

Evidence-Based Interventions for Improved Psychosocial Outcomes in Harmful Alcohol Use: A Scoping Review

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Abstract

Background. Harmful alcohol use is defined as a drinking pattern that lasts at least one month or has occurred often during the preceding 12 months and that negatively impacts multiple facets of life. It has a high recurrence rate and a poor prognosis, despite the availability of cognitive-behavioral and psychosocial therapy. Emerging neuromodulation techniques for treating harmful alcohol use are gaining traction in the field of psychotherapy, but knowing their efficacy in terms of psychosocial outcomes necessitates an adjuvant approach. This scoping review aims to investigate the existing evidence on the effectiveness of various psychosocial interventions that improve quality of life (QoL) dimensions in conjunction with neurotherapies for individuals with harmful alcohol use. **Methods.** The review utilized a five-stage technique to search for research papers from 2000 to 2022. After screening and reviewing 41 full-text papers, 29 were found to meet the inclusion criteria. **Conclusion.** The articles highlighted the advantages of integrated therapeutic interventions such as motivation enhancement therapy, cognitive behavior therapy, neurotherapy, multimodal therapy, supportive therapy, and 12-step facilitation programs. However, limited studies have explored the effectiveness of combining neurotherapy with psychosocial interventions. **Implications.** Future research should focus on the efficacy of combining neurofeedback with psychosocial therapies to improve QoL for individuals with harmful alcohol use.

Keywords: quality of life (QoL); psychosocial outcomes; harmful alcohol use; EEG neurofeedback; psychosocial intervention

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Background

Harmful alcohol consumption is a global mental health concern, as it has a wide range of negative life consequences in the physical, psychological, social, and environmental domains (Ugochukwu et al., 2013). There are 3 million annual deaths attributed to alcohol consumption, and several cases of disability and illness. The negative effects of alcohol consumption account for 5.1% of the global disease burden (World Health Organization [WHO], 2018).

Many unfavorable outcomes have been associated with alcohol usage beginning in adolescence (Adger & Saha, 2013) or early adulthood (Englund et al., 2018). Risky drinking habits are categorized as psychosocial phenomena in the biopsychosocial

framework (Gopiram & Kishore, 2014) and its intake is known as a typical stress-reduction coping strategy. In young adults harmful alcohol use has been traced back to early life or chronic exposure to psychosocial stresses (supported by “sensitivity to the effects of alcohol” or negative affectivity paradigm). It was found to be associated with negative life consequences, such as deterioration in physical health, intrapersonal, interpersonal (peers, family), social, difficulties at work or school, spiritual, and legal issues (Dhananjay & Prabhuswami, 2022; Foster, Peters, et al., 2000; Linskiy et al., 2022; Luk et al., 2022), and psychological impairment contributing to poor quality of life (QoL; Shiji et al., 2020). Research studies revealed that these psychosocial risk factors might intensify unhealthy drinking patterns, which can have a range of detrimental psychological and physical

repercussions, including the ability to exacerbate the effects of stress (Anthenelli & Grandison, 2012). A high stress threshold, along with a propensity for alcohol misuse, has been shown in the literature to alleviate the risk of retorting to addictive behavior (for more, see the stress coping model; Wagner et al., 1999).

Yet another study found that life stress influences treatment outcomes and relapse rates in substance addiction (Brady & Stone, 1999; Sinha, 2008). Even after accounting for other factors like income, socioeconomic status, comorbidities, marital status, and place of residence, it was still found to be independently associated with a lower QoL score (Callaghan & Tottenham, 2016). This could be because alcoholics believe they have little to no control over their drinking when faced with adversity. Stress cues and cognitive priming have been consistently linked to relapse. Advocates of a harm reduction approach recognize that while abstinence is the ideal outcome, not every individual is able to achieve it. For some individuals, controlled drinking may be a more realistic goal for reducing the risks associated with alcohol use. Research studies suggest that a small but significant proportion of patients may be able to resume normal or controlled drinking (Armor et al., 1976; Polich et al., 1980). However, this remains a controversial area that requires further evidence-based intervention research.

Numerous psychosocial interventions have been employed to treat harmful alcohol use either in conjunction with pharmacotherapy or as a standalone treatment. The most commonly utilized interventions include motivational interviewing (MI; Miller & Rose, 2009), cognitive behavioral therapy (CBT), screening and brief interventions (SBI), 12-step facilitation programs, cue exposure treatment, social network therapy, and multimodal therapy. Research has demonstrated that individuals who undergo detoxification and treatment without alcohol are more susceptible to relapse (Foster, Marshall, et al., 2000).

However, there is evidence to suggest that the effectiveness of many psychosocial interventions has been overestimated and that their limitations have been overlooked. Furthermore, the results of these interventions are difficult to generalize (McCambridge & Saitz, 2017).

The review seeks to comprehensively analyze and fill the gaps in research on various evidence-based practices used in conjunction with adjuvant

therapies. This will involve considering factors such as therapeutic duration or intensity (brief or extended), setting (primary care-based or inpatient), mode of delivery (group, individual, or web-based), and treatment goals (abstinence-oriented or harm reduction) in enhancing different domains of QoL (as defined by The Whoqol Group, 1998) for individuals exhibiting harmful alcohol use behavior.

Methods

With the use of a systematic search, a scoping review was conducted. Scoping reviews have been increasingly popular in the last few years, especially in the area of health care research (Daudt et al., 2013). This is because a systematic review is a suitable method to employ in fields with either inadequate prior research or where the results and conclusions of the most recent studies appear to be contradictory to one another. First, this scoping review examines the scope, depth, and nature of published research on different evidence-based psychosocial and allied interventions in the domain of alcohol use. The review does not necessarily assess study quality. Second, study gaps were identified and communicating the research findings in some specific domain was prioritized. Knowledge gaps in the Discussion section may prompt further research. Since there is limited knowledge summary on integrated intervention and effectiveness of psychosocial outcomes in conjunction to adjuvant therapeutic, this form of wide mapping is suited for enabling an overview of the knowledge status in this domain.

Articles using the terms “quality of life,” “psychosocial intervention,” “alcohol use,” “harmful alcohol use,” “integrated intervention,” and “EEG Neurofeedback” were searched in PUBMED, SCOPUS, Google Scholar, Science Direct, Proquest, the ETOH archival database of the National Institute on Alcohol Abuse and Alcoholism, EBSCO, and MEDLINE from 2000 to 2020, to define the psychosocial interventions used for people with harmful alcohol use who have been diagnosed with or are undergoing treatment using a variety of tools thought to be reflected in patients' QoL outcomes. Based on the results of this search, it appears that there is a lack of research on psychosocial intervention in conjunction to neurotherapy (integrated intervention). In order to create a more complete literature map, it was decided that papers presenting psychosocial outcome from several angles (standalone or adjuvant interventions) would be included. Statistically significant relationships with QoL domains such as physical, psychological,

interpersonal, intrapersonal, social (i.e., at the 95% confidence level) were also extracted. The review followed the five-stage methodological framework created by Arksey and O'Malley (2005), which was guided by the strategy for conducting systematic scoping reviews by Levac et al. (2010).

Identifying Research Question

This scoping study was driven by the following question:

What is known from the literature about the use of evidence-based interventions in relation to improved psychosocial outcomes in harmful alcohol use?

Identifying Relevant Studies

Following the initial search in PUBMED, SCOPUS, the ETOH archive database of the National Institute on Alcohol Abuse and Alcoholism, EBSCO, and MEDLINE, with the most recent searches conducted on March 11, 2020, no time constraints were imposed. The search approach incorporated context (harmful alcohol use, alcohol use disorder) and concept specifications (psychosocial outcome, QoL, psychosocial intervention; Peters et al., 2015). A more precise identification of the search phrases was then made. Combinations of the terms "alcohol use disorder," "substance use," and "harmful alcohol use" were used in reference to a person's psychosocial outcome. Psychosocial intervention were the major themes of the overarching idea term.

Study Selection

Inclusion Criteria. Full-length, original, quantitative, qualitative case study research papers that have been peer-reviewed were considered. The research papers were found through a manual search of key references and references known by coauthors. For this reason, we did not include study protocols or conference papers whose findings had not been published in peer-reviewed journals, even if they were relevant to our overarching goal of summarizing the current state of knowledge. Moreover, papers given in languages other than English were not considered due to time and resource constraints. Non-peer-reviewed empirical publications and studies were also eliminated.

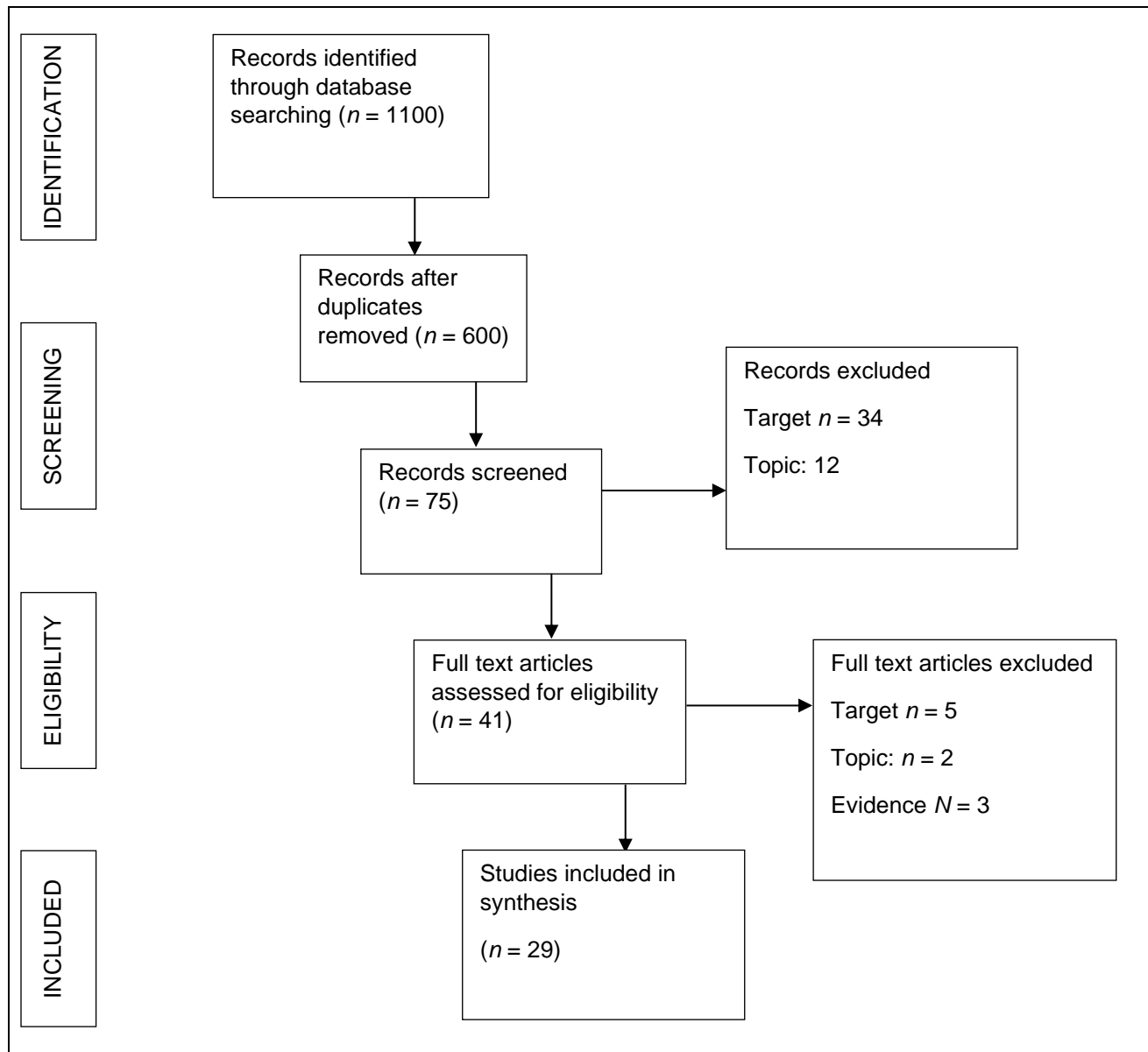
Participants. Everyone who met the criteria was taken into account, including people who had been

previously diagnosed with an alcohol use disorder. Psychosocial therapies with QoL and psychosocial outcome studies completed on a subset of the population were included in the literature mapping.

Concept. The best way to define psychosocial interventions is as "psychologically-based interventions aimed at reducing habitual alcohol consumption behavior or alcohol-related problems" (Kaner et al., 2018). Evidence-based psychosocial interventions reportedly used in conjunction to pharmacological and allied treatments have been discussed below. The primary concept discussed in the review was the psychosocial outcome, which refers to an individual's perception of their physical, psychological, social, intrapersonal, interpersonal, and environmental aspects of life. Studies that only focused on the relationship between alcohol use and comorbidities were excluded.

Context. All of these studies had one thing in common: alcohol use disorder. The studies' settings varied from clinical to nonclinical, but all of them measured patients' psychosocial outcomes.

Search Strategy. There was a total of 1,100 records found after applying the search method across all four databases. Data was transferred to EndNoteX8 from other sources. Four entries were found using other methods like a manual search of key references and input from coauthors. After eliminating duplicates, we had 600 records from which to select the titles and abstracts to review. Each author screened records individually, comparing titles and abstracts to the inclusion criteria, and settled on 75 abstracts screened and 41 papers reviewed as potentially relevant studies to do a full-text screening on. Twelve of the full-text articles that were checked had to be disqualified with reasons given. Most of these studies weren't included because their subjects didn't accurately represent the target population (those with alcohol use disorder and with comorbidities). This was also true for the qualitative case study articles that were not included, the majority of which had an emphasis on intangible indicators of subjective well-being or life satisfaction. The inclusion of articles that deviated too much from the psychological domains was restricted. Twenty-nine papers were included in the final analysis (Figure 1).

Figure 1. Flowchart of the Evidence Selection Process.

Charting the Data. The three main stages of qualitative content analysis were employed by the authors to carry out their research on how evidence-based interventions enhanced psychosocial outcomes in harmful alcohol use: data collecting, data organization, and data presentation (Elo & Kyngäs, 2008). A tool for working with structured data was employed for this purpose. Further study characteristics were gathered by the authors, reviewed, and then incorporated into the consensus. As this constituted a scoping review, each study was not evaluated for its quality (e.g., risks of bias or study strength; Arksey & O'Malley, 2005). The

review's screening process is depicted in the flow chart (Figure 1), illustrating the number of studies at each stage and the reasons for their exclusion. This methodical approach helps uphold transparency and rigor in the review process by systematically organizing and categorizing the issues arising from the research results included in the evaluation.

Collating, Summarizing, and Reporting the Results. Publication dates were used to categorize the studies. Research articles from the same year were divided into sections based on the surnames of their original authors. Several interventions have

been devised to improve different psychosocial domains of functioning in relation to harmful alcohol use. Various psychosocial interventions have been developed to ameliorate the harmful effects of alcohol consumption. Outcomes related to complementary treatments used such as CBT including relapse prevention (RP), contingency management (CM), CBT/psychoeducation MI/motivation enhancement therapy (MET), SBI, 12-step facilitation programs, social network therapy, and EEG neurofeedback are obtained and discussed below.

Psychoeducation and Brief Motivational Interview. It has been found that the combination of psychoeducation and brief MI is more effective in reducing alcohol intake than psychoeducation alone. Studies conducted by Hulse and Trait (2002) and Kraemer et al. (2002) have shown significant improvements in the physical domain as a result of this approach. Additionally, MI has been found to produce neural changes in various areas of the brain, including the central, postcentral, and superior temporal gyrus, as well as the orbitofrontal cortex (OFC), nucleus accumbens, insula, caudate, and putamen, which impact gustatory cue reactivity in patients with alcohol use disorder (Feldstein Ewing et al., 2011).

Broad-Spectrum Treatment, 12-Step Facilitation Program, and MET. The combined use of broad-spectrum treatment, a 12-step facilitation program, and MET has demonstrated greater efficacy in treating individuals with alcohol use disorder when integrated with pharmacotherapy. The broad-spectrum treatment strategy, which is encompassed by cognitive behavior coping skill therapy, emphasizes various aspects of life that are linked to relapse and drinking (Davidson et al., 2007). This approach involves identifying the triggers of negative emotions that may lead to increased drinking. Other forms of cognitive behavior coping skill therapy, such as the community network approach or behavioral self-control training, as well as relaxation training, including neurofeedback, can also be employed. Research has shown that neurofeedback intervention, particularly through deep relaxation training, can enhance mentalization capacity by strengthening connections in the default mode network (Imperatori et al., 2017). Studies have also suggested that stress can exacerbate alcohol use and potentially lead to relapse, as evidenced by impaired function in the hypothalamic-pituitary-adrenal (HPA) axis during the initial 6 months of abstinence (Burtscheidt et al., 2001; Dunne & Ivers, 2023). Therefore, further investigation of

neurofeedback as an adjunct therapy alongside the aforementioned treatments is warranted.

MET and Social Behavior and Social Network Therapy (SBNT). The relationship between alcohol consumption and treatment for alcohol-related issues can be moderated by the presence of a social network, as per the findings of Mowbray (2013). The research indicates that MET and social behavior and social network therapy (SBNT), which are measured by the social network index, can lead to a reduction in alcohol intake and an improvement in mental health conditions over a period of 12 months (UKATT Research Team, 2005). Furthermore, studies have revealed that dysregulation in the salience network during resting state can adversely affect social, inhibitory, and emotional processing, with activation in the bilateral anterior insula playing a role in the response to alcohol cues (Padula et al., 2011).

CBT and 12-Step Facilitation Program. The integration of CBT and a 12-step facilitation program has been found to be significantly efficacious, as it targets negative affect, dysfunctional behavior, and maladaptive cognitions while simultaneously instilling adaptive cognitive processes (Easton et al., 2007).

CBT, MI, Supportive Therapy. A cognitive-behavioral MI approach, accompanied by guided self-change and both social and natural support, has demonstrated positive results in altering the drinking behavior of individuals with alcohol addiction (Sobell et al., 2000). The integration of CBT, supportive therapy, and psychoeducation has shown favorable outcomes in both physical and interpersonal domains (Addolorato et al., 2013). Numerous studies have reported altered activation in the prefrontal cortex and other limbic regions following integrated behavior therapy (Devito et al., 2012) and CBT (Yuan et al., 2022).

Discussion

Research concentrating on both psychosocial interventions in alcohol consumption and psychosocial consequences is becoming more popular, as evidenced by the fact that most of the studies included in the scoping review were done after 2000 and were from a wide range of western countries. There were two case study designs. When analyzing outcomes based on a pre-post test design, which is often based on randomized control trials, most research employed well-established clinical and psychosocial tools and methodologies.

However, since these tools are based on a range of psychological dimensions and the interventions are aimed at enhancing a specific element of the outcome, results cannot be consistently compared between research. Numerous research papers also employed diverse comparison groups in clinical contexts and a range of study designs, such as a one-group posttest-only design or an experimental and control group design, indicating a variability among studies.

Alcohol Dependence Scale (ADS; Skinner & Horn, 1984), Inventory of Drinking Situations (IDS; Annis et al., 1982), Michigan Alcoholism Screening Test (Selzer, 1971), Structured Clinical Interview SCID for DSM-III-R (Spitzer et al., 1992), and Addiction Severity Index (McLellan et al., 1992) were the instruments utilized as screening measures. Two further widely utilized measures for evaluating drinking patterns were the Timeline Followback Scale (TLFB; Sobell et al., 1996) for alcohol intake and the Drinker Inventory of Consequences (DrInC; Miller et al., 1995).

Baseline assessments, pretests, and posttests employed psychosocial measures, such as the Short Form 36-item (SF-36; Hays et al., 1993) for the physical domain, the Health Survey, the Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001), and the model of end-stage liver disease (MELD) scores (Kamath et al., 2001).

The Mini-Mental State Examination (MMSE; Folstein et al., 1975), Hopkins Verbal Learning Test (Brandt, 1991), Trail Making Test (Partington & Leiter, 1949), Letter-Number Sequencing Test from the Wechsler Memory Scale-III (Wechsler, 1997), Mentalization Questionnaire (MZQ; Hausberg et al., 2012), Barrat Impulsivity Scale (BIS-11; Patton et al., 1995), and Thought Control Ability Questionnaire (Wells & Davies, 1994) were the main tools used to assess the cognitive and psychological domain.

The interpersonal domain evaluation consists of the family environment scale, work functioning, family functioning (Family Evaluation Device; Epstein et al., 1984), and spouse partner functioning (Dyadic Adjustment Scale; Spanier, 1976). The Alcohol Abstinence Self-Efficacy Scale (AASE; DiClemente et al., 1994), Treatment Self-Regulation Questionnaire (Ryan & Connell, 1989), MMPI-2, The Inventory of Clinical Personality Accentuation (Andresen, 2006), the NEO-Five-Factor Inventory (Costa & McCrae, 2008), and the Coping Strategies Scale (CSS; Folkman & Lazarus, 1980) were used to assess intrapersonal domains. The Readiness to

Change Questionnaire (RTCQ; Rollnick et al., 1992) was used to measure motivation for change based on the Transtheoretical Stages Change Approach (Prochaska et al., 2004).

Psychosocial Interventions and Adjuvant Therapy Outcomes

Alcohol consumption has been found to be significantly predicted by drinking motives. Likewise, changes in behavior related to alcohol consumption can be predicted by the level of readiness to change (RTC). Ambivalence towards alcohol misuse, for example, may influence commencement and hence an individual's motivational construct (Moustafa et al., 2023). Subjective standards may aid in the reduction of evaluative tension (Priester & Petty, 2001; subjective norms may influence behavioral intention and future behavior in which ambivalence moderate the relationship between subjective norms and behavioral intentions). Individuals with ambivalent opinions would feel more evaluative tension, pushing them to act on relevant groups' subjective criteria (Hohman et al., 2014). In the absence of particular information, people seek advice (Festinger, 1954; Suls & Wheeler, 2008). One method which can facilitate awareness is psychoeducation. Resistance to change is a symptom of ambivalence toward change, not an inherent trait. Confrontational tactics in therapy raise resistance and tension. A nonjudgmental and sympathetic approach is required to determine the client transformation action stage (Miller & Rose, 2015). The scoping review also facilitates researchers to focus on understanding, if intrinsic motivation in the action stage of change predicts improved QoL in alcohol misuse. Through psychoeducation on how to reorganize their social networks to be more conducive to abstinence and less conducive to drinking, network support therapy has been shown to be successful in strengthening the motivational construct (Litt et al., 2016). Therefore, network support therapy, psychoeducation, and motivational enhancement techniques may be helpful adjuvant or complementary treatment modalities in subsequent studies.

Intervention should focus on improving other domains (such as spiritual domain through mindful meditation techniques in conjunction to neurotherapy; Ghosh et al., 2014), facilitating abstinence or instilling social, behavioral, and cognitive skills and should establish a holistic approach to treatment module and follow-up care. To date, only physical and mental health outcomes have been carefully explored, while relatively little is

known about other critical areas of functioning such as sociocultural outcomes (Basheer et al., 2015; Sudhinaraset et al., 2015).

The inability to deal with stress and alcohol stimuli contributes to the continuation of excessive drinking and a relapse into drinking after unsuccessful attempts to quit (Becker, 2008). In addition, CBT includes the utilization of coping skills training to target and improve cognitive and behavioral coping deficiencies (McHugh et al., 2010). Prior studies reviewed above mostly found that both CBT and alternative treatment were equally effective in increasing alcohol-specific coping consistent with prior findings (Jones et al., 1982; McHugh et al., 2010; Monti et al., 1993). Other studies have reported similar findings comparing CBT and 12-step therapy (Carrol et al., 1999; Finney et al., 1998, 2007; Wells et al., 1994).

Research on the efficacy of CBT as a standalone treatment for alcohol dependence has mixed results, with low to moderate efficacy in some cases. Negative findings may be due to methodological flaws or sample population limitations (Hofmann et al., 2012; Powers et al., 2008). Assessing literacy levels is crucial for effective CBT self-help booklet (CBT-SHB) interventions. Studies have consistently reported that coping measures are associated with relapse. An alternative explanation could be that the inability to cope does not reflect a lack of behavioral repertoire, but a lack of motivation to engage in healthy behavior. To improve the methodological rigor of studies on the effects of CBT, four areas must be addressed: measures, treatment, design, and populations. There is a need to improve strategies for measuring CBT mediators. For example, future studies should test treatments that are based on functional analysis of individual patients and are long enough to ensure adequacy of coping skills.

Interpersonal and 12-step programs were shown to purportedly improve avoidance methods as well as stronger interpersonal skills facilitating social support and prevent relapse (Donovan et al., 2013; Easton et al., 2007; Finney et al., 1998; Getter et al., 1992; Kelly et al., 2020). The behavioral skills necessary to manage unpleasant feelings and other drinking-related triggers are not improved by these methods. Since alcoholics typically have a poor perception of their QoL, those who use avoidance as a coping mechanism are more likely to experience stress from emotions of guilt, failure, and discontentment. People often lack social judgment, are impulsive, struggle to deal with change and interpersonal

issues, lack planning insight, and have poor long-term psychological adjustment because they are oblivious of their problems (Karlsson et al., 2021).

Modulating brain rhythmic activity is yet another area of investigation by scientists and medical professionals as a possible treatment for alcoholism-related alterations in brain electrophysiology (Fielenbach et al., 2018; Jurado-Barba et al., 2020; Porjesz & Begleiter, 2003; Rangaswamy et al., 2002, 2003; Zhang et al., 2023). Treatment possibilities aimed at regulating brain activity, as explored by Vukadinovic et al. (2024), Dalkner et al. (2017), and Cox et al. (2016) hold potential in altering experiences and behaviors associated with alcohol-related concerns. By combining CBT-facilitated mind-training with neurofeedback techniques (Chiu et al., 2024, including stress management (via the Peniston-Kulkosky alpha-theta protocol) or cognitive enhancement training (using the Scott-Kaiser Modification Beta-SMR), a balanced integration of biological, psychological, and social dimensions in addressing the disorder may be achieved. Ros et al. (2014) found that this approach enhances long-term brain plasticity, enabling intentional control over brain oscillations. Employing these techniques collectively could potentially enhance memory, focus, emotional control, stress-coping skills and self-regulation (Ko & Park, 2018).

Consistency management for drug use and combined psychosocial treatments (e.g., CBT + cue exposure) for alcohol use have been shown to have the maximum treatment results in treatment trials in case of male patients (Monti et al., 1993). When comparing different CBT or RP strategies, there was some indication that CM approaches had more evidence-based support (Rawson et al., 2002). Meeting short-term objectives for abstinence was possible with the majority of evidence-based therapies.

Behavioral couple therapy (BCT) is a specialized approach planned to address issues with alcohol use, resulting in notable decreases in alcohol intake and enhancements in conjugal prosperity. (Epstein & McCrady, 1998). BCT as a standalone treatment, without CBT, was linked to a high rate of treatment retention (Stanton & Shadish, 1997). This may be because the patient's desired support network and home environment were successfully included into the treatment plan.

By conducting this scoping review, we filled in a potential area of future research on QoL and its importance to even consider preventive measures in

nonclinical populations by employing an adjuvant approach to psychotherapy.

Preventative measures, education on the importance of self-monitoring, and access to counselling services are key to enhancing psychosocial aspects for those with hazardous alcohol use outside of a clinical context.

Harmful alcohol use is classified not only by observable drinking patterns, but also by the user's emotional, physical, spiritual, social, and behavioral responses to its effects. These effects span numerous areas that could be carefully investigated in the future by means of a comprehensive assessment of the psychosocial domains (Dutra et al., 2008). Hence, the evaluation of QoL can serve as both an evaluation and a diagnostic tool, with each purpose employing a unique set of outcome characteristics to identify modifications in pattern of behavior (such as gagging motivation as an outcome measure in different stages of change, attitude change, knowledge of consequences, self-efficacy, perceived social support).

Conclusion

Based on the findings and discussion, it was determined that individuals with harmful alcohol use have poor coping mechanisms and experience detrimental psychological effects. In addition, there is a decreased motivation to sustain the behavioral modifications that lead to sobriety and a higher likelihood of relapse. The underlying evidence on combined psychotherapeutic techniques intended to achieve short-term treatment goals are reported in this review paper. In order to achieve long-term objectives, it is recommended that future study consider potential synergistic effects and make use of research findings regarding the most effective combinations of psychotherapy. Furthermore, the understanding of the methodological foundations of neurofeedback and its potential behavioral benefits in both experimental and clinical settings, particularly when used in conjunction with psychoeducation (PE), motivational enhancement therapy (MET), and other relevant psychotherapeutic approaches, remains limited. It is highly advised to incorporate neurofeedback training into comprehensive alcohol treatment plans in future studies. To support individual's assimilation of the changes derived from neurofeedback training, this approach involves introducing them to neurofeedback, elucidating the arousal model, conducting assessments, and closely overseeing and adjusting protocols.

Strength and Limitations

Comprehensive search criteria were used, and a substantial number of relevant studies were found. In a methodical and thorough manner, the authors screened the titles and abstracts. The authors took extra precautions to prevent the loss of significant studies by screening the full texts of publications, as well as using reference lists and holding discussion meetings. Unfortunately, some potentially important records may have been missing since studies published in languages other than English were not included. There were nine databases used in the search, thus it is likely that more were missed. However, experienced academic librarians provided guidance on the databases to use and the search terms to use in order to get the widest possible coverage of the population, concept, and context.

Author Disclosure

The authors affirm that there are no conflicts of interest regarding the research, authorship, and publication of this article. Furthermore, there are no financial interests or benefits associated with this research.

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