increased activity of the anterior cingulate cortex, as can be seen in Pietrini et al. (2000) study with PET and MRI, a neuroimaging technique used to create brain images via detection of magnetic brain signals.

A paradigm with a greater internal validity than the previously described one is the direct induction of anger, most prominently by implementing personal offense within a study of a seemingly different objective (Gilam & Hendler, 2015). This paradigm introduces sterner control over interpersonal variability of anger-inducing situations (every participant is exposed to the same anger-inducing situation) and has the benefit of observing immediate reactions instead of recollections. Here, increased activity was observed in the medial and lateral areas of the prefrontal cortex, the insula, the thalamus, the hippocampus, and both the posterior and the anterior cingulate cortex. The dorsal anterior cingulate cortex activity reflected the intensity of subjective estimate of anger and trait aggression, while the rostral anterior cingulate cortex and posterior cingulate cortex, combined with the hippocampus and the insula, reflected the self-reported rumination tendency operationalized by the frequency with which one thought of their performance after being disrupted by the experimenter to induce anger (Denson et al., 2009).

Grecucci et al. (2012) asked their participants to use reappraisal as a positive anger-decreasing strategy in a social interaction-based paradigm of the “ultimatum game”. The paradigm consists of two players splitting a large sum of money in which the first subject gives an offer the other decides to refuse or accept, depending on how fair the offer is interpreted. The authors found both increased activity in the dorsolateral prefrontal cortex and decreased activity in the insula as their participants were making a rational decision regarding the anger-inducing situation. In a provocative negotiation paradigm, essentially an ultimatum game paradigm with the addition of a scripted provocation by the offer-giver after each round of negotiations, Gilam et al. (2015) discovered, using the MRI technique, that rational decision-making was associated with the activation of the ventromedial prefrontal cortex and orbitofrontal cortex and inhibition of brainstem activity (likely locus coeruleus).

As far as facial recognition of emotion manifestation and subsequent emotional and cognitive response goes, studies have shown that it is associated with activity in the

middle frontal gyrus, the inferior frontal gyrus, the anterior cingulate cortex, the middle temporal gyrus, the parahippocampal gyrus, the claustrum, the insula, the fusiform gyrus, and the occipital gyrus (Fusar-Poli et al., 2009), and increased activity in the amygdala. The latter (Beaver et al., 2008), along with reduced connectivity to the ventromedial prefrontal cortex (Passamonti et al., 2008), determines the individual behavioral response to the recognition of the angered person. It appears that the prefrontal region of the brain, especially the ventromedial prefrontal cortex and the orbitofrontal cortex, are responsible for the general control of anger and aggression. Activity of the prefrontal cortex (PFC) is negatively correlated with aggressive behavior upon viewing angered faces (Beyer et al., 2014), and it is generally associated with regulatory behavior and cognitions (Buhle et al., 2013). Likhtik et al. (2005) claim that certain areas of the PFC have excitatory connections to the inhibitory neurons in the amygdala, therefore suppressing its activation upon threat perception. When one fails to handle intense anger, Blair (2011) suggests that it is because the PFC failed in its task due to reduced efficiency after being overpowered by emotion. Mega et al. (1997) posed that the medial orbitofrontal cortex along with the limbic system might play a role in motivational and affective operating, while the lateral orbitofrontal cortex, a component of the prefrontal circuit, may be responsible for the mediation of behavior in response to the social context. In their PET study on healthy adult males, Dougherty et al. (1999) found activation in the lateral orbitofrontal cortex, but not in the medial orbitofrontal cortex, hypothesizing that behavioral inhibition of anger took place. The subjective feeling of anger is commonly associated with the insula, linked to emotional experience, and the (dorsal) anterior cingulate cortex, linked to control and modification of behavior in situations that are in any way perceived as difficult. The two are also hypothesized to be involved in the perception of both social and physical pain (Gasquoin, 2013; Iannetti & Mouraux, 2010). It has also been found that the rostral affective division of the anterior cingulate, due to its connections to the hippocampus, the amygdala, the insula, the prefrontal areas, and the inferior temporal pole (Mega et al., 1997) is more involved in processing emotional information than in the experience of emotion itself (Lane et al., 1997).

Other than threat perception, anger, as has previously been described, can be induced by experiencing a frustrating event, especially when reinforcement principles are changed - behavior is no longer rewarded, or is even punished. The former paradigm is called behavioral extinction, and the latter reversal learning (Blair, 2011). When anger is induced in such a way, parts of the striatum are activated (Abler et al., 2005). The orbital/ventromedial (Brodmann's Area 10 and 11), inferior (Brodmann's Area 47 and 45) and dorsolateral frontal cortex and the anterior cingulate cortex (Brodmann's area 32) have also been identified as key areas (Budhani et al., 2007). The ventromedial

frontal cortex shows reduced activity during the reception of information about the omission of reward, while the dorsomedial, lateral, and especially inferior frontal cortexes appear to direct the subsequent change in behavioral response (Budhani et al., 2007). The situation is not too different from experiencing social frustration, and it was demonstrated that when fairness/cooperation norms are broken, the anterior insula, the dorsomedial and lateral frontal cortexes exhibit an increase in activation (Sanfey et al., 2003).

Autonomic nervous system. Proneness to anger and anger itself cause not only cortical activation, but influence the autonomic nervous system as well. Compared to other emotional states, anger has a greater arrhythmogenic effect - that is, pathologic irregularity of the heartbeat (Taggart et al., 2011). Taggart et al. (2011), however, still leave open the question of whether this is the case because of a specific pattern of activation in the autonomic nervous system or simply because of a greater arousal state in comparison with other emotions. Both hypotheses are scientifically supported, albeit the evidence for the former appears to be stronger, reporting an increase in heart rate and sympathetic dominance due to an unchanged high frequency component of heart rate variability (Rainville et al., 2006). Anger has also been known to increase the plasma catecholamines volume (Lampert et al., 2005) and decrease the activity of the X nerve - the vagus (Bernardi et al., 2000), eliciting an overall rise in sympathetic and a drop in parasympathetic activity. The vagus relation demonstrates that the autonomic nervous system is not entirely independent of the cortical activities regarding anger and emotion. For example, in patients with ICD diagnoses, anger induced T wave ECG alternans, which were predictive of later arrhythmic irregularities (Lampert, 2009).

Biochemistry of anger. Concerning the biochemical basis of anger, the higher the levels of norepinephrine and dopamine, the higher the chances of an aggressive response, a common occurrence following an anger outburst (Reuter et al., 2009). Additionally, noteworthy is the MAOA gene, specifically its product monoamine oxidase A, which regulates enzymatic metabolism of the neurotransmitters serotonin, dopamine and norepinephrine (Fowler et al., 1987). The lower the activity of the MAOA gene in the brain was, the higher the self-reports of aggression on Spielberger's (1988) State-Trait Anger Expression Inventory (STAXI-2) were, regardless of the low/high genotype classification (Alia-Klein et al., 2007). Thus, even the aggression predicting low MAOA genotype cannot by itself be responsible for violent behavior. Rather, it is a part of a complex interaction of nature within itself and with the environment (Widom & Brzustowicz, 2006).

Even though genes play a part in the probability of an anger response to a stimulus, hormones may play an even more significant role. Arita (2009) claims that stress hormones such as the adrenocorticotrophic hormone and cortisol do not directly inhibit

the serotonergic circuit in the raphe nucleus. Rather, based on the observations of rodents, a neural circuit that indirectly inhibits the serotonergic circuit via corticotropin-releasing factor neurons within the hypothalamic paraventricular nucleus, which then directly projects to the dorsal raphe nucleus and inhibits serotonin neurons via gamma aminobutyric acid GABA-ergic neurons has been proposed (Waselus et al., 2004). One might assume that the greater the stress a person experiences, the lower the activity of serotonin - therefore directly affecting the onset and the processing of the emotion of anger.

Anger management

Everyone experiences anger occasionally. Nevertheless, the ways people express anger and cope with it vary substantially. Heather Lench (2004) investigated these differences in her study that compared both a student and an anger management program sample. In both groups, those who scored higher on anger affection on Spielberger's (1996) STAXI test, on average used more maladaptive strategies (avoidance, aggressive action, antisocial action, instinctive action, indirect action, and expression of anger inwards) than adaptive strategies (support seeking, social joining, cautious action and control over the expression of anger), and vice versa. The only exception was assertive action, typically regarded as a positive strategy, where no significant differences were found. The participants also reported different outward expressions regarding their proneness to anger, the high-anger group reporting more physical, verbal, and nonverbal assault on people and objects and the low-anger group using more adaptive anger-out techniques like time-out and reciprocal communication.

Growing in popularity of maladaptive anger management are several folk remedies. Some of them are more Freudian, dealing with anger in cathartic ways, like rage rooms where one smashes plates against a wall and breaks TVs with a bat, paintball and axe-throwing arenas, or miscellaneous martial arts training. Some are more peaceful, like running, or art therapy. Still, this paper will focus on those more scientifically validated. Considering the biological foundation of anger in the brain, it is not irrational to assume medicating to be one of the most prominent approaches in managing maladaptive expression of anger. However, not only is it not as ground-breaking as one would at first believe, but it is also used with extreme caution and is one of the least commonly implemented strategies of anger management. Nevertheless, several pharmacological agents have proven effective and are occasionally used, especially when treating underlying disorders behind anger episodes, like those mentioned in the introduction. The most commonly used ones are the well-known psychostimulant Adderall, antianxiety agents Xanax and Valium, and sleep medication (Potter-Efron,

2012). Mood stabilizers lithium and valproic acid, anticonvulsant carbamazepine, antihypertensive agents beta-blockers in patients with lesions, antipsychotics risperidone and clozapine, serotonin reuptake inhibitors anxiolytic agent buspirone and antidepressant trazodone are also occasionally prescribed. However, benzodiazepines, pharmacological agents that have been previously used, should be avoided at all costs, as they have been proven to be counter effective (Glancy et al., 2017). Which medicine to implement in addition to another anger management technique is most often decided by means of trial and error, while it is highly emphasized that any medicine should not be used further than is needed for the client to learn adaptive anger management skills (Potter-Efron, 2012), or even be used as the last resort, especially in the case of patients with brain injury (Demark & Gemeinhardt, 2002).

The most widespread anger management approaches are cognitive therapy, cognitive behavioral therapy (CBT), cognitive relaxation therapy, stress inoculation approach, relaxation coping skills, social skills training, psychoeducation, psychodynamic therapy and acceptance and mindfulness (Glancy et al., 2017). Cognitive therapy attempts to instruct the client to rise above automatic appraisals and cognitive distortions by means of cognitive restructuring and reappraisal during affect-charged events (Beck, 1964). It does so through several steps including evaluation of the nature of the client's anger and identification of triggering environmental factors, self-monitoring instructions and differentiation of adaptive versus maladaptive cognitive appraisals and coping mechanisms. Finally, a healthy response in anger's stead is rehearsed (Deffenbacher et al., 2000). This is sometimes done using an interesting technique called instructional self-talk, which implies that the client's own verbal statements can control the behavioral response in an anger episode (Demark & Gemeinhardt, 2002). From this approach stem both cognitive behavioral therapy and cognitive relaxation therapy. Cognitive behavioral therapy additionally incorporates behavioral alteration through improving interpersonal and problem-solving skills in hopes of easing the controversial situation before the anger response even ensues (Glancy et al., 2017), while cognitive relaxation therapy adds relaxation techniques on top of the cognitive base as a form of a setup for successful implementation of restructuring techniques (Deffenbacher et al., 1988). Relaxation coping skills, the same as those used in cognitive relaxation techniques, target overwhelming emotional and physiological arousal, minimizing the stress response during an anger episode, and encourage self-control. Techniques such as relaxing imagery, deep breathing, either progressive muscle relaxation or muscle relaxation without tensing, cue-controlled relaxation and more are learned, practiced, and perfected in a relaxing environment of the therapist's office (Deffenbacher & Stark, 1992).

The stress inoculation strategy focuses on recognition of stress cues in the environment

and during rehearsals works on positive inner dialogue, cognitive reappraisal, and acquisition of a behavioral skillset (Meichenbaum & Deffenbacher, 1988; Novaco, 1977). Social skills training, as the name itself suggests, concerns both intrapersonal and interpersonal skill acquisition in service of de-escalating conflicts and regulating emotions that arise as a product. The most practiced skills being developed are active listening, negotiation, problem-solving, assertiveness, and positive feedback (Deffenbacher et al., 1987), as well as self-regulation over verbal and nonverbal expressiveness. Psychodynamic psychotherapy helps the client become conscious of their unconsciousness that supposedly stems from childhood. This approach heightens their responsiveness to their own feelings in hope of maintaining emotional self-regulation and developing verbal self-expression instead of channeling the suppressed energy through angry and violent outbursts (Lanza et al., 2009). The acceptance-mindfulness approach tries to boost self-awareness and acceptance of one's own feelings, thoughts and physiology in the present, without fixating either on the mistakes of the past or the uncertainty of the future through, among other - meditation, breathing exercises and yoga (Wright et al., 2009), in order to attain the ability to express anger in an adaptive, healthy way (Borders et al., 2010).

Most of these interventions can be implemented both individually, and in a group setting, and have been shown to be effective in various populations battling anger problems - from angry students, drivers, parents, and more (Glancy, 2017). Most of these approaches have similar effects, but CBT is the most widespread. Nevertheless, the psychodynamic approach at times shows enviable results, even in comparison to cognitive behavioral therapy (Lanza et al., 2009). The mindfulness-approach integrated with CBT in dialectical behavior therapy yields similar results (Frazier & Vela, 2014). But, there are a few exceptions - social skills training has an effect only on mild anger and cannot help with environmental factors and either direct or indirect hostility (Schippers et al., 2001), and psychoeducation - an approach most often used in an attempt to rehabilitate batterers - has been shown to be ineffective in the long run, and appears to work only superficially, under supervision that is most often temporary (Maxwell et al., 2010). Authors conclude that, while longer treatments do, in fact, appear to produce better results in comparison with shorter programs, it is simply because the supervision time is significantly longer. Ergo, neither of those permanently change the cognitive-behavioral pattern of the court mandated attendees of therapy. Nonetheless, it is more likely the lack of remorse and adequate motivation to change which halts the lasting betterment of such a population, rather than the approach itself. Regarding the successful approaches, they are mostly appointed in combination rather than applying just one approach, to reach maximum potential (Demark & Gemeinhardt, 2002).

A special line of anger management clients are people with an acquired brain injury

(ABI). Antonak et al. (1993) distinguish between two versions of anger in patients with a brain injury: internalized (directed towards themselves since they are blaming themselves for their condition) and externalized (directed outwards since they blame others for their injury). Prigatano (1992) differentiates between anger, preceded by frustration (both psychological factors), and *episodic dyscontrol*, an unprovoked violent assault (along with *agitation* - constant uninhibited movement, neurologically based and characteristic of brain injury patients). Anger in the ABI population is most commonly recognized by aggressive behavior persistently linked to damage in the frontal lobes and the prefrontal cortex (Tateno et al., 2003). Each instance of aggressive behavior is thought to be a result of a combination of pre-morbid internal and post-morbid external factors, but also cognitive impairments and damaged neural connections which is why pharmacological treatment is used more often than psychotherapy (Hicks et al., 2019). However, as there are no FDA approved medications in this field, all medication is prescribed off-label - that is, for purposes other than those it is intended for, which results in a diverse spectrum of treatments that may not always solve the problem and carry certain risks as heavy as, for instance, depression (Hicks et al., 2019). Some of them, namely propranolol, have worsened the BI patients' state, and only a few of them, such as methylphenidate, have had an effect on anger (Hicks et al., 2019). Several pharmacological agents were, however, effective in treating aggression and frustration in a brain injury sample. On the other hand, as most of used medications better the psychological wellbeing and cognition on a more extensive level, Hicks et al. (2019) justifiably pose a question of whether the medicine even has a direct and specific impact on aggression and anger itself, so much as on general lowering of other pathologies and then consequently, inadvertently, on anger. Be it as it may, the use of pharmacotherapy will continue to be necessary at least in the most difficult cases of BI where it indeed has produced the best results, regardless of the overall mixed findings and sometime brief and weak effects. On the other hand, the psychotherapeutic approach most used in treating anger issues within this population is CBT because of its very detailed structure and achievable goals in redefining the strategies distinctive to their personalities (Whitehouse, 1994), but also because of its behavioral aspect which can help structure their lives with the help of therapists and close people (Demark & Gemeinhardt, 2002). Demark and Gemeinhardt (2002) also imply that simpler relaxation techniques might be appropriate for patients with acquired brain injury other than those whose anger is neurologically caused. They also recommend not combining approaches with patients with brain injury so as not to overload their cognitive capacities. Additionally, while individual therapy has its advantages considering attention and motivation deficits in patients with brain injury (McGlynn, 1990), group therapy might have its benefits too, especially for patients with brain injury, since it, besides being economical, encourages social comparison

and instills hope (Delmonico et al., 1998).

In the case of patients with a brain injury, cognitive behavioral therapy has been shown to be the best choice. However, one cannot overlook the enormous attention it receives from both the scientific and non-scientific public in comparison with other approaches on a non BI population. Approaches such as psychodynamic therapy and dialectical therapy, but also mindfulness have been helpful, if not just as effective. One of those is certainly Shepherd's (2020) anger management treatment with a mindfulness/transactional analysis basis. Yet, they are still underrepresented in the public eye. As not one person is the same as the other, in addition to combining strategies from different approaches, it might be beneficial for patients to choose the course of action according to their own discretion after assessing the situation and being introduced to options other than the mainstream ones. For them to be able to adequately evaluate the options, those options must be available and validated, which calls for more reviews on the effects of anger management approaches other than those based on cognitive behavioral therapy. Furthermore, current data suggests that psychoeducation is not a suitable solution for rehabilitation of batterers which leaves open the space for improvement and even innovation in the anger management field, as battery is a consistent problem in aggressive anger. Lastly, although there is a myriad of instances of people using rage rooms, running and martial arts training as a form of anger management, either continuously or as a one-time solution, there have not been enough studies investigating the effects they actually have on anger and aggressive actions that may follow it. An issue like that should be pursued given the popularity of such "remedies" and the mixed evidence it has produced so far, especially in martial arts training, including the abundance of variables influencing the outcomes of such activities such as age, time spent training and the level of traditionality and philosophy behind the martial art, together with accompanying meditation practices (Lafuente et al., 2021).

Whichever modifications needed - simplifications of concepts, concrete examples, repetition and homework (Walker et al., 2010) - it is important to note that anger management does help healthy individuals as well as the brain injured and that, although it is easier and more effective when cutting at the root of the problem, anger management can be helpful at any time during the anger experience and should be attempted before having to deal with the consequences (Demark & Gemeinhardt, 2002).

Consequences of the (in)ability to control anger

Anger is known to have a negative impact on overall well-being. Lench's (2004) study showed that those attending an anger management program and students scoring high on anger on Spielberger's (1996) STAXI test showed fewer and less fulfilling romantic, social and work relationships. Their friendships ended in conflict more often than of those scoring low on anger, and those among them with longer-lasting relationships reported more frequent verbal and physical aggression within said relationships. Nevertheless, Candelaria et al. (2012) exhibited how school-based CBT problem-solving anger management interventions are the most effective in reducing negative *emotional* and social outcomes of poor anger management, such as aggressive behavior and subjective feeling of anger, in school-aged children. Valizadeh et al. (2010) implemented a 10-session anger management skill training with a *group* of adolescents and showed it can reduce angry thoughts and aggressive behavior. Buş et al. (2009) showed that in the population of prisoners in Romania, anger management training lead not only to a reduction in state anger and verbal and physical attacks, measured by Spielberger's (1988) STAXI and evaluations of the prison staff, but also a substitution of maladaptive coping styles with assertiveness, and that progress remained constant even two months after the program took place.

One's interpersonal relationships are without question an aspect that particularly suffers when one exhibits anger management issues - but it is certainly not the only one. Fortunately, anger management has proven effective in minimizing the negative consequences even in those cases. One of the negative consequences on health is, whether as a result of anger *suppression* or the lack of it, an increased risk of cardiovascular diseases, notably hypertension or coronary heart disease (Williams, 2009) and heart-attack (Player et al., 2007). Larkin and Zayfert (1996) demonstrated, however, that Novaco's (1977) multicomponent stress inoculation anger management approach, an approach characterized by three phases: the first, in which they're introduced to the underlying cognitive basis of their anger, the second, which aims to develop relaxation, assertiveness and problem-solving skills, and the third, in which previously learned knowledge is implemented and practiced on a variety of anger-inducing hypothetical situations in a hierarchical order (Demark & Gemeinhardt, 2002), resulted in lower diastolic blood pressure in patients. Another increased risk is a smoking *addiction* (Gehricke et al., 2007) - it is possible that angry people are more inclined to start smoking and become dependent on nicotine trying to manage the stressful circumstances they keep finding themselves in. Gehricke et al. (2009) even propose that generalized cortical and subcortical activation *upon* nicotine use may reflect task performance (in)efficiency of higher cortical and subcortical functioning in charge of planning and processing *emo-*

tional anger stimuli. Laitano et al. (2021) conclude in their review that psychoactive substance abusers also score higher on anger, experiencing it more often and more strongly. They attribute this partially to withdrawal symptoms causing frustration and *agitation* during abstinence, not excluding the possibility of long-term cortical changes throwing the reward system out of balance - primarily in drug users and secondarily in alcoholics. Comorbid with anger issues, in this population particularly and possibly due to substance-induced neurological dysfunctions, are particularly anxiety, depression and impulsivity (Aksu et al., 2020). It was also suggested that substance abuse, typically comorbid with anger expression issues, might precede aggressive behavior (Glancy et al., 2017), but anger management interventions provide evidence that even such situations where one's anger is induced and even amplified by substance use and dependency might be resolvable (Fernandez & Scott, 2009). In conclusion, anger management can not only decrease both individual and societal costs of poor anger control, whether *emotional*, behavioral, social, health-wise, or financial (Glancy et al., 2017), but anger, when correctly articulated, can improve negotiation abilities (van Dijk et al., 2008) resulting in financial (Grecucci & Sanfey, 2014), or moral benefits (Salerno & Peter-Hagene, 2013).

Conclusion

Anger is known to have a negative impact on overall well-being. Lench's (2004) study showed that those attending an anger management program and students scoring high on anger on Spielberger's (1996) STAXI test showed fewer and less fulfilling romantic, social and work relationships. Their friendships ended in conflict more often than of those scoring low on anger, and those among them with longer-lasting relationships reported more frequent verbal and physical aggression within said relationships. Nevertheless, Candelaria et al. (2012) exhibited how school-based CBT problem-solving anger management interventions are the most effective in reducing negative emotional and social outcomes of poor anger management, such as aggressive behavior and subjective feeling of anger, in school-aged children. Valizadeh et al. (2010) implemented a 10-session anger management skill training with a group of adolescents and showed it can reduce angry thoughts and aggressive behavior. Buş et al. (2009) showed that in the population of prisoners in Romania, anger management training lead not only to a reduction in state anger and verbal and physical attacks, measured by Spielberger's (1988) STAXI and evaluations of the prison staff, but also a substitution of maladaptive coping styles with assertiveness, and that progress remained constant even two months after the program took place.

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