



Anger, Hostility, and Aggression in Severe Alcohol Use Disorder

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Abstract

Severe alcohol use disorder (SAUD) is among the most prevalent psychiatric disorders, leading to a wide range of deleterious consequences for the individual, their relatives, and the society. Individuals suffering from SAUD are often tough

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to be more aggressive and violent. We reviewed the literature linking alcohol consumption and aggression to provide a synthesis of available evidence on this topic. In general, both acute alcohol consumption and SAUD are associated with an increase in the three subcomponents of aggression, namely, anger, hostility, and aggressive behaviors. We identified several mechanisms involved in the elicitation of aggression in SAUD, including hostility biases and the lack of emotional or cognitive control. Finally, we proposed treatments that specifically target these processes.

Keywords

Alcohol · Severe alcohol use disorder · Hostility bias · Attributional bias · Emotion regulation · Cognitive control · Acute alcohol consumption · Alcoholism · Alcohol dependence · Anger · Hostility · Aggression

Abbreviations

AAF	alcoholics anonymous facilitation
AM	anger management
ART	affect regulation training
CBT	cognitive behavioral therapy
EFE	emotional facial expression
HLS	healthy lifestyles control
HVC	healthy video control
IBM-H	interpretation bias modification for hostility
IED	intermittent explosive disorder
IPV	intimate partner violence
SAUD	severe alcohol use disorder
SIP	social information processing
TOSS	treatment of social stress

Introduction

Severe alcohol use disorder (SAUD) is a pattern of chronic maladaptive alcohol consumption leading to clinically significant impairment or distress. SAUD is highly prevalent in Western countries (e.g., past 12 months prevalence of 3.7% in Europe and 4.1% in the Americas; WHO 2018). It generates large-scale deleterious consequences, not only for the patients but also for their relatives and for the whole society (Nutt et al. 2010). Identifying the mechanisms through which SAUD leads to such public health burden is therefore crucial. A firmly held belief in the general population, but also among healthcare practitioners, is that patients with SAUD are more aggressive than individuals with other psychiatric disorders (Kilian et al. 2021). This perceived increase in aggression might thus contribute to the reduction of social bounds and to the negative societal consequences of SAUD. However, despite the

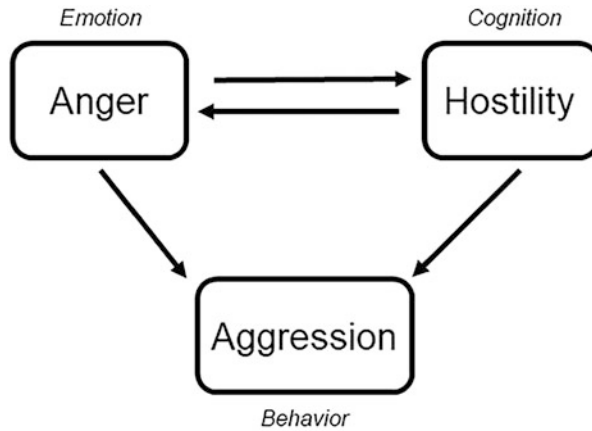


Fig. 1 Links between anger, hostility, and aggression

key role that such elevated aggression may play in SAUD-related negative outcomes, there is no review or evidence synthesis on this topic.

Capitalizing on prominent theoretical approaches (e.g., Buss and Perry 1992), we will conceptualize aggression as a multidimensional construct englobing an affective (i.e., anger), cognitive (i.e., hostility), and behavioral (i.e., aggressive behavior) component. Anger refers to an emotional state varying in intensity, from mild irritation or annoyance to intense fury or rage. It involves physiological arousal, as well as aggressive action tendencies (Buss and Perry 1992; Spielberger and Reheiser 2010). Hostility is primarily characterized by negative and cynical beliefs about others, as well as negative attitudes toward them (Buss and Perry 1992; Spielberger and Reheiser 2010). Finally, aggression refers to destructive or punitive behaviors (including verbal acts) that result in hurting/harming others or damaging objects (Buss and Perry 1992; Spielberger and Reheiser 2010). Regarding the links between these components, a causal pathway successively involving anger, hostility, and aggression has been described. On the one hand, anger either constitutes a cause for both aggression and hostility (Spielberger and Reheiser 2010), a direct causal factor for aggression only (Wilkowski and Robinson 2008), or the bridge between hostility and aggression (Buss and Perry 1992). On the other hand, hostility also seems to have a predominant role in the appearance of aggressive behaviors (Rubio-Garay et al. 2016) (Fig. 1).

On the basis of this theoretical background, this chapter reviews the literature linking alcohol consumption and aggression, first by exploring results obtained in acute alcohol intoxication and subclinical populations, and then by focusing on SAUD. We also identify potential psychological mechanisms involved in aggression in SAUD, and discuss perspectives for psychological treatment targeting aggression. Finally, we highlight gaps in this research field and propose ways forward.

Anger, Hostility, and Aggression in Acute Alcohol Intoxication

Most studies exploring the links between anger, hostility, aggression, and alcohol consumption have actually focused on the effect of acute alcohol ingestion. First, participants under alcohol intoxication display more facial expressions of anger than sober ones (Parrott et al. 2003), and this emotional trend is corroborated by increased aggression. Indeed, evidence from empirical studies support a strong association between alcohol and violent behavior, and a meta-analysis including 22 studies (Crane et al. 2016) examined the causal effect of acute alcohol consumption on self-reported and observed indicators of male-to-female general or sexual aggression, as well as of intimate partner violence (IPV). Results indicated that male participants under the acute influence of alcohol evidenced increased aggressive behavior toward females while completing a subsequent laboratory aggression paradigm.

Concerning violence, alcohol intoxication is implicated in 67.9% of incidents involving physical aggression (Wells et al. 2000). For both genders, heavy episodic drinking, drinking frequency, and drinking volume are associated with fights after drinking (Wells et al. 2005). A study of Duke et al. (2011) demonstrated a positive linear trend between the quantity of alcohol consumed and aggression: the higher the acute alcohol intoxication, the more likely the individual is to engage in aggressive behavior, supporting a dose-response model. Experimental studies demonstrated that acute alcohol consumption itself is not sufficient to generate aggression, but it facilitates aggression in people with high trait anger and low anger control (e.g., Parrott and Zeichner 2002). The study of Eckhardt and Crane (2008) also supports this idea of alcohol being a facilitator of aggression in predisposed subjects: intoxicated participants high (but not low) in baseline aggression tendencies presented more aggressive verbalizations than sober ones, which supports the aggression moderation hypothesis. Both alcohol intake and trait anger thus facilitate aggression, these two aspects generating cumulative effects. Under specific conditions, excessive alcohol consumption can trigger existing aggressive predispositions and conversely, anger may exacerbate the alcohol-aggression relationship (Clements and Schumacher 2010; Walitzer et al. 2015).

Attentional biases might explain this phenomenon, as problematic drinkers may be more likely to attend to aggressogenic stimuli in their environment when intoxicated (Massa et al. 2019). This is in line with the alcohol myopia theory predicting that alcohol reduces the ability to attend to competing cues. Thus, intoxicated individuals' attention might be directed toward salient provocative cues, which will favor the occurrence of aggressive behaviors (Giancola et al. 2010). The multiple threshold model (Clements and Schumacher 2010) also posits that individual differences can be risk factors for lower aggression thresholds. Following this model, there is an interaction between (1) alcohol-induced disinhibition and myopia; (2) anger-induced disinhibition toward aggression, and (3) increased processing of anger-arousing stimuli. Individuals prone to aggressive cognitive processes may be more susceptible to the disinhibiting properties of alcohol. Thus, existing dysfunctional socio-cognitive processes are most likely to trigger violence when combined

with alcohol intoxication (Clements and Schumacher 2010). It should however be noted that the facilitating influence of alcohol intoxication on violence can be multifold, including, for example, the psychomotor stimulant effect of alcohol, the alteration of the pain system, as well as cognitive interference, reduced inhibition, or misunderstanding of the situation (Hoaken and Stewart 2003).

Overall, alcohol is often involved in aggressive behaviors and fights, but specific predispositions (e.g., high basal level of anger or aggression) increase this effect. Moreover, as higher acute anger (e.g., generated in laboratory settings) can also conversely increase following alcohol consumption, individuals can quickly be trapped in a vicious cycle linking alcohol and negative emotions, where anger increases alcohol intake, which itself generates higher anger feelings.

Anger, Hostility, and Aggression in Chronic Alcohol Consumption

In addition to studies exploring the association between acute alcohol intoxication and anger, hostility and aggression, many studies explored these links with chronic alcohol consumption in the general population.

Regarding the emotional component, anger levels increase linearly with the frequency and intensity of alcohol consumption, higher anger being associated with more frequent alcohol consumption and more alcohol-related consequences (Leibsohn et al. 1994). Similar results are reported for hostility: beyond presenting less anger, abstainers are also less hostile toward others than all alcohol drinkers, moderate drinkers moreover being less hostile than heavy drinkers (Schonwetter and Janisse 1991). Several studies showed that hostility is associated with chronic alcohol intake (e.g., Calhoun et al. 2001), but also with adverse consequence of drinking (Butryn and Zeichner 1997). Finally, alcohol consumption is associated with higher risk of aggressive behaviors (Shima et al. 2022). More precisely, it is positively associated with irritability and reactive, but not proactive, aggression scores in youth (Blair et al. 2021), as well as with dispositional aggression and indirect aggression (e.g., malicious humor, social exclusion; Sheehan et al. 2016). There is a large literature about alcohol use and aggression in intimate relationships. For example, hostility and alcohol consumption can interact to predict alcohol-related aggression among husbands and wives: heavy alcohol consumption is associated with alcohol-related aggression only for husbands and wives high in hostility (Kachadourian et al. 2012). More globally, there is a link between alcohol consumption and IPV but the effect sizes are only small to moderate (Foran and O'Leary 2008). However, the relationship between alcohol use and physical or verbal aggression in intimate relationships is complex, with several personality characteristics (e.g., dispositional hostility) and environmental factors mediating and moderating this relationship (Tomlinson et al. 2016).

Here again, while chronic alcohol consumption appears to increase aggression, the reverse influence can also occur: longitudinal studies revealed that early aggressive behavior in adolescence predicted later alcohol use (e.g., Skara et al. 2008) while another study showed that aggression and indirect hostility (e.g., gossip

dissemination) predicted alcohol consumption over a 21-year follow-up (Airagnes et al. 2017). A vicious circle emerges: there is a risk of higher alcohol consumption following sadness and hostility and these drinking episodes, in turn, predict elevation in these same negative moods in the following week (Hussong et al. 2001). This bidirectionality is highly relevant with alcohol consumption on the one hand and anger, hostility, and aggression on the other hand fostering each other. Acting on one dimension could therefore break this circle and have positive effects on both.

The above-mentioned studies thus support a bidirectional association between alcohol consumption intensity and each component of aggression, but their cross-sectional designs preclude temporal or causal inferences. Longitudinal studies in adolescence provide valuable insights on this question. This period is particularly relevant to study as neurobiological research shows that addictive disorders emerge gradually and have their onset predominantly during the particularly risky period of adolescence. Understanding how alcohol use and aggression interact in adolescence could improve prevention targets before the onset of addictive disorders. A first study revealed that both prior aggressive behavior (especially for men) and prior alcohol use (especially for women) predicted later episodes of acute alcohol-related aggression. However, the relationships between alcohol use and aggression did not vary according to hostility level (White and Hansell 1996). A second study revealed alcohol use in early adolescence increased the later odds of anger, both in middle and late adolescence (Weiner et al. 2001). In the same vein, another longitudinal study showed that alcohol use may be related causally to violent behaviors, but the effect of drinking was limited to individuals prone to suppress their angry feelings (Norström and Pape 2010).

Another line of studies also showed a role of alcohol expectancies on aggression, independently of actual alcohol consumption. Following near-subliminal exposure to alcohol-related words, individuals with stronger expectancies that drinking fosters aggression showed greater hostility toward a target person following provocation (Friedman et al. 2007). In the same vein, undergraduate students took faster lexical decisions concerning aggression-related words following alcohol primes in the absence of any alcohol or placebo consumption (Bartholow and Heinz 2006). In addition, participants who were exposed to alcohol advertisements rated behaviors as more hostile than participants who were primed with control advertisements, and this effect was intensified when people associate more strongly alcohol and aggression (Bartholow and Heinz 2006). Another study showed that students with strong alcohol-aggression expectancies reported higher levels of alcohol-related aggression and hostility, irrespectively of their alcohol consumption level (Borders et al. 2007). All these data support the proposal that, independently of the actual alcohol consumption, the expectancies about alcohol effects on aggression and the preexisting implicit alcohol/aggression links shape aggressiveness tendencies when confronted with alcohol-related stimuli.

In summary, this literature supports the view that alcohol has a causal role in the elicitation of aggressive behavior, and is associated with higher levels of anger and hostility. Based on this, one may expect that patients with SAUD, who display chronic patterns of intense use, will exhibit heightened levels of aggression.

Anger, Hostility, and Aggression in SAUD

In striking contrast with studies on acute alcohol effects and different subclinical chronic consumption profiles, research focusing on anger, hostility, and aggression among patients with SAUD is relatively scarce. This topic is however relevant as people with SAUD present a high prevalence of anger (e.g., 63.5% among patients with SAUD in Jordan have severe clinical anger; Al-Khawaldeh et al. 2020) and are 1.9 times more at risk of being violent (Arseneault et al. 2000). Here, we present a summary of the available evidence.

First, SAUD is globally associated with higher anger, hostility, physical and verbal aggression, as well as indirect aggression levels than the general population (Bácskai et al. 2011; Ilyuk et al. 2012; Kelly et al. 2010). People with SAUD have higher mean scores for state anger, trait anger, and expression of anger compared to abstainers and social drinkers, and these aspects lead to low quality of life (Sharma et al. 2011). More precisely, when we take a look at the subscales of the tools used, SAUD is particularly characterized by higher “anger expression-in” (i.e., holding in or suppressing angry feelings), trait anger, resentment, guilt, aggression, and hostility (Ilyuk et al. 2012). Some of these results seem inconsistent as Tivis et al. (1998) also found that individuals with SAUD have a higher trait anger and anger expression-in than controls, but that they also have a higher anger expression-out (i.e., typical tendency to overtly express anger in verbal or physical behavior) and that they do not have higher state anger. Some gender differences can be underlined: women with SAUD have higher scores than men on hostility (Robinson et al. 2001), but men with SAUD are more likely than women to engage in physical fights while intoxicated (Schuckit et al. 1998). However, the difference with the control group regarding physical fight frequency is higher for women than men. These results were contradicted by Bácskai et al. (2011) who showed that males and females with SAUD display the same level of physical aggression, despite males being more aggressive in the general population. Concerning IPV, approximately 50% of individuals living with a partner presenting SAUD report violence in their couples before treatment (O’Farrell and Murphy 1995). Compared to other substance use disorder, SAUD is the most prevalent among IPV perpetrators (21.7%) and IPV victims (24.6%) (Smith et al. 2012). Interestingly, a study by Leonard et al. (1985) revealed that diagnosis of SAUD within the past 3 years, rather than the current alcohol consumption, was related to the number of fights or physical marital conflict, and this link was not due to hostility or marital satisfaction. However, dominance analysis contradicted this result by identifying hostility as a predictor of physical IPV perpetrated by men seeking alcohol treatment (Tharp et al. 2013).

Second, SAUD is frequently comorbid with Intermittent Explosive Disorder (IED), characterized by recurrent explosive behaviors indicating an inability to resist to aggressive impulses. The bidirectional relationship between SAUD and IED is complex and debated. Some authors showed that IED increases the severity of the addiction as well as current/lifetime alcohol consumption, but the presence of a substance dependence did not increase the severity of IED core features (i.e., aggression, anger, impulsivity) (Coccaro et al. 2016; Shima et al. 2022).

However, Puhalla et al. (2020) contradicted this last result and showed that individuals with IED showed increased intoxicated aggression as a function of SAUD severity.

The links between SAUD and the three aggression components are relevant to consider because patients with SAUD who display higher levels of anger and aggression have a more severe clinical profile. High anger is associated with more severe alcohol problems and consumption (Kelly et al. 2010) and trait aggressiveness is related with early SAUD development and onset (Mann et al. 1998). Anger is also associated with several other clinical variable in individuals with SAUD, including hopelessness, suicidality, depression, and anxiety (Demirbas et al. 2011). Moreover, these effects persist after abstinence: recovered patients with SAUD (3-year abstinent) still present higher aggression and hostility than the control group, while differences disappeared on physical and verbal aggression (Ziherl et al. 2007).

In summary, available empirical data provide support to the idea that patients with SAUD display higher levels of anger, hostility, and aggression than healthy individuals, and that the prevalence of clinical levels of aggression components is higher (although not systematic) in this group compared to healthy controls. Additionally, aggression is linked to worse clinical outcomes in patients with SAUD, stressing the need to target aggression in treatment settings. An important step in this regard is to elucidate the mechanisms that may participate in elevated aggression in SAUD.

Psychological Mechanisms of Aggression

Several theoretical models have proposed mechanistic explanations to understand differences in aggression. Here, we provide a brief overview of three dominant psychological and, more specifically, social cognitive conceptualizations, the latter constituting a synthesis and extension of the two first. Then, we show how they might explain elevated anger, hostility, and aggression in SAUD.

Social Information Processing Theory

The most influential socio-cognitive model is the Social Information Processing (SIP) theory (Crick and Dodge 1994), developed to provide a comprehensive theoretical framework of aggression in youth. The SIP centrally states that an individual's aggressive response not only depends on the objective presence of an aggressive cue in the environment, but on how the individual will interpret this cue. Specifically, a key proposal of this model is that aggressive individuals present a hostility bias, namely, a tendency to perceive or interpret ambiguous social information in a hostile way. This hostility bias may in turn facilitate the onset of aggressive behaviors. This proposal has received extensive empirical support. For example, a recent meta-analysis demonstrated a significant relationship between hostility biases and aggression (Klein Tuente et al. 2019). The SIP model also

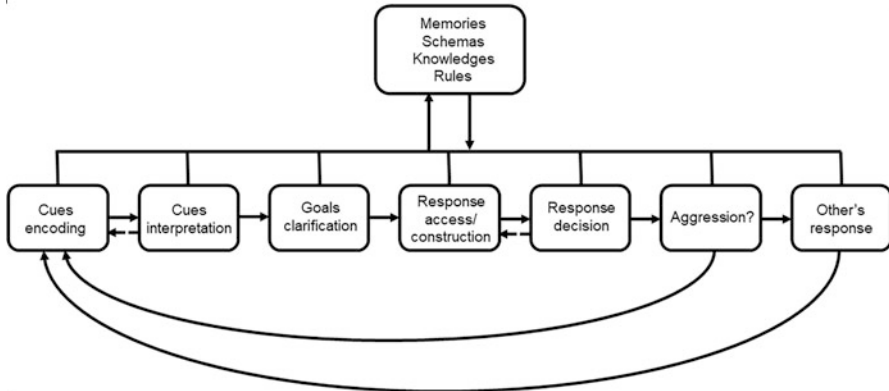


Fig. 2 Social Information Processing model

considers the role of later higher order cognitive processes (e.g., goal clarification, decision-making) in the transition between information processing and aggressive behavior (Fig. 2).

General Aggression Model

The General Aggression Model, originally proposed by Anderson et al. (1995) under the name “General Model of Affective Aggression,” suggests that there are three stages leading to a potentially aggressive behavior. In summary, inputs influence an individual’s internal state, which in turn affects appraisal and decision processes, which then lead to aggressive behaviors (Allen et al. 2018).

Situational and personal inputs (i.e., any individual differences or aspects of the situation) constitute the first level of the model. Their interpretation will influence the person’s current internal state at the second stage. The second stage, the present internal state, is composed of three types of states (i.e., cognitive schema, affective state, and arousal state). It is the way through which the previous inputs influence appraisal and decision processes (and thus potentially elicit aggressive behaviors). As social situations are often unclear in meaning, a hostile schema in this second stage might lead to biased interpretations of hostility. The third stage concerns appraisal and decision processes, which will lead to aggressive or nonaggressive outcomes. The individual appraises the situation and decides how to respond to it. There is a primary appraisal where the individual interprets the situation (e.g., intent) and experiences affect (e.g., anger). Primary appraisal is automatic, fast, and requires low cognitive effort. When time and cognitive resources are available, the results of primary appraisal are further evaluated in a more thoughtful, effortful, and conscious secondary appraisal. Additional information and consideration of various behavioral responses are added to the individual’s appraisal. Finally, the individual takes a decision and engages in a behavioral response. The action selected then

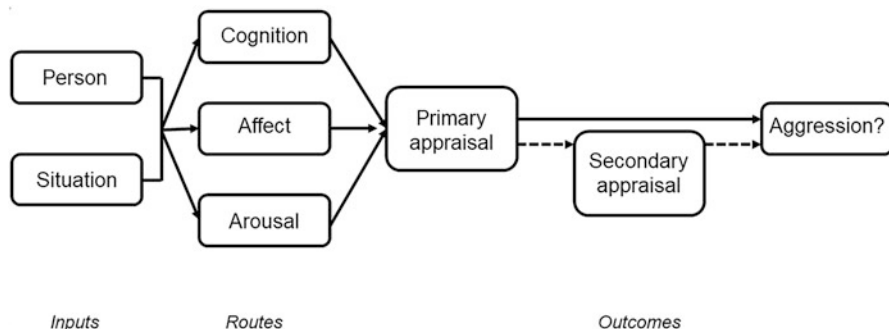


Fig. 3 General Aggression Model

influences the encounter, which in turn influences the first inputs and lead to a new cycle (Anderson et al. 1995; Allen et al. 2018).

Hostility biases have an important place in this model, as people can differ on their predisposition to hostility interpretation (i.e., personal input) and on their cognitive schemas (i.e., hostile schema), which will lead to an erroneous primary appraisal (i.e., hostile attributional bias). In turn, if the person does not have enough cognitive resources to reevaluate the situation (i.e., secondary appraisal) and control for its bias, he/she can react aggressively in an unwarranted manner. This model completes the previous one as it considers the emotional aspect of the interpretation and makes a distinction between a first automatic appraisal of the situation and a second more thoughtful evaluation (Fig. 3).

Integrative Cognitive Model of Trait Anger

This third model is an integration of the two previous ones but also adds a new element in the process, namely, ruminative attention. Based on a review of previous models explaining anger and aggression, Wilkowski and Robinson (2008) proposed a model where anger and resulting aggression originate from automatic hostile interpretations, ruminative attention, and effortful control. They suggest that automatic hostility biases in information processing are key anger triggers. Hostility biases in attention reinforce the impact of preexisting hostile interpretations, notably through rumination. Indeed, ruminative processes will extend the attention to hostile information, and thus also contribute to anger and aggression. For example, Wilkowski et al. (2006) showed that individuals with a tendency to disagreeableness are slow to disengage attention from hostile stimuli. Wilkowski and Robinson (2008) suggest a dual-process explanation of the hostile interpretation bias: it first emerges automatically very early in information processing but, to the extent that individuals take the time to analyze the situation, they are able to correct their biased spontaneous inferences. In sum, the hostile attributional bias emerges at an early, automatic processing stage, but can be corrected with additional controlled

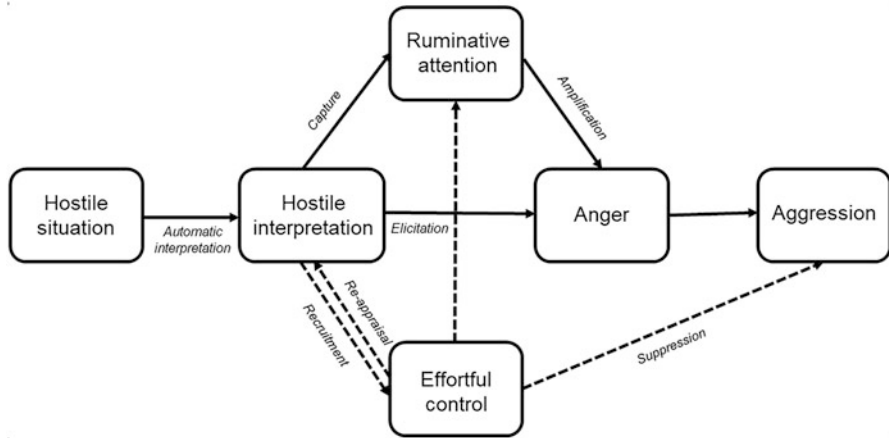


Fig. 4 Integrative cognitive model of trait anger

processing. It is important to note that effortful control resources are necessary but not sufficient for anger control. Such capacities also have to be successfully recruited and specifically employed in response to situations that are likely to provoke anger and aggression. To sum up, high-trait-anger individuals are angry both because they are more prone to hostile interpretations and because they engage in fewer cognitive processes needed to self-regulate their hostile thoughts (Wilkowski and Robinson 2008) (Fig. 4).

These last two models are highly relevant in our view to offer a double explanation regarding how individuals with SAUD are prone to more anger, hostility, and aggression-related behaviors: (1) they may display automatic hostility biases leading to a building up of anger; (2) they may not exert cognitive control to reinterpret their first bias appraisal and/or to inhibit the behavioral aggressive response.

Further supporting the relevance of these dual-process models of aggression to SAUD is their similarity with the dominant Dual Process Model of Addiction (Mukherjee 2010). This model is based on the idea that everyday decision-making is determined by the efficient equilibrium between a control system and an impulsive system. According to this approach, a generalized deficit in executive functions (e.g., flexibility, inhibition, working memory) following alcohol misuse will create action regulation impairments (i.e., under-activation of the control system), particularly in emotional contexts. In addition to this loss of control, addictive states are also characterized by an increased appetite toward the substance, due to two processes: craving (the irrepressible urge to consume a substance) and attentional bias (the preferential processing of stimuli related to the substance). These two mechanisms reflect the over-activation of the impulsive system. The emergence and persistence of alcohol-related disorders are thought to result from an imbalance between the control and the impulsive systems.

Capitalizing on the identification of the potential role played by increased hostility biases and reduced cognitive control (notably in emotional situations) in

aggression among patients with SAUD, we will focus in the next sections on what is presently known about these two factors, before describing how they might be treated to reduce the frequency and intensity of aggressive behaviors.

Hostility Biases in SAUD

Hostility Bias in Emotion Processing

The previous section highlighted the restricted evidence concerning anger and hostility in SAUD. However, a widely studied field in SAUD is emotion recognition, a main component of social cognition (Bora and Zorlu 2017). Emotional facial expression (EFE) processing and its related biases are interesting to study in the context of this chapter as they could produce misinterpretations of social cues, which could themselves lead to inappropriate social responses, and thus increase the risk of interpersonal conflicts and aggressions (Clements and Schumacher 2010). More precisely, overestimating anger could lead to retaliatory aggression, and thus increase the risk for violence (Clements and Schumacher 2010).

Classically, an EFE recognition task consists of the presentation of photos (or videos) of actors expressing different emotions at different intensities, the participant being asked to identify which emotion is displayed among a proposed list. Patients with SAUD present an accentuated deficit for the recognition of socially hostile emotions, and particularly anger (e.g., Hoffman et al. 2019). Moreover, Hoffman et al. (2019) identified a negative correlation between anger identification performance and interpersonal problems in SAUD. Of more direct relevance to the present chapter, patients with SAUD overestimate the intensity of angry expressions, and crucially overestimate the intensity of anger expressed by non-angry (e.g., sad, fearful, neutral) expressions (e.g., Maurage et al. 2009). Additionally, beyond intensity overestimations, SAUD is associated with misperceptions of emotional expressions. Patients with SAUD tend to perceive disgusted expressions as angry or contemptuous (Philippot et al. 1999). Moreover, they categorize nonhostile expressions such as sadness, fear, and neutrality as disgust or anger (Freeman et al. 2018). They also fail to discriminate angry facial expression among disgusted ones (Maurage et al. 2008), which hints toward specific difficulties in the processing of socially hostile stimuli in this population. In other words, patients with SAUD present a hostility bias in the perceptual processing of emotional expressions. These biases have been linked with interpersonal problems in SAUD (Maurage et al. 2009) and with aggression in other groups (Penton-Voak et al. 2013).

Hostile Attributional Bias

A far less studied but highly relevant process for understanding aggression is the hostile attributional bias, namely, the tendency to explain negative social outcomes supervening in ambiguous situations as resulting from others' hostile intentions. For

example, a teacher might attribute the fact that a student leaves the room in the middle of the class to that student's intention to be defiant (hostile attributional bias) or to the fact that an emergency came up (nonhostile attribution). In a review counting 25 studies, Klein Tunte et al. (2019) concluded to a positive association between hostile attributional bias and aggression, suggesting that this bias contributes to aggressive behavior. It is thus crucial to explore hostile attributional biases in SAUD, but only a few studies explored this issue and they reported inconsistent results.

First, Moss and Whiteman (1985) evaluated a potential hostility bias using the Paired Hands Test, which consist of a friendliness-hostility rating of ambiguous pictures of two interacting hands task. In this context, patients with SAUD did not demonstrate a hostile attributional bias. However, more recent studies using more reliable tasks demonstrated differences between patients with SAUD and healthy controls in hostility biases. Dethier and Blairy (2012) found more attribution of rejection and less attribution of affiliation in SAUD using an interpersonal intention task based on video-stimuli of EFE, where participants had to assess if a personality description matches the person that they viewed in the video. They also attributed more rejection intentions when people expressed anger. A more recent study by Pabst et al. (2020) found a hostile attributional bias in patients with SAUD. They used a short form of the Ambiguous Intentions Hostility Questionnaire (Combs et al. 2007), where participants had first to read five vignettes of social situations with negative outcomes (e.g., "you walk past a group of teenagers at the mall and you hear them start to laugh") and then to imagine themselves being the victims. After that, they had to explain the reasons behind the other persons' behavior and rated whether the behavior was intentional, how angry they would be, and how much they would blame the perpetrators. Finally, they had to explain how they would react in this situation. Patients with SAUD attributed more hostile intentions in ambiguous scenarios than controls, but no group difference was observed regarding aggression. Moreover, hostility scores were associated with interpersonal problems in SAUD.

In short, preliminary evidence suggests that individuals with SAUD present hostility biases, in the forms of overinterpretation of hostile emotions, as well as overinterpretation of hostile intent in others' behavior.

Lack of Emotional and Cognitive Control

As previously mentioned, a hostility bias could lead to increased feelings of anger and hostile thoughts in patients with SAUD. At this stage, emotion regulation skills can be deployed to control these cognitive-affective states and prevent their escalation into behavioral aggression. Emotion regulation refers to the processes responsible for monitoring, evaluating, and modifying emotional reactions to accomplish one's goals (Thompson 1994). It is highly relevant as impaired emotion regulation contributes to the development, persistence, severity, and relapse of SAUD (Jakubczyk et al. 2018; Petit et al. 2015), and some of these difficulties persist after abstinence (Fox et al. 2008). In general, SAUD is characterized by impaired

emotion regulation (Fox et al. 2008; Ghorbani et al. 2017; Jakubczyk et al. 2018). More precisely, individuals with SAUD tend to use more emotional suppression (i.e., maladaptive emotion regulation strategy consisting in the conscious inhibition of one's own emotional expressive behavior while emotionally aroused) and less reappraisal (i.e., a form of cognitive change where the emotional impact of a situation varies according to its importance to the individual), which is an adaptive strategy resulting in positive emotional and physical responses to emotion-eliciting stimuli (Ghorbani et al. 2017) and cognitive change (Petit et al. 2015). They also experience more difficulties in emotional awareness (i.e., the tendency to pay attention to emotions and the ability to recognize them) and clarity (i.e., the degree to which an individual can understand distinctly which emotion he/she is experiencing) as well as impulse control (i.e., the capacity to maintain control of one's behavior when experiencing negative emotions) (Fox et al. 2008). These difficulties in emotion regulation are associated with alcohol-related consequences (Dvorak et al. 2014). Moreover, impaired emotion regulation has several impacts: for example, high negative affect and low positive affect indirectly influenced craving through limited emotion regulation strategies (Khosravani et al. 2017). The deficit in emotional processing, highly present in SAUD, combined with a lack of awareness of this deficit, impede emotional regulation (Le Berre 2019).

A second highly relevant aspect is cognitive control. It allows to select contextually relevant information and organize/optimize information processing to reach goal-directed behavior (Ridderinkhof et al. 2004). However, individuals with SAUD are strongly impaired in inhibition (e.g., Quoilin et al. 2018). Using self-reported questionnaires, several studies showed that individuals with SAUD present increased impulsivity (Jakubczyk et al. 2018; Mitchell et al. 2005; Quoilin et al. 2018). Nevertheless, Mitchell et al. (2005) showed that this deficit is limited to cognitive impulsivity and not motor impulsivity, and Jakubczyk et al. (2018) found no association between emotion regulation and motor impulsivity. However, it seems there is an important motor component in the neural correlates of altered inhibitory control in SAUD (Quoilin et al. 2018).

While presented successively here for the sake of clarity, emotional regulation, and cognitive control are often combined in real-life situations, being both related to the ability to regulate oneself (i.e., to reduce emerging emotions or to inhibit a behavior). In line with this, Sprague et al. (2011) revealed experiences of anger and hostility mediated the relationship between perceived stress and aggressive behavior among people low in executive functions. This finding highlights the importance of higher-order cognitive processes in regulating appropriate affective and behavioral responses. To sum up, because of their difficulties in self-regulation, including emotion regulation and cognitive control, individuals with SAUD are unlikely to compensate for their hostility bias via a second appraisal of the situation, or by inhibiting their behavioral tendencies, as suggested by the General Aggression Model or the integrative cognitive model of trait anger (Fig. 5).

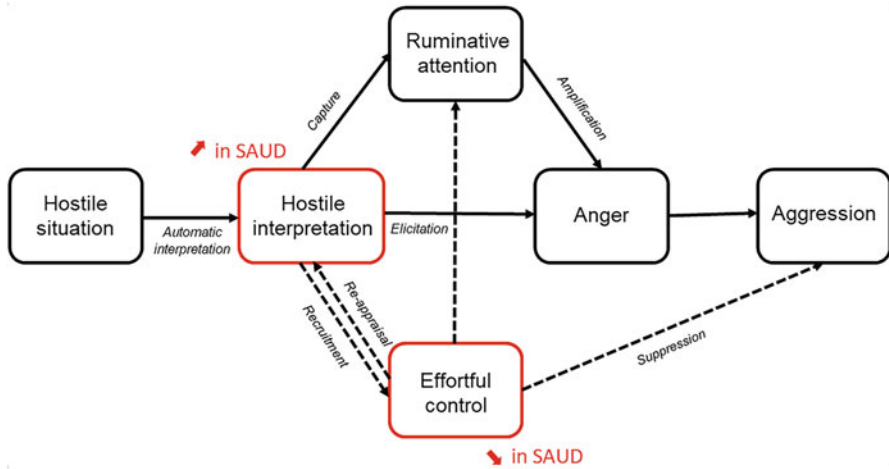


Fig. 5 Impaired aggression processes in SAUD

Psychological Treatments Addressing Aggression in SAUD

Several interventions targeting the above-mentioned psychological mechanisms could reduce aggressive behaviors in SAUD. Indeed, in view of the causal links identified, decrease in anger and hostility could in turn reduce alcohol-related aggressions and drinking frequency/intensity (Airagnes et al. 2017; Cougle et al. 2017; Tomlinson et al. 2016). It is also important to consider anger and hostility in treatment because anger is considered as hampering successful treatment in SAUD and contributes to relapse (Walitzer et al. 2015; Al-Khawaldeh et al. 2020). Enhancing anger management skills may thus decrease the likelihood of relapse (Ziherl et al. 2007; Walitzer et al. 2015), and help relapsed patients to return to abstinence (Witkiewitz and Villarreal 2009). In the same line, hostility and aggression can have implications for treatment, especially concerning the therapeutic relationship. The therapist might struggle to create an effective therapeutic alliance, and treatment process might be longer when patients present hostile attitudes or aggressive behaviors (Robinson et al. 2001). However, classical treatments which do not specifically target anger and hostility reduction seem ineffective to decrease it (Kelly et al. 2010; Moss and Whiteman 1985). Model-based interventions can serve to prevent the building up of anger and hostility in the first place and/or regulate their escalation into aggressive behaviors in SAUD, depending on whether they target hostility biases or emotional/cognitive control.

Treatments Targeting the Overestimation of Hostile Emotion

First, interventions could target the hostility bias specifically observed in emotion recognition. Indeed, Penton-Voak et al. (2013) efficiently modified biases in emotion recognition to promote the perception of happiness over anger in ambiguous expressions. Moreover, this rehabilitation results in a decrease in anger and aggression, which provides strong evidence that emotion processing plays a crucial and causal role in anger and the maintenance of aggressive behaviors (Penton-Voak et al. 2013). However, although its efficacy is demonstrated, this kind of intervention has never been tested in a population of individuals with SAUD.

Treatments Targeting Hostile Attributional Bias

A second treatment target could be hostile attributional bias. Interventions focused on interpretation bias have already been applied in the general population. This kind of intervention could lead to broad improvements in anger, aggression, and alcohol consumption (Cogle et al. 2017). An example of these interventions is provided by Cogle et al. (2017) who tested the efficacy of an online interpretation bias modification for hostility (IBM-H) intervention. Fifty-eight individuals with elevated trait anger and moderate/severe alcohol use disorder were randomly assigned to eight web-based sessions (two per week) of IBM-H or a healthy video control condition (HVC). The IBM-H intervention consists of a scenarios-based task. Participants have to read ambiguous scenarios and imagine themselves in it (512 total trials over 8 sessions). Participants first see an ambiguous, anger-related scenario. Then, another sentence, meant to resolve the ambiguity with a benign interpretation, appears with a letter missing from the keyword of the sentence. Participants are asked to type the missing letter to form the keyword. The nonhostile interpretations were then reinforced via a comprehension question to which participants responded with “yes” or “no.” If their answer confirmed the nonhostile interpretation or rejected the hostile interpretation, they proceeded to the next trial. Otherwise, they were asked to “try again.” The scenarios in each session covered a wide range of anger-related themes (e.g., feeling ignored, driving situations, disagreements, annoying traits of others). Measures of interpretation bias, anger, and alcohol use were administered at pre- and posttreatment and at 1-month follow-up. Results showed that IBM-H led to greater improvements in interpretation bias compared to HVC at posttreatment and follow-up. IBM-H also led to greater reductions in trait anger via changes in interpretation bias and lower anger expression than HVC. In addition, they found that reductions in trait anger and anger expression accounted for reductions in drinking to cope with anger. No effects of IBM-H were noted for alcohol consumed or drinking-related consequences, as both conditions reported decreases in alcohol use and consequences following treatment. These findings provide initial support for the utility of IBM-H as a brief nonconfrontational intervention for individuals with SAUD with elevated trait anger (Cogle et al. 2017).

Moreover, interventions targeting hostility biases could also be beneficial as a prevention tool, before a SAUD is installed. Indeed, Mathes (2021) developed a new computer-based intervention targeting hostile interpretation bias and alcohol-related outcomes. This intervention uses cognitive restructuring to address hostile attribution bias. She has carried out a randomized controlled trial on 101 undergraduates who reported elevated hostility and alcohol use disorder symptoms. The Treatment of Social Stress (TOSS) is a 40-min computerized intervention designed to reduce hostile interpretations of other people's actions and intentions. It starts with case examples that describe individuals who have high levels of hostility and may therefore experience interpersonal difficulties. Then, it introduces the rationale for using cognitive restructuring to challenge automatic thoughts and core beliefs about other people, and provides examples to practice the skill. After that, examples of core beliefs that often underlie hostile interpretations are provided. Finally, the importance of behavioral practice to test the validity of restructured thoughts is explained. Their results indicated that the hostility intervention was associated with greater reductions in hostile interpretations than the control intervention, but there were no effects on hostile core beliefs, drinking behavior, alcohol-related problems, and drinking-related motives. However, there were significant indirect effects of intervention on conformity and social motives for drinking, through changes in hostile interpretations. This intervention also provides promising results for hostility attributional bias rehabilitation.

Treatments Targeting Emotional/Cognitive Control

Thirdly, interventions could target control abilities, and particularly the regulation of negative affect, including anger. Indeed, despite the link between negative affect and alcohol consumption, only a few studies have targeted negative affect in interventions (Stasiewicz et al. 2013). Emotion regulation improvement could teach individuals with SAUD how to control their anger induced by hostility biases, in order to avoid responding with an unjustified aggressive behavior. Reducing negative affect during alcohol treatment could also reduce relapse risk, or help the individual to return into abstinence after relapse (Witkiewitz and Villarroel 2009; Stasiewicz et al. 2013). Indeed, patients with SAUD, especially those presenting low emotional intelligence, could benefit from interventions targeting emotion regulation (de Sousa Uva et al. 2010). Stasiewicz et al. (2013) created a new intervention that specifically targeted negative affect. Seventy-seven alcohol-dependent outpatients received 12-weekly, 90-min sessions of either cognitive behavioral therapy for SAUD plus affect regulation training (CBT+ART) or cognitive behavioral therapy plus a healthy lifestyles control condition (CBT+HLS). ART was developed combining several affect regulation strategies (i.e., mindfulness, prolonged exposure, distress tolerance) to address the needs of individuals with SAUD who reported to frequently drink in negative emotional situations (i.e., negative affect drinkers). Their intervention's results indicated greater reductions in alcohol use for CBT + ART than for CBT+HLS as well as decreases in negative affect. Moreover, the gains

were maintained at 3- and 6-month follow-up for the percentage of days abstinent and of heavy drinking days. Nandrino et al. (2021) confirmed these results by showing that ART leads to a greater improvement in emotion regulation strategies in comparison to the delivery of usual care alone in SAUD, especially for recently detoxified patients.

This type of intervention focused on general negative affect regulation and taught patients how to deal with these negative affects to avoid drinking. However, some treatments specifically focused on anger could be useful, due to its central impact in SAUD. For example, Gonzalez-Prendes (2008) conducted a preliminary study on 13 participants to test the efficacy of an 8-week anger-control treatment on trait anger on women recovering from alcohol and drug addiction. This cognitive-behavioral anger-control treatment was compared to a relapse-prevention treatment. The anger treatment was displayed in eight 90-min group sessions that followed three stages: (a) developing a conceptual understanding of the problem, (b) acquiring skills and rehearsal, and (c) applying it and following through. They observed a decrease on trait anger after treatment in the anger-control group but not in the relapse-prevention group, providing promising results for this approach. Walitzer et al. (2015) tested an alcohol-adapted anger management treatment (AM) for outpatients with SAUD. Seventy-six patients were randomly assigned to treatment condition (AM or Alcoholics Anonymous Facilitation treatment (AAF)) and followed for 6 months after treatment end. AM treatment consisted of twelve 60-min sessions focusing on the development of relaxation and cognitive coping skills for anger regulation. Although this treatment had a positive impact by reducing heavy drinking days, alcohol consequences, anger, and maladaptive anger-related thoughts and by increasing abstinence and self-confidence regarding not drinking to anger-related triggers, no differences in these constructs were found between treatment conditions, suggesting that the AAF treatment is just as effective. These gains were maintained at 3- and 6-month follow-ups. However, change in trait anger was a stronger predictor of posttreatment alcohol consequences for patients in the AM condition than in the AAF condition.

In conclusion, treatments can target different processes to act on aggression in SAUD. Interventions that aim to improve anger management or rehabilitate the hostility attributional bias can further decrease the high aggression rates present in SAUD, as aggressive behaviors are thought to result from these impaired processes (as developed in the models presented) (Fig. 6).

Conclusion and Perspectives for Future Studies

This review highlights the increased presence of the three subcomponents of aggression (i.e., anger, hostility, and aggressive behaviors) both in acute alcohol consumption and in SAUD. We have identified two important processes involved in this elevated aggression, namely, hostility biases (i.e., hostility bias in emotion regulation and hostile attributional bias) and emotional/cognitive control (i.e., emotion regulation and inhibition/impulsivity). Some promising therapeutic approaches have been

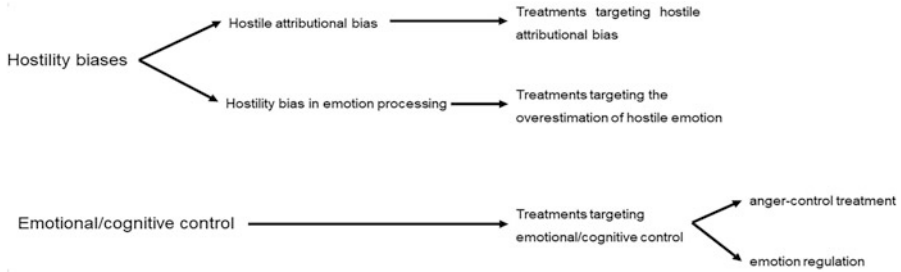


Fig. 6 Processes involved in aggression and their treatment targets

presented, targeting different processes involved in the elicitation of aggressive behavior. However, future studies should still focus on several aspects, namely, (1) working on a better characterization of the subcomponents of anger, hostility, and aggression in SAUD; (2) exploring other potential mechanisms involved in aggression in SAUD (e.g., ruminative attention, decision-making); and (3) develop and test new therapeutic approaches focused on the emotional (i.e., anger), cognitive (i.e., hostility), and behavioral (i.e., aggressive behavior) components of aggression.

Application of the Material

Considerable evidence suggests that, beyond alcohol, the disordered use of other psychotropic substances such as cannabis, hallucinogens, stimulants, opioids, and sedatives (Zhong et al. 2020), as well as psychiatric disorders including schizophrenia, bipolar disorder, personality disorder, post-traumatic stress disorder, and depression are also associated with increased aggression (Whiting et al. 2021). Accordingly, both the methodology employed in the current chapter and its general conclusions may be informative beyond the strict context of SAUD. First, the approach adopted to describe and analyze aggression can be transposed to increase its understanding in other psychiatric or substance-related disorders. The systematic organization of aggression subcomponents into affective, cognitive, and behavioral subcomponents allows for refined modular investigations into the differential contribution of each aggression facet to each disorder. This can in turn improve fundamental conceptualizations of the disorders and orient research on specific mechanisms and treatments. The search for and identification of mechanisms at the psychological process level further offers opportunities to develop and propose more precise, targeted, and hence more effective interventions. Second, we argue that the specific psychological mechanisms (e.g., hostility biases, reduced emotional or cognitive control), and corresponding intervention approaches (e.g., hostility bias modification, emotional regulation training) that we found to be relevant in SAUD, given that they are based on models that were not elaborated with reference to a specific disorder, may be of direct transdiagnostic interest to address aggression. Support for the wide applicability of these mechanisms notably comes from reports

of hostility biases or emotional control impairments in other substance use and psychiatric disorders (e.g., Lahera et al. 2015; Zimmermann et al. 2017).

Mini-dictionary of Terms

Aggression – A multidimensional construct consisting in three intertwined subcomponents, respectively, related to affective (anger), cognitive (hostility), and behavioral (aggressive or destructive actions) dimensions.

Anger – A basic emotional state constituting the affective component of aggression. It encompasses aggressive action tendencies and physiological arousal, and ranges from mild irritation to intense rage.

Attributional bias – The propensity to consider that the personal and interpersonal events occurring in one's life are mostly due to internal (i.e., individual responsibility) or external (i.e., others' responsibility or contextual variables) causes.

Cognitive control – The ability to use executive functions, and centrally inhibition, in order to regulate one's thoughts or behaviors and avoid inappropriate actions.

Emotional regulation – The cognitive processes deployed to accomplish one's goals when facing internally or externally arousing events. It encompasses the monitoring, evaluation, and modification of emotional reactions toward these events, and can be adaptive or maladaptive.

Hostility – A group of negative and cynical beliefs about others, combined with negative attitudes toward them, which is involved in the emergence of aggression.

Severe alcohol use disorder – The excessive, chronic and maladaptive consumption of alcohol, generating (1) a loss of control on consumption; (2) an increased priority given to consumption in comparison with other activities; (3) clinically significant impairments (e.g., personal, professional, or relational disturbances); and/or (4) physiological effects (e.g., tolerance, craving).

Key Facts on the Dangers of Alcohol and Its Link with Aggression

- Alcohol is responsible for high levels of mortality, morbidity, and associated social costs (WHO 2018).
- The number of alcohol-attributable deaths per year is estimated to be 3 million (which represents 5.3% of all deaths) (WHO 2018).
- The mean abstinence rate for individuals with SAUD who did not follow a treatment program is only 21% (Moyer and Finney 2002).
- Individuals with SAUD are almost twice more at risk of being violent (Arseneault et al. 2000).
- Alcohol-attributable deaths accounting 28.7% are caused by intentional or unintentional injuries (WHO 2018).
- There is a bidirectional link between alcohol and aggression, as they are mutually reinforcing.

Summary Points

We offer the first review on the popular belief that alcohol misuse is associated with aggression.

We explored the emotional and cognitive components of aggression in severe alcohol use disorder (SAUD).

Both acute alcohol consumption, chronic alcohol consumption habits, and SAUD are related to higher rates of anger, hostility, and aggression.

SAUD is associated with hostile bias in emotion recognition and in the attribution of intent to others' behaviors, and with a lack of cognitive and emotional control.

We suggested several therapeutic approaches to target the processes involved in the elicitation of aggressive behaviors in SAUD.

Anger, hostility, and aggression are crucial in the course of SAUD and should thus be considered in research and clinical practice.

References

- Airagnes G, Lemogne C, Gueguen A et al (2017) Hostility predicts alcohol consumption over a 21-year follow-up in the Gazel cohort. *Drug Alcohol Depend* 177:112–123. <https://doi.org/10.1016/j.drugalcdep.2017.03.034>
- Al-Khawaldeh SA, Hamdan-Mansour AM, Shehadeh JH, Thultheen IN (2020) Socio-demographics and psychological correlates of anger among individuals diagnosed with alcohol use disorder in Jordan. *Open Nurs J* 14:135–140. <https://doi.org/10.2174/1874434602014010135>
- Allen JJ, Anderson CA, Bushman BJ (2018) The general aggression model. *Curr Opin Psychol* 19: 75–80. <https://doi.org/10.1016/j.copsyc.2017.03.034>
- Anderson CA, Deuser WE, DeNeve KM (1995) Hot temperatures, hostile affect, hostile cognition, and arousal: tests of a general model of affective aggression. *Personal Soc Psychol Bull* 21: 434–448. <https://doi.org/10.1177/0146167295215002>
- Arseneault L, Moffitt TE, Caspi A et al (2000) Mental disorders and violence in a total birth cohort: results from the Dunedin study. *Arch Gen Psychiatry* 57:979–986. <https://doi.org/10.1001/archpsyc.57.10.979>
- Bácskai E, Czobor P, Gerevich J (2011) Gender differences in trait aggression in young adults with drug and alcohol dependence compared to the general population. *Prog Neuro-Psychopharmacol Biol Psych* 35:1333–1340. <https://doi.org/10.1016/j.pnpbp.2011.04.005>
- Bartholow BD, Heinz A (2006) Alcohol and aggression without consumption: alcohol cues, aggressive thoughts, and hostile perception bias. *Psychol Sci* 17:30–37. <https://doi.org/10.1111/j.1467-9280.2005.01661.x>
- Blair RJR, Bajaj S, Sherer N et al (2021) Alcohol use disorder and cannabis use disorder symptomatology in adolescents and aggression: associations with recruitment of neural regions implicated in retaliation. *Biol Psych Cogn Neurosci Neuroimag* 6:536–544. <https://doi.org/10.1016/j.bpsc.2020.11.016>
- Bora E, Zorlu N (2017) Social cognition in alcohol use disorder: a meta-analysis. *Addiction* 112: 40–48. <https://doi.org/10.1111/add.13486>
- Borders A, Barnwell SS, Earleywine M (2007) Alcohol-aggression expectancies and dispositional rumination moderate the effect of alcohol consumption on alcohol-related aggression and hostility. *Aggress Behav* 33:327–338. <https://doi.org/10.1002/ab.20187>
- Buss AH, Perry M (1992) The aggression questionnaire. *J Pers Soc* 63(3):452–459. <https://doi.org/10.1037/0022-3514.63.3.452>

- Butryn MF, Zeichner A (1997) Temperament, hostility, and consequences of alcohol use. *Psychol Rep* 80(2):544–546. <https://doi.org/10.2466/pr0.1997.80.2.544>
- Calhoun PS, Bosworth HB, Siegler IC, Bastian LA (2001) The relationship between hostility and behavioral risk factors for poor health in women veterans. *Prev Med (Baltim)* 33:552–557. <https://doi.org/10.1006/pmed.2001.0921>
- Clements K, Schumacher JA (2010) Perceptual biases in social cognition as potential moderators of the relationship between alcohol and intimate partner violence: a review. *Aggress Violent Behav* 15:357–368. <https://doi.org/10.1016/j.avb.2010.06.004>
- Coccaro EF, Fridberg DJ, Fanning JR et al (2016) Substance use disorders: relationship with intermittent explosive disorder and with aggression, anger, and impulsivity. *J Psychiatr Res* 81:127–132. <https://doi.org/10.1016/j.jpsychires.2016.06.011>
- Combs DR, Adams SD, Penn DL et al (2007) Social cognition and interaction training (SCIT) for inpatients with schizophrenia spectrum disorders: preliminary findings. *Schizophr Res* 91(1): 112–116. <https://doi.org/10.1016/j.schres.2006.12.010>
- Cougle JR, Summers BJ, Allan NP et al (2017) Hostile interpretation training for individuals with alcohol use disorder and elevated trait anger: a controlled trial of a web-based intervention. *Behav Res Ther* 99:57–66. <https://doi.org/10.1016/j.brat.2017.09.004>
- Crane CA, Godleski SA, Przybyla SM et al (2016) The proximal effects of acute alcohol consumption on male-to-female aggression: a meta-analytic review of the experimental literature. *Trauma, Violence, Abuse* 17:520–531. <https://doi.org/10.1177/1524838015584374>
- Crick NR, Dodge KA (1994) A review and reformulation of social information-processing mechanisms in Children's social adjustment. *Psychol Bull* 115:74–101. <https://doi.org/10.1037/0033-2909.115.1.74>
- de Sousa Uva MC, de Timary P, Cortesi M et al (2010) Moderating effect of emotional intelligence on the role of negative affect in the motivation to drink in alcohol-dependent subjects undergoing protracted withdrawal. *Pers Individ Dif* 48:16–21. <https://doi.org/10.1016/j.paid.2009.08.004>
- Demirbas H, Ilhan IO, Dogan YB (2011) Assessment of the mode of anger expression in alcohol dependent male inpatients. *Alcohol Alcohol* 46:542–546. <https://doi.org/10.1093/alcalc/agr056>
- Dethier M, Blairy S (2012) Capacity for cognitive and emotional empathy in alcohol-dependent patients. *Psychol Addict Behav* 26:371–383. <https://doi.org/10.1037/a0028673>
- Duke AA, Giancola PR, Morris DH et al (2011) Alcohol dose and aggression: another reason why drinking more is a bad idea. *J Stud Alcohol Drugs* 72:34–43. <https://doi.org/10.15288/jsad.2011.72.34>
- Dvorak RD, Sargent EM, Kilwein TM et al (2014) Alcohol use and alcohol-related consequences: associations with emotion regulation difficulties. *Am J Drug Alcohol Abuse* 40(2):125–130. <https://doi.org/10.3109/00952990.2013.877920>
- Eckhardt CI, Crane C (2008) Effects of alcohol intoxication and aggressivity on aggressive verbalizations during anger arousal. *Aggress Behav* 34:428–436. <https://doi.org/10.1002/ab.20249>
- Foran HM, O'Leary KD (2008) Alcohol and intimate partner violence: a meta-analytic review. *Clin Psychol Rev* 28:1222–1234. <https://doi.org/10.1016/j.cpr.2008.05.001>
- Fox HC, Hong KA, Sinha R (2008) Difficulties in emotion regulation and impulse control in recently abstinent alcoholics compared with social drinkers. *Addict Behav* 33:388–394. <https://doi.org/10.1016/j.addbeh.2007.10.002>
- Freeman CR, Wiers CE, Sloan ME et al (2018) Emotion recognition biases in alcohol use disorder. *Alcohol Clin Exp Res* 42:1541–1547. <https://doi.org/10.1111/acer.13802>
- Friedman RS, McCarthy DM, Bartholow BD, Hicks JA (2007) Interactive effects of alcohol outcome expectancies and alcohol cues on nonconsumptive behavior. *Exp Clin Psychopharmacol* 15:102–114. <https://doi.org/10.1037/1064-1297.15.1.102>
- Ghorbani F, Khosravani V, Sharifi Bastan F, Jamaati Ardakani R (2017) The alexithymia, emotion regulation, emotion regulation difficulties, positive and negative affects, and suicidal risk in

- alcohol-dependent outpatients. *Psychiatry Res* 252:223–230. <https://doi.org/10.1016/j.psychres.2017.03.005>
- Giancola PR, Josephs RA, Parrott DJ, Duke AA (2010) Alcohol myopia revisited: clarifying aggression and other acts of disinhibition through a distorted lens. *Perspect Psychol Sci* 5: 265–278. <https://doi.org/10.1177/1745691610369467>
- Gonzalez-Prendes AA (2008) Anger-control group counseling for women recovering from alcohol or drug addiction. *Res Soc Work Pract* 18:616–625. <https://doi.org/10.1177/1049731507308356>
- Hoaken PNS, Stewart SH (2003) Drugs of abuse and the elicitation of human aggressive behavior. *Addict Behav* 28:1533–1554. <https://doi.org/10.1016/j.addbeh.2003.08.033>
- Hoffman LA, Lewis B, Nixon SJ (2019) Neurophysiological and interpersonal correlates of emotional face processing in alcohol use disorder. *Alcohol Clin Exp Res* 43:1928–1936. <https://doi.org/10.1111/acer.14152>
- Hussong AM, Hicks RE, Levy SA, Curran PJ (2001) Specifying the relations between affect and heavy alcohol use among young adults. *J Abnorm Psychol* 110:449–461. <https://doi.org/10.1037/0021-843X.110.3.449>
- Ilyuk RD, Gromyco DI, Kiselev AS et al (2012) Hostility and anger in patients dependent on different psychoactive drugs. *Act Nerv Super (Praha)* 54:125–134. <https://doi.org/10.1007/BF03379590>
- Jakubczyk A, Trucco EM, Kopera M et al (2018) The association between impulsivity, emotion regulation, and symptoms of alcohol use disorder. *J Subst Abus Treat* 91:49–56. <https://doi.org/10.1016/j.jsat.2018.05.004>
- Kachadourian LK, Homish GG, Quigley BM, Leonard KE (2012) Alcohol expectancies, alcohol use, and hostility as longitudinal predictors of alcohol-related aggression. *Psychol Addict Behav* 26:414–422. <https://doi.org/10.1037/a0025842>
- Kelly JF, Stout RL, Tonigan JS et al (2010) Negative affect, relapse, and alcoholics anonymous (AA): does AA work by reducing anger? *J Stud Alcohol Drugs* 71(3):434–444. <https://doi.org/10.15288/jsad.2010.71.434>
- Khosravani V, Sharifi Bastan F, Ghorbani F, Kamali Z (2017) Difficulties in emotion regulation mediate negative and positive affects and craving in alcoholic patients. *Addict Behav* 71:75–81. <https://doi.org/10.1016/j.addbeh.2017.02.029>
- Kilian C, Manthey J, Carr S et al (2021) Stigmatization of people with alcohol use disorders: an updated systematic review of population studies. *Alcohol Clin Exp Res* 45:899–911. <https://doi.org/10.1111/acer.14598>
- Klein Tuente S, Bogaerts S, Veling W (2019) Hostile attribution bias and aggression in adults - a systematic review. *Aggress Violent Behav* 46:66–81. <https://doi.org/10.1016/j.avb.2019.01.009>
- Lahera G, Herrera S, Reinares M et al (2015) Hostile attributions in bipolar disorder and schizophrenia contribute to poor social functioning. *Acta Psychiatr Scand* 131:472–482. <https://doi.org/10.1111/acps.12399>
- Le Berre AP (2019) Emotional processing and social cognition in alcohol use disorder. *Neuropsychology* 33:808–821. <https://doi.org/10.1037/neu0000572>
- Leibsohn MT, Oetting ER, Deffenbacher JL (1994) Effects of trait anger on alcohol consumption and consequences. *J Child Adolesc Subst Abus* 3:17–32. https://doi.org/10.1300/J029v03n03_02
- Leonard KE, Bromet EJ, Parkinson DK et al (1985) Patterns of alcohol use and physically aggressive behavior in men. *J Stud Alcohol Drugs* 46(4):279–282. <https://doi.org/10.15288/jsa.1985.46.279>
- Mann K, Ackermann K, Jung M et al (1998) Aggressive, onset of dependence, and treatment outcome in socially well-adapted alcoholics. *Alcohol Alcohol* 33:16–19. <https://doi.org/10.1093/oxfordjournals.alcalc.a008341>
- Massa AA, Subramani OS, Eckhardt CI, Parrott DJ (2019) Problematic alcohol use and acute intoxication predict anger-related attentional biases: a test of the alcohol myopia theory. *Psychol Addict Behav* 33:139–143. <https://doi.org/10.1037/adb0000426>

- Mathes BM (2021) The development and evaluation of an online intervention for hostility among individuals at risk for alcohol use disorder. Dissertation, Florida State University
- Maurage P, Campanella S, Philippot P et al (2008) Electrophysiological correlates of the disrupted processing of anger in alcoholism. *Int J Psychophysiol* 70:50–62. <https://doi.org/10.1016/j.ijpsycho.2008.05.572>
- Maurage P, Campanella S, Philippot P et al (2009) Impaired emotional facial expression decoding in alcoholism is also present for emotional prosody and body postures. *Alcohol Alcohol* 44: 476–485. <https://doi.org/10.1093/alcalc/agg037>
- Mitchell JM, Fields HL, D'Esposito M, Boettiger CA (2005) Impulsive responding in alcoholics. *Alcohol Clin Exp Res* 29:2158–2169. <https://doi.org/10.1097/01.alc.0000191755.63639.4a>
- Moss SB, Whiteman JL (1985) An analysis of alcoholics' perception of hostility before and after treatment. *J Subst Abus Treat* 2:107–111. [https://doi.org/10.1016/0740-5472\(85\)90034-0](https://doi.org/10.1016/0740-5472(85)90034-0)
- Moyer A, Finney JW (2002) Outcomes for untreated individuals involved in randomized trials of alcohol treatment. *J Subst Abus Treat* 23(3):247–252. [https://doi.org/10.1016/s0740-5472\(02\)00264-7](https://doi.org/10.1016/s0740-5472(02)00264-7)
- Mukherjee K (2010) A dual system model of preferences under risk. *Psychol Rev* 117:243–255. <https://doi.org/10.1037/a0017884>
- Nandrino JL, Claisse C, Duprez C et al (2021) Training emotion regulation processes in alcohol-abstinent individuals: a pilot study. *Addict Behav* 114:106652. <https://doi.org/10.1016/j.addbeh.2020.106652>
- Norström T, Pape H (2010) Alcohol, suppressed anger and violence. *Addiction* 105:1580–1586. <https://doi.org/10.1111/j.1360-0443.2010.02997.x>
- Nutt DJ, King LA, Phillips LD (2010) Drug harms in the UK: a multicriteria decision analysis. *Lancet* 376(9752):1558–1565
- O'Farrell TJ, Murphy CM (1995) Marital violence before and after alcoholism treatment. *J Consult Clin Psychol* 63:256–262. <https://doi.org/10.1037/0022-006X.63.2.256>
- Pabst A, Peyroux E, Rolland B et al (2020) Hostile attributional bias in severe alcohol use disorder. *J Psychiatr Res* 129:176–180. <https://doi.org/10.1016/j.jpsychores.2020.06.031>
- Parrott DJ, Zeichner A (2002) Effects of alcohol and trait anger on physical aggression in men. *J Stud Alcohol* 63:196–204. <https://doi.org/10.15288/jsa.2002.63.196>
- Parrott DJ, Zeichner A, Stephens D (2003) Effects of alcohol, personality, and provocation on the expression of anger in men: a facial coding analysis. *Alcohol Clin Exp Res* 27:937–945. <https://doi.org/10.1097/01.ALC.0000071923.78618.5B>
- Penton-Voak IS, Thomas J, Gage SH et al (2013) Increasing recognition of happiness in ambiguous facial expressions reduces anger and aggressive behavior. *Psychol Sci* 24:688–697. <https://doi.org/10.1177/0956797612459657>
- Petit G, Luminet O, Maurage F et al (2015) Emotion regulation in alcohol dependence. *Alcohol Clin Exp Res* 39:2471–2479. <https://doi.org/10.1111/acer.12914>
- Philippot P, Kornreich C, Blairy S et al (1999) Alcoholics' deficits in the decoding of emotional facial expression. *Alcohol Clin Exp Res* 23:1031–1038. <https://doi.org/10.1111/j.1530-0277.1999.tb04221.x>
- Puhalla AA, Berman ME, Coccaro EF et al (2020) History of childhood abuse and alcohol use disorder: relationship with intermittent explosive disorder and intoxicated aggression frequency. *J Psychiatr Res* 125:38–44. <https://doi.org/10.1016/j.jpsychores.2020.02.025>
- Quoilin C, Wilhelm E, Maurage P et al (2018) Deficient inhibition in alcohol-dependence: Let's consider the role of the motor system! *Neuropsychopharmacology* 43:1851–1858. <https://doi.org/10.1038/s41386-018-0074-0>
- Ridderinkhof KR, Ullsperger M, Crone EA, Nieuwenhuis S (2004) The role of the medial frontal cortex in cognitive control. *Science* 306:443–447. <https://doi.org/10.1126/science.1100301>
- Robinson EAR, Brower KJ, Gombert ESL (2001) Explaining unexpected gender differences in hostility among persons seeking treatment for substance use disorders. *J Stud Alcohol* 62: 667–674. <https://doi.org/10.15288/jsa.2001.62.667>

- Rubio-Garay F, Carrasco MA, Amor PJ (2016) Aggression, anger and hostility: evaluation of moral disengagement as a mediational process. *Scand J Psychol* 57:129–135. <https://doi.org/10.1111/sjop.12270>
- Schonwetter DJ, Janisse MP (1991) Alcohol consumption, anger and hostility: a link to coronary heart disease. *Pers Individ Dif* 12:1049–1055. [https://doi.org/10.1016/0191-8869\(91\)90034-9](https://doi.org/10.1016/0191-8869(91)90034-9)
- Schuckit MA, Daepfen JB, Tipp JE et al (1998) The clinical course of alcohol-related problems in alcohol dependent and nonalcohol dependent drinking women and men. *J Stud Alcohol* 59: 581–590. <https://doi.org/10.15288/jsa.1998.59.581>
- Sharma MK, Suman LN, Murthy P, Marimuthu P (2011) State-trait anger and quality of life among alcohol users. *Ger J Psychiatry* 14:60–65
- Sheehan BE, Linden-Carmichael AN, Lau-Barraco C (2016) Caffeinated and non-caffeinated alcohol use and indirect aggression: the impact of self-regulation. *Addict Behav* 58:53–59. <https://doi.org/10.1016/j.addbeh.2016.02.002>
- Shima C, Lee R, Coccaro EF (2022) Associations of aggression and use of caffeine, alcohol and nicotine in healthy and aggressive individuals. *J Psychiatr Res* 146:21–27. <https://doi.org/10.1016/j.jpsychires.2021.10.015>
- Skara S, Pokhrel P, Weiner MD et al (2008) Physical and relational aggression as predictors of drug use: gender differences among high school students. *Addict Behav* 33:1507–1515. <https://doi.org/10.1016/j.addbeh.2008.05.014>
- Smith PH, Homish GG, Leonard KE, Cornelius JR (2012) Intimate partner violence and specific substance use disorders: findings from the national epidemiologic survey on alcohol and related conditions. *Psychol Addict Behav* 26:236–245. <https://doi.org/10.1037/a0024855>
- Spielberger CD, Reheiser EC (2010) International handbook of anger. *Int Handb Anger* 403–412. <https://doi.org/10.1007/978-0-387-89676-2>
- Sprague J, Verona E, Kalkhoff W, Kilmer A (2011) Moderators and mediators of the stress-aggression relationship: executive function and state anger. *Emotion* 11:61–73. <https://doi.org/10.1037/a0021788>
- Stasiewicz PR, Bradizza CM, Schlauch RC et al (2013) Affect regulation training (ART) for alcohol use disorders: development of a novel intervention for negative affect drinkers. *J Subst Abuse Treat* 45:433–443. <https://doi.org/10.1016/j.jsat.2013.05.012>
- Tharp AT, Schumacher JA, Samper RE et al (2013) Relative importance of emotional dysregulation, hostility, and impulsiveness in predicting intimate partner violence perpetrated by men in alcohol treatment. *Psychol Women Q* 37:51–60. <https://doi.org/10.1177/0361684312461138>
- Thompson RA (1994) Emotion regulation: a theme in search of definition author. *Monogr Soc Res Child Dev* 59:25–52
- Tivis LJ, Parsons OA, Nixon SJ (1998) Anger in an inpatient treatment sample of chronic alcoholics. *Alcohol Clin Exp Res* 22:902–907. <https://doi.org/10.1111/j.1530-0277.1998.tb03887.x>
- Tomlinson MF, Brown M, Hoaken PNS (2016) Recreational drug use and human aggressive behavior: a comprehensive review since 2003. *Aggress Violent Behav* 27:9–29. <https://doi.org/10.1016/j.avb.2016.02.004>
- Walitzer KS, Deffenbacher JL, Shyhalla K (2015) Alcohol-adapted anger management treatment: a randomized controlled trial of an innovative therapy for alcohol dependence. *J Subst Abuse Treat* 59:83–93. <https://doi.org/10.1016/j.jsat.2015.08.003>
- Weiner MD, Pentz MA, Turner GE, Dwyer JH (2001) From early to late adolescence: alcohol use and anger relationships. *J Adolesc Health* 28:450–457. [https://doi.org/10.1016/S1054-139X\(01\)00200-2](https://doi.org/10.1016/S1054-139X(01)00200-2)
- Wells S, Graham K, West P (2000) Alcohol-related aggression in the general population. *J Stud Alcohol* 61:626–632. <https://doi.org/10.15288/jsa.2000.61.626>
- Wells S, Graham K, Speechley M, Koval JJ (2005) Drinking patterns, drinking contexts and alcohol-related aggression among late adolescent and young adult drinkers. *Addiction* 100: 933–944. <https://doi.org/10.1111/j.1360-0443.2005.001121.x>

- White HR, Hansell S (1996) The moderating effects of gender and hostility on the alcohol-aggression relationship. *J Res Crime Delinq* 33(4):450–470. <https://doi.org/10.1177/0022427896033004004>
- Whiting D, Lichtenstein P, Fazel S (2021) Violence and mental disorders: a structured review of associations by individual diagnoses, risk factors, and risk assessment. *Lancet Psychiatry* 8: 150–161. [https://doi.org/10.1016/S2215-0366\(20\)30262-5](https://doi.org/10.1016/S2215-0366(20)30262-5)
- WHO (2018) Global status report on alcohol and health 2018. World Health Organization, Geneva
- Wilkowski BM, Robinson MD (2008) The cognitive basis of trait anger and reactive aggression: an integrative analysis. *Personal Soc Psychol Rev* 12:3–21. <https://doi.org/10.1177/1088868307309874>
- Wilkowski BM, Robinson MD, Meier BP (2006) Agreeableness and the prolonged spatial processing of antisocial and prosocial information. *J Res Pers* 40:1152–1168. <https://doi.org/10.1016/j.jrp.2005.12.004>
- Witkiewitz K, Villarroel NA (2009) Dynamic association between negative affect and alcohol lapses following alcohol treatment. *J Consult Clin Psychol* 77:633–644. <https://doi.org/10.1037/a0015647>
- Zhong S, Yu R, Fazel S (2020) Drug use disorders and violence IT SC. *J Drug Issues*. In press
- Zihler S, Čebašek Travník Z, Kores Plesničar B et al (2007) Trait aggression and hostility in recovered alcoholics. *Eur Addict Res* 13:89–93. <https://doi.org/10.1159/000097938>
- Zimmermann K, Walz C, Derckx RT et al (2017) Emotion regulation deficits in regular marijuana users. *Hum Brain Mapp* 38:4270–4279. <https://doi.org/10.1002/hbm.23671>