The Application of Acceptance and Commitment Therapy (ACT) in Substance Use Disorder (SUD): A Scoping Review

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June 2021

Contents

Abstract

Background: Substance Use Disorder (SUD) is one of the most prevalent psychological disorders worldwide, with a prevalence of up to 7% in the general population. Additionally, most individuals diagnosed with SUD display mental health comorbidities such as depression, anxiety or substance-induced psychosis. Therefore, effective treatment of SUD is of great importance at societal, economic and medical levels. Treatment as Usual (TAU) for SUD focuses on treating SUD exclusively while disregarding comorbidities to a large part. Also, relapses are very common after completing TAU for SUD, so that several cycles of treatment are required. An alternative to TAU could be the transdiagnostic approach of Acceptance and Commitment Therapy (ACT) which is considered a positive psychological "third-wave" therapy. *Objectives:* The general aim of this scoping review was to elaborate on whether ACT is an effective approach in SUD treatment. Further aims were comparing the effectiveness of ACT versus TAU and Cognitive Behavioural Therapy (CBT) in treating SUD, exploring the mechanisms tackled by ACT in the treatment of SUD, and determining short- and long-term effectiveness and limitations of the ACT approach in the treatment of SUD. *Method:* An exhaustive literature search of Web of Science, Scopus and PubMed was conducted. 11 studies on the effectiveness of ACT in SUD treatment were identified and reviewed in this paper. *Results:* It was found that ACT is an effective treatment approach for SUD. Further, ACT is at least equally effective as TAU and CBT when treating SUD, while ACT seems more effective than CBT over the long term. ACT is a transdiagnostic approach, thus, the mechanisms tackled by ACT do not only alleviate symptoms of SUD but are also effective in treating comorbidities such as Posttraumatic Stress Disorder (PTSD) and depression. A limitation of ACT is that individual variables such as gender might influence its effectiveness. *Conclusions:* ACT is a promising approach for the treatment of SUD. Because of its transdiagnostic stance, it can be effectively applied to various psychological disorders, including but not limited to SUD. ACT also seems to be effective over the long term, but additional research is needed to clarify preliminary evidence. Future research is required to explore variables that might influence the effectiveness of ACT in the treatment of SUD and to validate findings on the long-term effects of ACT in SUD treatment.

Keywords: Acceptance and Commitment Therapy, Substance Use Disorder, drug abuse, adults, effectiveness, transdiagnostic, scoping review

The Application of Acceptance and Commitment Therapy (ACT) in Substance Use Disorder (SUD): A Scoping Review

This scoping review concerns the application of Acceptance and Commitment Therapy (ACT) in the treatment of Substance Use Disorder (SUD). SUD is among the most prevalent mental disorders, with approximately two of five young adults meeting the criteria for at least one SUD (Arterberry et al., 2020). Overall, the prevalence of substance use disorder worldwide is estimated at up to 7%, and that between 2008 and 2012, 9.5% of full-time workers aged 18-65 years met the criteria for SUD in the past year (Bush & Lipari, 2016; Rehm & Shield, 2019). According to the National Institute in Drug Abuse (NIDA, 2019), SUD is associated with severe short- and long-term consequences such as physical health problems including wakefulness, loss of appetite, stroke, hepatitis or even death (NIDA, 2019) and causes problems in various areas of life, such as occupational, social or interpersonal conflicts (Grant et al., 2017; NIDA, 2019). Also, individuals with SUD mostly display comorbidities such as depression, anxiety or substance-induced psychosis, which complicates successful treatment of the disorder (Burdzovic Andreas et al., 2015). Consequently, SUD poses a challenge at societal, economic and medical levels.

SUD refers to the problematic consumption of substances such as alcohol, hallucinogens (e.g. Lysergic acid diethylamide (LSD)), inhalants (e.g. certain types of glue), opioids (e.g. heroin), sedatives, hypnotics, or anxiolytics (e.g. benzodiazepines), stimulants (e.g. cocaine), tobacco, or caffeine. According to the *Diagnostic and Statistical Manual of Mental Disorders [*5th ed., DSM-5, American Psychiatric Association, (APA)], the diagnosis of SUD encompasses several psychological and physiological symptoms and can range from mild to severe, depending on the severity of the SUD condition (APA, 2013). Whereas mild SUD, also called drug abuse, is indicated by the presence of two to three of the eleven symptoms, moderate SUD (moderate drug dependence) requires four to five symptoms for the diagnosis and the presence of more than six symptoms over the last year indicates severe SUD (severe drug dependence) (Compton et al., 2013). The pathology of SUD includes cognitive and behavioural as well as physiological symptoms: the development of *tolerance* to the substance and consequently needing more of the substance to reach the same effects; *craving* for the substance; repeated attempts to *control* or quit use; *withdrawal symptoms* (e.g. nausea, headaches, loss of appetite, restlessness or irritability) when stopping use; neglect of activities and major roles; psychological and/ or physiological problems as a consequence of use such as depression, anxiety, liver damage or lung cancer; hazardous use of the substance (e.g. driving while intoxicated); social or interpersonal problems related to use (e.g. conflicts

because of use); the use of larger amounts and longer than intended; and spending a significant amount of time on substance use (APA, 2013). There are several neural and cognitive mechanisms presumed to underlie the development and maintenance of SUD. On the one hand, neurophysiological processes linked to dopamine function, and other neurotransmitters, related to the *reward system* seem to be altered in patients with SUD (Houston & Schlienz, 2018). The reward system, which is a complex circuit of brain cells that releases the feeling of pleasure and encourages humans to repeat whatever brought the joy, likely gets impaired by substance consumption (Nestler & Malenka, 2004). On the other hand, cognitive mechanisms such as attentional biases and impaired impulse inhibition seem strongly related to SUD. (Houston & Schlienz, 2018; Verdejo-Garcia, 2016). Additionally, cultural, familiar influences and values are presumed to either protect or enhance an individual's substance use. If a person compasses values that strongly contradict substance use, the individual will be less likely to consume substances and vice versa (Thomas, 2013).

SUD treatment is complex, and currently applied methods for treating SUD are mainly focused on treating SUD exclusively while disregarding comorbidities to a large part. Further, relapse rates are high and successful treatment frequently requires several treatment cycles. An alternative treatment approach, which displays promising preliminary results, is Acceptance and Commitment Therapy (ACT), a transdiagnostic approach emerging from the so-called “third-wave” therapies. The present review intends to delineate and synthesize the main findings concerning ACT in SUD treatment to provide an overview of its general effectiveness in treating SUD, its limitations, and short- and long-term effects to guide future research.

Treatment of Substance Use Disorder

The treatment of SUD mainly consists of a combination of pharmacotherapy, behavioural methods, psychoeducation, and relapse prevention (RP) (Butler & Le Foll, 2019; NIDA, 2019). SUD treatment is particularly challenging as there is a high relapse rate and mental health comorbidities (Aas et al., 2021; NIDA, 2019). Consequently, many patients require several treatment cycles to maintain abstinence (Hser et al., 2007; Scott et al., 2005). The NIDA (2019) proposes some basic principles for effective treatment, among others: the treatment must be flexible and tailored to each individual; people need to have quick access to treatment; effective treatment addresses all of the patient’s needs, not just their drug use; staying in treatment long enough is crucial; treatment should address other possible mental disorders (NIDA, 2019). According to Santa Ana et al. (2008), treatment as usual (TAU) for

SUD most commonly includes individual treatment, group therapy and psychoeducation. Typical components are assessing and monitoring substance use, functioning in different areas of life, reviewing and discussing symptoms associated with SUD and reflective listening. Other standard practices include case management, psychoeducation, self-help (group) interventions, discussion of risk behaviours or psychodynamic interventions. Generally, TAU for SUD is mostly abstinence-driven. While SUD treatment is frequently based on a traditional 12-step facilitation model, most hospitalized treatment programs use Cognitive Behavioural Therapy (CBT) (Santa Ana et al., 2008; Shorey et al., 2017).

Cognitive Behavioural Therapy in the Treatment of Substance Use Disorder

One of the most frequently used approaches in treating SUD is CBT, which is based on the assumption that maladaptive cognitive processes contribute to the development and maintenance of behavioural problems. Thus, it aims at altering these maladaptive cognitions to change and reduce problematic behaviours (Hofmann et al., 2012). In SUD treatment, CBT aims to help patients modify their relationship to drugs or other substances, increase healthy lifestyles and medication adherence (NIDA, 2019). However, CBT has proven to produce limited long-term effects regarding RP, for instance, regarding abstinence maintenance in alcohol use disorder (AUD) (Campbell et al., 2018). In addition, the duration of psychosocial interventions often varies and must take into account numerous individual factors such as age or social environment to reach sustainable therapeutic outcomes, which seems to be problematic in currently used treatment approaches (Bricker et al., 2014; Campbell et al., 2018; Lanza et al., 2014).

Because of the outlined difficulties in the treatment of SUD, new treatment approaches are constantly being researched. One of which is Acceptance and Commitment Therapy (ACT) which has been developed in the context of the increasingly emerging “third-wave therapies” (Ehman & Gross, 2019; Najafi & Arab, 2020; Svanberg et al., 2017).

Acceptance and Commitment Therapy in the Treatment of Substance Use Disorder

ACT uses a contextual, positive psychological approach and aims at increasing psychological flexibility and mindfulness (Hayes et al., 2006). It involves six core processes: acceptance, cognitive defusion, being present, self as context, values, and committed action. ACT is a transdiagnostic approach that does not aim to treat one particular disorder but is applicable to a wide range of presenting issues and various contexts (Dindo et al., 2017; Hayes et al., 2006). Furthermore, its principles enable the development and implementation of

internet- and smartphone-based applications (apps) (Ly et al., 2012). Like that, treatment becomes more accessible to a greater number of people and might decrease inhibitions or barriers to seeking treatment (Boschen & Casey, 2008).

Generally, ACT aims at altering stimulus functions, namely the effect a stimulus has on a subsequent response, to allow an individual to live according to their values despite feared consequences or emotions, memories, bodily states or behavioural predispositions that are presumed to be unacceptable, by decreasing avoidance strategies and increasing psychological flexibility (Lanza et al., 2014). Thus, in the treatment of SUD, ACT aims at accepting unpleasant thoughts and urges to consume a substance or unpleasant experiences caused by abstinence of the substance (e.g. withdrawal) instead of suppressing them. Regarding the possibility that substance consumption resulting in SUD might be driven by experiential avoidance combined with the numbing effects of substance consumption, ACT seems a promising approach in SUD treatment (Wilson & Byrd, 2004). Furthermore, ACT aims at enhancing personal values and living according to them. Research has shown that specific values such as family unity, support and interdependence can act as protective factors against substance use (Telzer et al., 2014). Possibly, ACT might, therefore, also be effective in alleviating SUD by strengthening such defensive values which contradict substance use and enhancing the will to live according to them.

Many of the available ACT interventions for SUD are based on 12-step facilitation programs, which are brief interventions that include 12 steps individuals with addictions should achieve during the recovery process (Donovan et al., 2013; Nowinski, 2000). The 12-step philosophy assumes that addictions can be controlled but never eliminated. Thus, the focus of those interventions is enhancing individual maturity, minimizing self-centeredness, promoting spiritual growth, and providing help and support to other individuals with addictions (Donovan et al., 2013). Because of its promising effects for recovery, several ACT interventions have adopted the 12-step program to set process goals for each intervention session (Nowinski, 2000).

Moreover, ACT interventions are increasingly delivered via smartphone apps. Although there are not many studies available up to this point in time, delivering ACT interventions via apps seems promising in enhancing therapy effects (Levin et al., 2017; Torous et al., 2017). Smartphone apps convey low-intensity, high-frequency interventions. Thus, the interventions are flexibly available anytime and anywhere, causing more frequent engagement with the interventions, which seems to increase the effectiveness of ACT

interventions (Levin et al., 2019). As ACT interventions are process- rather than outcome-oriented, more regular engagement with the ACT components might enhance the learning process and therapy effects (Levin et al., 2017; Torous et al., 2017). Additionally, developers can easily tailor interventions to the individual user by using smartphone apps, which provides another potential advantage for increasing their effectiveness (Levin et al., 2017). Previous research has demonstrated promising impact produced by smartphone-delivered ACT interventions, and they might be a prosperous future-oriented addition to traditional ACT interventions.

Furthermore, ACT is frequently combined with other third-wave therapeutic approaches such as mindfulness-based relapse prevention (MBRP) or mindfulness-based stress reduction (MBSR). Those approaches build on formal practices such as sitting meditation to foster a non-judgmental experience of the present moment (Bowen et al., 2014). Mindfulness-based approaches have proven effectiveness in the treatment of SUD and were found to reduce the consumption of several substances such as alcohol, cannabis, amphetamines and opiates (Chiesa & Serretti, 2014). Thus, as mindfulness-based approaches and ACT share many commonalities, they can be combined in SUD treatment (Shorey et al., 2017).

So far, research on ACT in the context of addictive behaviours suggests that it is equally effective or superior to traditional CBT (Hernández-López et al., 2009; Twohig & Crosby, 2010). However, there is also contradicting evidence for the superiority of ACT in treating SUD (Byrne et al., 2019). As third-wave therapies are continuously developing, the methods are not as extensively researched as second-wave methods such as CBT. The application of positive psychological methods in addictive disorders awakes the interest of researchers, but their key findings are not being reviewed and aligned in a structured way until now. An overview of existing studies and results is necessary to guide future research in the field. Thus, the current systematic review aims to explore the effectiveness of ACT in the treatment of SUD. The general objective of this review is to examine the use of ACT in the treatment of SUD and provide a comprehensive synthesis of studies targeting this topic. Secondary objectives are to determine the underlying mechanisms of SUD addressed by using ACT, evaluate the short- and long-term effects of ACT in the treatment of SUD, explore whether the approach of ACT is more effective in treating SUD than CBT and TAU, and what limitations ACT poses in the treatment of SUD. To address the objectives of this scoping review, the following research questions (RQ) are formulated:

RQ_1: “To what extent is ACT effective in the treatment of individuals diagnosed with SUD?”.

RQ_2: “To what extent do ACT, CBT and TAU differ in effectiveness when treating individuals diagnosed with SUD?”

RQ_3: “What are the mechanisms addressed by ACT in the treatment of SUD?”

RQ_4: “What are the short-term effects of ACT in the treatment of SUD?”

RQ_5: “What are the long-term effects of ACT in the treatment of SUD?”

RQ_6: “What are the limitations of the ACT approach when applied in the treatment of SUD?”.

Method

For this literature review, an exhaustive literature search of *Scopus, Web of Science,* and *PubMed* was conducted. *Google Scholar* was used for additional research. Search terms related to the concepts of ACT and SUD were created and combined using the Boolean operators “AND” and “OR” (Table 1). At first, a broad search was conducted. Further, the snowballing system was used to find more specific and potentially relevant articles. Finally, the reference lists of previously retrieved articles were screened, and additional articles on the topic were identified.

Table 1

Search Strategies

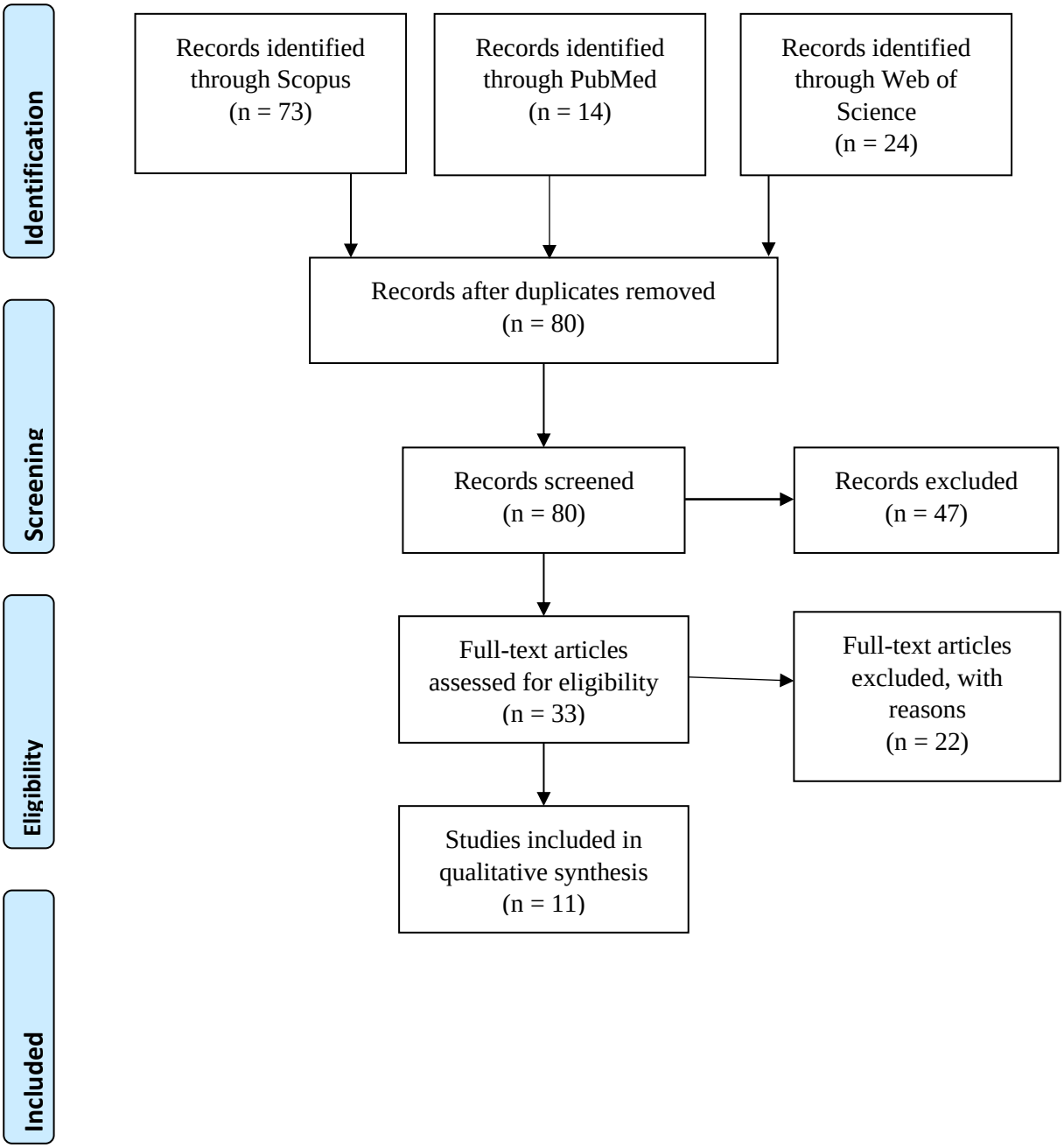
Scopus	("acceptance and commitment therapy" AND ("alcohol abuse" OR "substance use disorder" OR SUD OR "drug addiction" OR "drug dependence" OR "nicotine use"))
Web of Science	("acceptance and commitment therapy" AND ("alcohol abuse" OR "substance use disorder" OR SUD OR "drug addiction" OR "drug dependence" OR "nicotine use"))
PubMed	("acceptance and commitment therapy" AND ("alcohol abuse" OR "substance use disorder" OR SUD OR "drug addiction" OR "drug dependence" OR "nicotine use"))

The inclusion criteria were 1) studies using ACT as a psychological intervention, 2) studies applying ACT specifically in SUD and 3) studies were reported in English. The initial search delivered 111 articles. After thoroughly screening the titles and abstracts, 47 articles were excluded as they did not meet the inclusion criteria or were duplicates. 33 papers were

thoroughly screened for eligibility resulting in 11 relevant studies for further assessment (Figure 1). Of those, all met the inclusion criteria and were included in the present review.

Figure 1

PRISMA Flow Diagram (Moher et al., 2009)



Results

Table 2

Summary of studies on ACT in the treatment of SUD

Study (by date)	Aims	Sample (age, standard deviation)	Instruments	Procedure	Results
Heffner et al. (2003)	Case-study to evaluate ACT for alcohol dependence.	N = 1 (middle-aged)	Structured Clinical Interview for DSM-V, Values Assessment Narrative, Outcome Questionnaire	The patient completed 21 ACT-based therapy sessions comprised in 15 weekly outpatient visits and 6 follow-up visits.	The patient reached nearly 100% sobriety at 9 months follow-up, and his affect improved significantly.
Petersen and Zettle (2009)	Comparing the effectiveness of ACT and TAU in treating inpatients with comorbid depression and alcohol use disorder.	TAU: N = 12 (38.9, 7.8) ACT: N = 12 (36.7, 11.5)	Hamilton Rating Scale (HRS), Beck Depression Inventory – Second Edition (BDI-II), Acceptance And Action Questionnaire (AAQ), Alcohol Timeline Followback Interview (Alcohol TFLB), Problems Assessment for Substance-Using Psychiatric Patients (PASUPP)	Participants were randomly assigned to a treatment condition. All participants were prescribed antidepressant medication. All participants attended at least 5 hours of group therapy per week and nightly Alcoholics Anonymous meetings. Psychoeducation was provided. One condition received sessions with the approach the counsellor found appropriate (TAU). The other group received ACT sessions.	ACT demonstrated efficacy in treating both depression and substance abuse. Participants in the ACT condition met the discharge criteria sooner than TAU participants. ACT was not more effective than TAU in reducing depression and substance use, but ACT participants required significantly less time to be discharged.

ACT: Acceptance and Commitment Therapy

CBT: Cognitive Behavioural Therapy

TAU: Treatment as usual

MBSR: Mindfulness-Based Stress Reduction

MBRP: Mindfulness-Based Relapse Prevention

Table 2 *(Continued)*

Study (by date)	Aims	Sample (age, standard deviation)	Instruments	Procedure	Results
Smout et al. (2010)	Comparing ACT and CBT in the treatment of methamphetamine use disorder.	N = 104 (30.9, 6.5)	Semi-structured interview, hair analysis, Leeds Dependence Questionnaire (LDQ), Beck Depression Inventory (BDI-II)	Participants were randomly assigned to the study conditions. Participants in both conditions received 12 weekly 60-minutes sessions of either ACT or CBT.	ACT was not more effective in treating methamphetamine use disorder than CBT. Only in the CBT condition, participants reported significant improvement in subjectively assessed methamphetamine use. ACT did not produce superior outcomes at follow-up.
Bricker et al. (2014)	Evaluating phone-delivered ACT compared to CBT for smoking cessation.	N = 121	Depression scale of Anxiety and Depression Detector (ADD), Heaviness Smoking Index, nine-item subscale of Avoidance and Inflexibility Scale (AIS)	Participants were assigned to receiving either an ACT or CBT based phone-delivered intervention using an automated algorithm. Both interventions were delivered as a five-session counselling protocol. First calls were 30 minutes, and subsequent calls were 15 minutes.	Among all subgroups, quit rates were higher for ACT participants compared to CBT. At 3-month follow-up, ACT participants reported significantly higher rates of acceptance of cravings to smoke than CBT participants.
González-Menéndez et al. (2014)	Testing the efficacy of ACT compared to CBT in the treatment of drug abuse.	N = 37 (33.59, 7.5)	Semi-structured interview, Addiction Severity Index-6 (ADI-6), Anxiety Sensitivity Index (ASI), Acceptance and Action Questionnaire-II (AAQ-II), Mini International Neuropsychiatric Interview (MINI), Multidrug Urinalysis (UA)	Participants were randomly assigned to one of the two conditions. Both conditions received 16 weekly group sessions à 90 minutes following a protocol developed for substance use disorder.	Both ACT and CBT led to significant increases in abstinence rates. At 19-month post-treatment, ACT showed significantly greater results demonstrating the long-term effectiveness of ACT.
Heffner et al. (2015)	Examining the most effective and most used features of an ACT-based smoking cessation smartphone app.	N = 76 (41.8, 11.9)	Log-in records, follow-up survey	Participants were asked to download the SmartQuit" app and use it over the 8-week treatment period. For better adherence, daily reminders were sent to the participants.	The most frequently used features of the app were based on CBT. However, several ACT features were associated with successful quitting.

ACT: Acceptance and Commitment Therapy

CBT: Cognitive Behavioural Therapy

TAU: Treatment as usual

MBSR: Mindfulness-Based Stress Reduction

MBRP: Mindfulness-Based Relapse Prevention

Table 2 *(Continued)*

Study (by date)	Aims	Sample (age, standard deviation)	Instruments	Procedure	Results
Shorey et al. (2017)	Evaluating a 4-week, eight-session, adjunctive mindfulness and acceptance group therapy for patients in residential substance use treatment.	N = 117 (41.27, 10.68)	Treatment components checklist (TCC), Penn Alcohol Craving Scale (PACS), Five Facet Mindfulness Questionnaire (FFMQ), Acceptance and Action Questionnaire substance abuse (AAQ-SA)	Participants were randomly assigned to study conditions based on a computerized algorithm. TAU consisted of 28-30 days residential substance use treatment primarily based on the traditional 12-step model. Participants in the Mindfulness and Acceptance condition received eight twice-weekly 1.5-hour group sessions based on MBSR, MBRP and ACT.	Participants in the mindfulness and acceptance-based condition reported lower drug cravings and higher psychological flexibility related to substance use. However, the differences between conditions were not significant.
Svanberg et al. (2017)	Explore the effectiveness of a manual-based ACT intervention for inpatients institutionalized for severe SUD and describe the effects on mental health, executive functioning, and psychological flexibility.	N = 18 (-)	Depression, Anxiety and Stress Scale-21 (DASS-21), Acceptance and Action Questionnaire-II (AAQ-II), Behavior Rating Inventory of Executive Functioning – Adult Version (BRIEF-A)	Participants received an intervention based on the six core processes of ACT. The manual included seven 90-minute sessions over a 3-week period. The training included daily mindfulness practice.	The majority of participants did not report significant changes in mental health. 12 participants reported improvement in psychological flexibility. Concerning executive functioning, 8 participants reported a positive tendency, 10 reported no significant difference, and two reported negative change.
Meyer et al. (2018)	Explore the effectiveness of the transdiagnostic approach of ACT for treating co-occurring SUD and PTSD.	N = 43 (-)	Mini-International Neuropsychiatric Interview (MINI), CAPS-5, Life Event Checklist, PTSD checklist for DSM-5 (PCL-5), Structured Clinical Interview for Dsm-5 (SCID-5), AUDIT, Drug Abuse Screening Test (DAST), Patient Health Questionnaire (PHQ-9), World Health Organisation Disability Assessment Schedule (WHODAS 2.0), WHO Quality of Life-Brief (WHOQOL-BREF), Acceptance and Action Questionnaire-II, Brief Experiential Avoidance Questionnaire, Treatment Credibility and Expectancy Questionnaire	Participants received a 12-step Acceptance and Commitment Therapy for Posttraumatic Stress Disorder and Alcohol Use Disorder Treatment Manual. Sessions consisted of 12 approximately weekly individual outpatient meetings and included the core aspects of ACT.	Participants reported significant reductions in PTSD symptoms, substantial reductions in all alcohol-related outcomes and reductions in functional disability became significant at follow-up. A majority of participants reported a decrease in depressive symptoms and suicidal ideation. Furthermore, participants reported significant improvements in quality of life.

ACT: Acceptance and Commitment Therapy

CBT: Cognitive Behavioural Therapy

TAU: Treatment as usual

MBSR: Mindfulness-Based Stress Reduction

MBRP: Mindfulness-Based Relapse Prevention

Table 2 *(Continued)*

Study (by date)	Aims	Sample (age, standard deviation)	Instruments	Procedure	Results
Ehman and Gross (2019)	Evaluating the use of ACT paired with Motivational Interviewing (MI) in treating alcohol use disorder.	N = 1 (20)	Mini-International Neuropsychiatric Interview (MINI), Depression Anxiety and Stress Scale (DASS-21), Beck Depression Inventory-II (BDI-II), Beck Anxiety Inventory (BAI), Outcome Questionnaire (OQ-45.2)	The participant received 10 60-minute sessions of individual therapy for 3 months.	ACT was found effective for treating alcohol use disorder in this case study. The client displayed improvements in distress, depression, problematic episodes of binge drinking and behavioural changes. Increased psychological flexibility and adherence to values were demonstrated.
Najafi and Arab (2020)	Evaluate the effectiveness of ACT on psychological resilience in hospitalized drug abuser women.	N = 30 (29.74, 14.95)	Connor-Davidson Resilience Scale (CD-RISC)	Participants were randomly assigned to the ACT or control condition. Those in the ACT condition received an eight-step intervention.	Participants who received ACT displayed improvements in resilience.

ACT: Acceptance and Commitment Therapy

CBT: Cognitive Behavioural Therapy

TAU: Treatment as usual

MBSR: Mindfulness-Based Stress Reduction

MBRP: Mindfulness-Based Relapse Prevention

A total of 11 studies met the inclusion criteria. These studies are reported in Table 2. All included studies used ACT protocols or elements of ACT in the treatment of individuals diagnosed with SUD.

Objectives of the studies

All studies included 1) ACT protocols or specific aspects of ACT and 2) had the objective to evaluate its effectiveness in treating SUD or 3) examine the effects of ACT on other psychological variables related to the development and maintenance of SUD.

Acceptance and Commitment Therapy

Two studies were pilot studies and used a within-subject design to examine the effectiveness of ACT in the treatment of SUD (Meyer et al., 2018; Svanberg et al., 2017). The intervention of Meyer et al. (2018) aimed at reducing symptoms of SUD and co-occurring Post Traumatic Stress Disorder (PTSD) by decreasing functional disability and depressive symptoms and increasing quality of life, while Svanberg et al. (2017) aimed at improving participants' mental health by increasing psychological flexibility and improving executive functioning.

Acceptance and Commitment Therapy versus Cognitive Behavioural Therapy

Four studies directly compared the effectiveness of an ACT intervention to CBT interventions (Bricker et al., 2014; González-Menéndez et al., 2014; Heffner et al., 2015; Smout et al., 2010). Thereby, the studies of Bricker et al. (2014) and Heffner et al. (2015) aimed at smoking cessation and the ultimate aim of the interventions was total abstinence. Furthermore, Heffner et al. (2015) investigated the relation between skills practice and abstinence. The interventions of Smout et al. (2010) and González-Menéndez et al. (2014) aimed at reducing drug abuse and related harms and symptoms and increasing treatment attendance while the ultimate goal was substance abstinence. Furthermore, González-Menéndez et al. (2014) investigated the long-term effectiveness of ACT for SUD by examining abstinence rates and symptom reduction at follow-up.

Acceptance and Commitment Therapy versus Treatment as Usual

Three studies compared the effectiveness of ACT to TAU (Najafi & Arab, 2020; Petersen & Zettle, 2009; Shorey et al., 2017). All three studies had the aim of reducing substance consumption and thereby alleviating the symptoms of SUD. However, the interventions aimed at different core processes. Shorey et al. (2017) aimed at reducing

substance use cravings by increasing psychological flexibility and dispositional mindfulness, whereas Najafi and Arab (2020) wanted to increase psychological resilience and Petersen and Zettle (2009) aimed at reducing experiential avoidance to reduce symptoms of SUD and co-occurring depression.

Case Studies

Two additional studies were case studies which aimed at reducing the participants' substance consumption with the ultimate goal of sobriety by defining value-related goals and implementing behaviours to reach those goals, teaching coping skills to reduce craving and consumption, and increasing psychological flexibility (Ehman & Gross, 2019; Heffner et al., 2003).

Samples and diagnoses

A total sample of 568 participants was included in the studies. The age range was 16 to 65 years. All participants were diagnosed with SUD. Of those, 54 displayed polydrug abuse, such as alcohol and cocaine or heroin and tobacco. 197 participants showed tobacco use disorder, 140 participants were diagnosed with alcohol use disorder, and 108 displayed stimulant use disorder (e.g. methamphetamine). Two participants were diagnosed with cannabis use disorder, and one participant showed hallucinogen use disorder and sedative/hypnotic or anxiolytic use disorder, respectively. Further, 47 participants were diagnosed with various SUD (e.g. stimulant use disorder (cocaine), opioid use disorder (e.g. heroin) and other illegal drug misuses). The remaining 18 participants were diagnosed with severe SUD (e.g. alcohol use disorder and various illegal drug misuse). In addition, 43 participants were veterans with SUD, and comorbid PTSD and 24 were diagnosed with SUD and comorbid depression. A number of 190 participants took part in the studies during residential treatment.

Interventions

Target Constructs

All studies incorporated either pre-existing ACT interventions or modified or developed their own intervention based on the six core processes underlying ACT. Five interventions were primarily focused on the six core processes of ACT, such as increasing psychological flexibility and thereby decreasing cravings, decreasing experiential avoidance and accepting unpleasant situations, and teaching ACT-based coping strategies to alleviate suffering from SUD (Ehman & Gross, 2019; Heffner et al., 2003; Petersen & Zettle, 2009;

Shorey et al., 2017; Svanberg et al., 2017). Five other interventions aimed to alleviate SUD symptoms, minimise substance consumption, or achieve complete abstinence from the substance (Bricker et al., 2014; González-Menéndez et al., 2014; Heffner et al., 2015; Meyer et al., 2018; Smout et al., 2010). In addition, one intervention targeted the construct of mindfulness to reduce substance consumption by combining the ACT approach with MBSR and MBRP (Shorey et al., 2017). The eleventh intervention mainly focused on increasing psychological resilience in participants, thereby alleviating SUD (Najafi & Arab, 2020).

Group versus individual interventions

The interventions were delivered with different approaches. Thus, Shorey et al. (2017), Svanberg et al. (2017), and González-Menéndez et al. (2014) offered groups sessions, whereas the remaining eight interventions were delivered individually (Bricker et al., 2014; Ehman & Gross, 2019; Heffner et al., 2015; Heffner et al., 2003; Meyer et al., 2018; Najafi & Arab, 2020; Petersen & Zettle, 2009; Smout et al., 2010).

Inpatient versus outpatient treatment

The setting in which the interventions were delivered varied across studies. Five studies were conducted with inpatients of residential or hospitalized treatment (González-Menéndez et al., 2014; Najafi & Arab, 2020; Petersen & Zettle, 2009; Shorey et al., 2017; Svanberg et al., 2017), while the other six studies were conducted in an outpatient setting (Bricker et al., 2014; Ehman & Gross, 2019; Heffner et al., 2015; Heffner et al., 2003; Meyer et al., 2018; Smout et al., 2010).

Number of sessions

Another factor that varied across studies was the number of ACT sessions delivered to the participants. Bricker et al. (2014) conducted the smallest number of sessions and offered five-session via telephone, which lasted 15 to 30 minutes. Svanberg et al. (2017) conducted seven ACT sessions á 90-minutes for three weeks. The interventions by Najafi and Arab (2020) and Shorey et al. (2017) consisted of eight ACT sessions delivered in regular intervals. In the case study by Ehman and Gross (2019), the participant took part in ten 60-minute ACT sessions over three months. Another two studies were based on the 12-step ACT intervention, therefore including twelve individual ACT sessions (Meyer et al., 2018; Smout et al., 2010). The interventions conducted by González-Menéndez et al. (2014) and Heffner et al. (2003) were delivered for 16 and 21 sessions respectively. Regarding the study of Petersen and Zettle (2009), no fixed number of sessions was determined before the intervention. Participants

received regular ACT sessions until they met the criteria for being discharged. In the last study, the intervention was delivered via a smartphone app. Thus, no fixed number of sessions could be determined, but participants were asked and reminded to use the app every day over eight weeks (Heffner et al., 2015).

Longitudinal versus short-term data

Ten of the eleven studies reported short-term data, ranging from post-intervention to 6-months follow-up, while only the study conducted by González-Menéndez et al. (2014) investigated longitudinal data up to 18-month follow-up.

Technological Application

A last considerable difference between the individual studies was the use of technological applications. Whereas nine of the eleven studies did not use any specific technical applications in their setup, Heffner et al. (2015) and Bricker et al. (2014) based their studies upon those. Bricker et al. (2014) used the telephone to deliver their interventions. Thus, traditional face-to-face ACT concepts were transferred to make the intervention more flexible, and participants were independent regarding their current location. Similarly, the intervention by Heffner et al. (2015) was delivered via a smartphone app. Like that, participants were even more independent as the intervention could be accessed anytime and anywhere without any local or timely dependence. Furthermore, it could be investigated which features of the app were mostly used and associated with abstinence.

Research Results

Case Studies

In their case study, Heffner et al. (2003) found evidence for the effectiveness of ACT. A significant improvement in SUD could be observed. Within the first two weeks of the intervention, the participant's sobriety rate increased from 0% to 60% and peaked at 100% by week ten of the intervention, maintained at 9-months follow-up (Heffner et al., 2003). In the other case study by Ehman and Gross (2019), similar but less significant improvements could be observed. After ten sessions of the ACT intervention, the participant reported reduced distress and lower scores on depression. Before the intervention, the participant scored in the moderate range of the Beck Depression Inventory (BDI-2), whereas she scored in the mild range after the intervention. Anxiety scores remained in the normal range before and after the intervention. Furthermore, after the intervention, the participant displayed increased psychological flexibility, determined her values and increasingly acted according to them

(Ehman & Gross, 2019). Post-intervention, she reported fewer heavy drinking days and stayed sober for one week, which was not conceivable before the intervention, and she displayed increased acceptance of therapy (Ehman & Gross, 2019).

Pilot Studies within-subjects

The most considerable changes were observed in the study by Meyer et al. (2018), who found that participants receiving ACT displayed significant reductions on all alcohol-related aspects, including the quantity and frequency of consumption, no longer engaging in activities that were previously enjoyed, drinking despite occupational or personal problems caused by alcohol, or withdrawal symptoms. Before the intervention, 86.2% met the criteria for severe SUD, while post-intervention, only 17.2% met the criteria for severe SUD within the past month, representing a significant reduction (Meyer et al., 2018). At follow-up, significant declines in suicidal ideation and functional disability and significant increases in quality of life could be observed (Meyer et al., 2018). Furthermore, a large, significant reduction in PTSD symptoms remained significant at 3 months follow-up. In the study by Svanberg et al. (2017), the results were not as clear. Most participants reported no significant change in mental health after the intervention. However, a trend towards improvement became visible. 12 participants (67%) displayed increased psychological flexibility over time, whereas four maintained status quo and two showed a decrease. Furthermore, an increase in behavioural regulation and inhibition, especially within the dimension of self-monitoring, could be observed (Svanberg et al., 2017). 31% of participants implied an increase in psychological flexibility and executive functioning after receiving the three-week intervention, 57% remained status quo, and 12% reported a negative change (Svanberg et al., 2017).

Acceptance and Commitment Therapy versus Treatment as Usual

The studies comparing the effect of ACT to TAU did not find significant differences concerning effectiveness. Petersen and Zettle (2009) found that participants in the different treatment groups displayed an equivalent impact on mental health. However, ACT participants only required 68% of treatment length compared to the TAU group to meet discharge criteria, representing a significantly shorter individual treatment phase (3.1 hours vs 4.3 hours) (Petersen & Zettle, 2009). Furthermore, only participants receiving ACT treatment reported a significant increase in psychological flexibility (Petersen & Zettle, 2009). The other study comparing ACT to TAU did not find significant differences in effectiveness for the primary outcomes. Post-intervention, both groups displayed no significantly different

results on any variable of interest and thus similar improvements (Shorey et al., 2017). However, the ACT group displayed slightly lower drug cravings and higher psychological flexibility than the TAU group. Furthermore, participants who received ACT reported increased perceived importance of the group treatment (Shorey et al., 2017). A further study found that ACT had a significant effect on psychological resilience in women diagnosed with SUD, but the results remained similar to the TAU control group. Post-intervention, the participants displayed significant increases in interpersonal competence, negative affective tolerance and spiritual effects (Najafi & Arab, 2020).

Acceptance and Commitment Therapy versus Cognitive Behavioural Therapy

Another four studies compared the effectiveness of ACT interventions to CBT interventions. The study examining the effectiveness of an ACT-based app for smoking cessation found mixed evidence (Heffner et al., 2015). ACT components did not increase adherence and were less frequently used than CBT components of the app. However, even if only half of the participants regularly used the ACT components, ACT-based exercises were the most predictive components for quitting with a significant effect, and additional ACT components were predictive for cessation at a trend level. In contrast, the most popular CBT-based features predicted a lower likelihood of drug cessation (Heffner et al., 2015). The overall abstinence rate was 13%, which indicates the general effectiveness of the ACT-based app for smoking cessation (Heffner et al., 2015).

The study by Bricker et al. (2014) showed more effectiveness of the ACT intervention compared to CBT. First, ACT participants completed significantly more calls than those in the CBT condition (36% vs 13%), while more compliance to treatment predicted a higher success of abstinence at 6-months follow-up for the ACT group. Also, those in the ACT condition were more satisfied with the treatment overall (Bricker et al., 2014). Differences in the general abstinence rates and those of the subgroups of smokers with comorbid depression and heavy smokers were not significant (31% ACT vs 22% CBT; 33% ACT vs 13% CBT; 36% ACT vs 17% CBT). However, the difference in effectiveness for the subgroup which, pre-treatment, reported a low acceptance of cravings was significant (37% ACT vs 10% CBT) (Bricker et al., 2014). Generally, participants from the ACT group reported significantly higher acceptance of cravings after receiving the treatment than the CBT group, resulting in a 4.6 times higher likelihood of abstinence at 6-months follow-up (Bricker et al., 2014).

Smout et al. (2010), on the other hand, found that there was no significant difference in effectiveness between an ACT and a CBT treatment condition. Both groups displayed

significant decreases in drug use, drug dependence and negative consequences, but no significant between-group difference could be observed. Moreover, there was no significant difference in treatment attendance between the two groups (Smout et al., 2010). A significant improvement in SUD obtained by an objective measure, namely a hair sample, was only present in participants from the CBT condition, while the ACT group merely displayed a trend towards improvement on this variable (Smout et al., 2010).

A fourth study comparing ACT to CBT was conducted by González-Menéndez et al. (2014), who mainly focused on the long-term outcomes. Both interventions were effective in treating SUD. At the start of the intervention, 77.8% of participants met the criteria for SUD, which decreased to 42.9% at 6-month follow-up and 21.4% at 18-month follow-up (González-Menéndez et al., 2014). However, improvements in the ACT group were significantly greater than in the CBT group. Accordingly, the abstinence rates of participants diagnosed with SUD changed as follows during the study 1) post-intervention 27.8% for the ACT group and 15.8% for the CBT, 2) at 6-month follow-up 42.8% for the ACT group and 25% for the CBT group, 3) at 12-month follow-up 84.6% for the ACT group and 54.4% for the CBT group and 4) at 18-month follow-up 85.7% for the ACT group and 50% for the CBT group. Those results implied that ACT was more effective in the long term than CBT (González-Menéndez et al., 2014). Moreover, participants in the ACT group were more compliant with treatment than those in the CBT group (66.7% vs 47.4%). In line with that, levels of acceptance increased only in participants in the ACT group. Additionally, ACT produced significantly greater changes on the ASI-6 subscales drug, psychological and family, whereas CBT produced greater changes on the subscales somatic and cognitive (González-Menéndez et al., 2014).

Mechanisms addressed by Acceptance and Commitment Therapy

All eleven studies reported tackling similar mechanisms by the use of ACT, namely increasing the acceptance of cravings and accompanying unpleasant emotions caused by abstinence of the substance, exploring values and promoting behaviours in line with those values despite the urge of consuming a substance and thereby increasing distress tolerance, mindfulness and cognitive defusion to consciously observe, accept and be aware of thoughts instead of suppressing them, and improving executive functioning (Bricker et al., 2014; González-Menéndez et al., 2014; Heffner et al., 2015; Heffner et al., 2003; Meyer et al., 2018; Najafi & Arab, 2020; Petersen & Zettle, 2009; Shorey et al., 2017; Smout et al., 2010; Svanberg et al., 2017). Thus, in the present studies, ACT was used to change the participants'

relation to their thoughts and inner experiences, which should help them distance themselves from a previously consumed substance instead of giving in to urges and impulses. The treatments were process- rather than outcome-driven and enhanced commitment by evoking personal values and building self-compassion as an alternative response to slipping and craving (Bricker et al., 2014; Heffner et al., 2015; Heffner et al., 2003; Svanberg et al., 2017).

Short- versus long-term effects of Acceptance and Commitment Therapy

González-Menéndez et al. (2014) investigated the effectiveness of ACT in the treatment of SUD over 18 months and found promising evidence for the long-term effectiveness of ACT for this target group. From post-intervention to 6-months follow-up, the abstinence rate of participants increased from 27.8% to 42.8%. From 6-month follow-up to 12-month follow-up, the abstinence rate further increased to 84.6% and reached its peak at 18-month follow-up with an abstinence rate of 85.7%, implying that in the treatment of SUD, ACT becomes more effective over time (González-Menéndez et al., 2014). Furthermore, the measures on ASI-6 also improved for 18-months follow-up, indicating that the long-term effectiveness is also given for comorbid conditions. Also, the two case studies provided promising positive tendencies produced by ACT over the long term. Although the case studies give no statistical data, both describe increased abstinence and enhanced engagement in and acceptance of therapy several months after the ACT intervention (Ehman & Gross, 2019; Heffner et al., 2003). Altogether the studies implied that next to the short-term effects of ACT for SUD demonstrated by other studies (Bricker et al., 2014; Heffner et al., 2015; Heffner et al., 2003; Meyer et al., 2018; Najafi & Arab, 2020; Petersen & Zettle, 2009; Shorey et al., 2017; Svanberg et al., 2017), ACT also provides promising long-term effects in the treatment of SUD.

Limitations of Acceptance and Commitment Therapy

As opposed to the promising effects of ACT outlined in the presented studies, two studies mentioned a potentially imposing limitation of the ACT approach. First, Najafi and Arab (2020) found that gender was one of the main factors influencing the effectiveness of ACT treatment. Therefore, it was assumed that women benefit more from ACT interventions and accordingly display greater improvements (Najafi & Arab, 2020). Contrary, Heffner et al. (2015) reported that the male gender predicted the effect of ACT for smoking cessation and abstinence. Hence, it was assumed that men benefit more from the ACT-based smoking cessation app (Heffner et al., 2015).

Discussion

The main aim of this review was to determine whether ACT is effective in treating SUD. Further, it was explored whether ACT is more effective in treating SUD than CBT and TAU, which underlying mechanisms are tackled by ACT in the treatment of SUD, whether there are differences in the short- and long-term effectiveness of ACT in treating SUD and which limitations appear when applying ACT in the treatment of SUD. The studies included in this review provide significant preliminary evidence for the effectiveness of ACT in the treatment of SUD. Most importantly, ten of the eleven studies found that ACT produced significant improvements in SUD treatment. The eleventh study did not find significant improvements produced by the ACT intervention, but a trend towards improvement could be observed (Svanberg et al., 2017).

The underlying mechanisms tackled by the different interventions represent the transdiagnostic stance of ACT, as they were not explicitly modified or adapted to SUD. All studies of this review included at least some of the six core processes that build the ACT basis. The most prominently tackled processes of the present studies were acceptance of unpleasant emotions, being present, values and committed action with the ultimate aim of increasing psychological flexibility and decreasing experiential avoidance (Ehman & Gross, 2019; Heffner et al., 2003; Petersen & Zettle, 2009; Shorey et al., 2017; Svanberg et al., 2017). The intervention of Najafi and Arab (2020) aimed at increasing psychological resilience and thereby increasing psychological flexibility, and Heffner et al. (2015) included the concept of cognitive defusion. Those core processes are not SUD specific but are part of the development and maintenance of several psychological disorders such as depression, anxiety disorders, PTSD, and even physiological complaints such as migraine (Dindo et al., 2017; Hayes et al., 2006). ACT does not aim to alleviate the symptoms of a disorder itself but rather change an individual's relation to the condition, enhancing the development of personal values and the willingness to live according to them whilst decreasing experiential avoidance and accepting unpleasant emotions (Lanza et al., 2014). Individuals should invest less energy in suppressing unpleasant experiences and developing avoidance behaviours but rather designate more time and energy to activities they value, which in turn create positive experiences (Dindo et al., 2017; Hayes et al., 2006). According to ACT, the main problems of psychological dysfunctionality are tackled by the six core processes underlying ACT. Acceptance is implemented as an alternative to experiential avoidance. Instead of designating energy to unnecessary attempts to change the frequency and intensity of unpleasant experiences, individuals are encouraged to embrace those experiences. Thus, rather than

trying to suppress cravings, individuals should accept and embrace them. Cognitive defusion aims at modifying one's relationship to thoughts instead of altering their form or frequency. Instead of taking thoughts as the truth ("I have to consume XY"), individuals are encouraged to value their thoughts, view them as external observations, or label the process of thinking ("I am having the thought, that I must consume XY") (Hayes et al., 2006). Through being present, individuals are encouraged to experience the world around them more directly, enabling more flexible actions that are value-directed rather than automated processes. Another core process is self as context, which emphasises that people themselves are not the content of their thoughts, but rather act as an observer who can objectively observe experiences and take them for what there are instead of attempting to modify them (Dindo et al., 2017; Hayes et al., 2006).

The previously elaborated core processes build up and clear the path for choosing and developing values and life directions. Ultimately, ACT encourages committed action, namely implementing and changing one's behaviour according to the previously clarified values and directions (Hayes et al., 2006). All six core processes are interrelated and build upon each other so that implementing those changes represents a holistic change. The primary aim of ACT is living a meaningful life, including intimate relationships, meaningful work, and valued activities despite experiencing negative emotions and mental health problems (Dindo et al., 2017). Therefore, a strong point of ACT is that its mechanisms are relevant to various disorders, including, but not limited to, SUD. This is also underlined by the fact that the consumed substance was not clearly defined for about one-third of the total participants included in this review, as this information is not relevant for the transdiagnostic approach of ACT (González-Menéndez et al., 2014; Najafi & Arab, 2020; Shorey et al., 2017; Svanberg et al., 2017).

In line with that, two studies investigated the effectiveness of ACT in treating participants with SUD and comorbidities of depression and PTSD and found that ACT, besides being effective in the treatment of SUD, was effective in treating PTSD and depression as well (Ehman & Gross, 2019; Meyer et al., 2018). Although the studies were case- and pilot studies and therefore had limited statistical power, those findings support the underlying idea of ACT as a transdiagnostic approach. Thus, ACT is not aimed at treating a specific disorder but can be applied to various psychological disorders (Hayes et al., 2006). This poses a major advantage, as people with comorbidities would not need different therapies for distinct conditions, but several psychological problems could be tackled with the same approach. Until now, most treatments tackle SUD independently, and other methods and

practices are added to treat comorbidities. Contrary, a transdiagnostic approach, such as ACT, is not aimed at alleviating a specific disorder but rather global mechanisms presumed to underlie various conditions (Hayes et al., 2006; Hayes et al., 2004). Thus, instead of applying several therapies or using different approaches for specific psychological problems, ACT seems to effectively alleviate both SUD and comorbidities, which would reduce the financial, time implication and mental burden for society, practitioners, and patients.

Next, it was elaborated on whether ACT is more effective in treating SUD than CBT and TAU. The studies comparing the effectiveness of ACT to other treatment approaches, TAU and CBT, found mixed evidence. Although all ACT interventions were effective in treating SUD, evidence concerning the superiority of ACT remains ambivalent. Whereas two studies found that the ACT approach produced superior effects compared to CBT interventions (Bricker et al., 2014; Heffner et al., 2015), the other five studies found that ACT produced significant but comparable effects to CBT and TAU (González-Menéndez et al., 2014; Najafi & Arab, 2020; Petersen & Zettle, 2009; Shorey et al., 2017; Smout et al., 2010). Interestingly, the two studies which found evidence for the superiority of ACT were those that delivered the ACT intervention via telephone and a smartphone app and not in person (Bricker et al., 2014; Heffner et al., 2015).

Regarding previous research and considering the findings by Heffner et al. (2015) and Bricker et al. (2014), the first significant indication is that ACT principles can effectively be transferred to mobile interventions as an alternative to traditional face-to-face therapy. Secondly, one should consider that offering interventions via mobile devices such as smartphones might have considerable advantages. For example, seeking support via an app or phone calls might facilitate starting therapy as it is perceived as a lower barrier than opening up to a therapist and being in face-to-face contact. In addition, mobile interventions are mostly low-intensity and high-frequency and might represent a different mode of action than traditional therapy (Levin et al., 2017; Torous et al., 2017). Furthermore, smartphone apps and telephone calls enable greater timely, and local independence than traditional therapy as they can be accessed anytime, anywhere and accordingly are easier to integrate into day to day lives. Lastly, such apps are more cost-effective. Hence, through mobile therapies, more people could be reached and get access to effective and low-cost treatment, which currently poses a tremendous societal challenge (Levin et al., 2019; Levin et al., 2017; Torous et al., 2017). All in all, in this review, only mobile ACT interventions were found to be more effective than CBT. Thus, it should be considered that the method of offering an intervention

might influence its effectiveness and that offering mobile ACT interventions could be a complementary tool in the treatment of SUD.

Another relevant finding is that ACT seems to be effective in the short- as well as long-term. The majority of studies in this review found that ACT interventions produced significant improvements post-intervention (Najafi & Arab, 2020; Petersen & Zettle, 2009; Shorey et al., 2017), which remained significant at 3-months follow-up (Bricker et al., 2014; Heffner et al., 2015). The intervention results by Smout et al. (2010) and Heffner et al. (2003) remained significant up to 6- and 9-months follow-up, respectively. Additionally, one study investigated the long-term effects of ACT in SUD where improvements were significant at post-intervention but became even larger at 6-, 12- and 18-months follow-up (González-Menéndez et al., 2014). González-Menéndez et al. (2014) found that ACT is effective over the long-term and that at 18-months follow-up, ACT is significantly more effective than CBT, with the CBT group displaying an abstinence rate of 50% compared to 85.7% for the ACT group. While the effectiveness of CBT also increased over time, at all points of measurement, ACT was still significantly more effective regarding abstinence and anxiety measures (González-Menéndez et al., 2014).

While the total number of sessions did not seem to influence the effectiveness, the duration of the intervention might play a role. From the present studies, it could be understood that interventions conducted over a longer period, regardless of the total number of sessions, might be more effective (Meyer et al., 2018; Shorey et al., 2017). As ACT is a process- rather than an outcome-driven therapy approach, this observation would be in line with the principles of the ACT approach. Accordingly, the effectiveness might not rely on the actual intervention time but on the amount of time an individual takes to engage with values, reflect on experiences and practise acceptance and commitment. Overall, the results imply that ACT can be effectively implemented as a short-term intervention for SUD but might develop its full effectiveness with time and practice.

An issue that seems to limit the promising findings of the included studies was outlined by Najafi and Arab (2020) and Heffner et al. (2015). Both studies indicated that the effectiveness of ACT might be mediated by gender, whereas the mediating factors are not further determined so far. Thus, the generalizability of results should be regarded with caution, as it remains unclear whether ACT produces comparable effectiveness for different genders or whether its effectiveness might be decreased or enhanced by currently unknown factors, such as individual variables or social context of individuals.

Limitations

The present scoping review has certain limitations. First, two of the included studies were pilot studies and therefore have limited statistical power. Second, two more studies were case studies that only included one participant each and thus generated no generalizable results. Thus, a total of four out of eleven studies was conducted with small samples with limited to no statistical power. Nevertheless, despite the limited statistical power, the results of the case and pilot studies supported the findings of larger-scale studies included in this review. Therefore, their results can be viewed as adjunctive findings to confirm theories based on previous studies.

Moreover, only a limited number of studies was included in this review. Numerous studies examining the effectiveness of various ACT interventions and other third-wave therapies in SUD treatment were conducted in the past. However, only a few could be included due to the limited resources for this review. Thus, the validity and generalizability of the present results could be increased by having more of the available studies in subsequent reviews.

A further limitation is that the present review only included data on a limited number of SUD sub-categories. Most studies focused on alcohol use disorder, tobacco use disorder, and stimulant use disorder, whereas substance use disorders include many more substances. Henceforth, the generalizability of the results is limited, and it is not clear whether the findings remain valid across substances.

Future Research

Future research should focus on the long-term effects of ACT in SUD as there is only very limited longitudinal data available up to this point. It should be investigated whether the effectiveness of ACT for SUD changes over time and whether positive short-term effects of ACT interventions for patients with SUD can be maintained over time. While one study already confirmed that ACT is significantly more effective than CBT in the long term (González-Menéndez et al., 2014), future studies should also compare the long-term effectiveness of ACT and TAU. Moreover, research should focus on factors that mediate the effectiveness of ACT interventions in patients with SUD. As outlined before, some research suggests that gender has a mediating role regarding the effectiveness of ACT. Further, the only two interventions that were superior to CBT in this review were those delivered via a smartphone app and phone calls. Thus, it would be valuable to investigate whether the mode

of ACT intervention delivery plays a role in its effectiveness in treating SUD. Lastly, it should be researched whether and how the number of sessions, the duration of an ACT intervention and the time spent on individual acceptance and commitment practise influences the effectiveness of ACT for patients with SUD.

Conclusion

This scoping review integrated the results of eleven studies investigating the effectiveness of ACT in the treatment of SUD. It can be summarized that ACT is an effective approach in treating SUD. Although most studies found that ACT does not produce superior treatment outcomes than CBT or TAU, it produces comparable results. An advantage of ACT in SUD treatment is that it is a transdiagnostic approach and seems to alleviate comorbid conditions, such as depression, anxiety or PTSD, which often accompany SUD. In addition, ACT produces significant short-term improvements of SUD, which seem to be enhanced or at least maintained over time. However, longitudinal data on the effects of ACT on SUD is limited until now, and thus further research is needed to make solid conclusions.

References

Aas, C. F., Vold, J. H., Gjestad, R., Skurtveit, S., Lim, A. G., Gjerde, K. V., Løberg, E.-M., Johansson, K. A., & Fadnes, L. T. (2021). Substance use and symptoms of mental health disorders: a prospective cohort of patients with severe substance use disorders in Norway. *Substance Abuse Treatment, Prevention, and Policy, 16*(1). https://doi.org/10.1186/s13011-021-00354-1

APA. (2013). *Diagnostic and Statistical Manual for Mental Disorders* (5 ed.). American Psychiatric Publishing. https://doi.org/10.1176/appi.books.9780890425596

Arterberry, B. J., Boyd, C. J., West, B. T., Schepis, T. S., & McCabe, S. E. (2020, 2020/08/17). DSM-5 substance use disorders among college-age young adults in the United States: Prevalence, remission and treatment. *Journal of American College Health, 68*(6), 650-657. https://doi.org/10.1080/07448481.2019.1590368

Boschen, M. J., & Casey, L. M. (2008). The use of mobile telephones as adjuncts to cognitive behavioral psychotherapy. *Professional Psychology: Research and Practice, 39*(5), 546. https://doi.org/10.1037/0735-7028.39.5.546

Bowen, S., Witkiewitz, K., Clifasefi, S. L., Grow, J., Chawla, N., Hsu, S. H., Carroll, H. A., Harrop, E., Collins, S. E., Lustyk, M. K., & Larimer, M. E. (2014). Relative Efficacy of Mindfulness-Based Relapse Prevention, Standard Relapse Prevention, and Treatment as Usual for Substance Use Disorders. *JAMA Psychiatry, 71*(5), 547. https://doi.org/10.1001/jamapsychiatry.2013.4546

Bricker, J. B., Bush, T., Zbikowski, S. M., Mercer, L. D., & Heffner, J. L. (2014). Randomized Trial of Telephone-Delivered Acceptance and Commitment Therapy Versus Cognitive Behavioral Therapy for Smoking Cessation: A Pilot Study. *Nicotine & Tobacco Research, 16*(11), 1446-1454. https://doi.org/10.1093/ntr/ntu102

Burdzovic Andreas, J., Lauritzen, G., & Nordfjærn, T. (2015, 2015/09/01/). Co-occurrence between mental distress and polydrug use: A ten year prospective study of patients from substance abuse treatment. *Addictive Behaviors, 48,* 71-78. https://doi.org/10.1016/j.addbeh.2015.05.001

Bush, D. M., & Lipari, R. N. (2016). Substance use and substance use disorder by industry. https://europepmc.org/article/NBK/nbk343542

Butler, K., & Le Foll, B. (2019). Impact of Substance Use Disorder Pharmacotherapy on Executive Function: A Narrative Review. *Frontiers in Psychiatry, 10*. https://doi.org/10.3389/fpsyt.2019.00098

Byrne, S. P., Haber, P., Baillie, A., Costa, D. S. J., Fogliati, V., & Morley, K. (2019). Systematic Reviews of Mindfulness and Acceptance and Commitment Therapy for Alcohol Use Disorder: Should we be using Third Wave Therapies? *Alcohol and Alcoholism, 54*(2), 159-166. https://doi.org/10.1093/alcalc/agy089

Campbell, E. J., Lawrence, A. J., & Perry, C. J. (2018). New steps for treating alcohol use disorder. *Psychopharmacology, 235*(6), 1759-1773. https://doi.org/10.1007/s00213-018-4887-7

Chiesa, A., & Serretti, A. (2014). Are Mindfulness-Based Interventions Effective for Substance Use Disorders? A Systematic Review of the Evidence. *Substance Use & Misuse, 49*(5), 492-512. https://doi.org/10.3109/10826084.2013.770027

Compton, W. M., Dawson, D. A., Goldstein, R. B., & Grant, B. F. (2013). Crosswalk between DSM-IV dependence and DSM-5 substance use disorders for opioids, cannabis, cocaine and alcohol. *Drug and Alcohol Dependence, 132*(1-2), 387-390. https://doi.org/10.1016/j.drugalcdep.2013.02.036

Dindo, L., Van Liew, J. R., & Arch, J. J. (2017). Acceptance and commitment therapy: a transdiagnostic behavioral intervention for mental health and medical conditions. *Neurotherapeutics, 14*(3), 546-553. https://doi.org/10.1007/s13311-017-0521-3

Donovan, D. M., Ingalsbe, M. H., Benbow, J., & Daley, D. C. (2013). 12-Step Interventions and Mutual Support Programs for Substance Use Disorders: An Overview. *Social Work in Public Health, 28*(3-4), 313-332. https://doi.org/10.1080/19371918.2013.774663

Ehman, A. C., & Gross, A. M. (2019). Acceptance and Commitment Therapy and Motivational Interviewing in the Treatment of Alcohol Use Disorder in a College Woman: A Case Study. *Clinical Case Studies, 18*(1), 36-53. https://doi.org/10.1177/1534650118804886

González-Menéndez, A., Fernández, P., Rodríguez, F., & Villagrá, P. (2014). Long-term outcomes of Acceptance and Commitment Therapy in drug-dependent female

inmates: A randomized controlled trial. *International Journal of Clinical and Health Psychology*, *14*(1), 18-27. https://doi.org/10.1016/S1697-2600(14)70033-X

Grant, B. F., Chou, S. P., Saha, T. D., Pickering, R. P., Kerridge, B. T., Ruan, W. J., Huang, B., Jung, J., Zhang, H., Fan, A., & Hasin, D. S. (2017). Prevalence of 12-Month Alcohol Use, High-Risk Drinking, and DSM-IV Alcohol Use Disorder in the United States, 2001-2002 to 2012-2013. *JAMA Psychiatry*, *74*(9), 911. https://doi.org/10.1001/jamapsychiatry.2017.2161

Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, *44*(1), 1-25. https://doi.org/10.1016/j.brat.2005.06.006

Hayes, S. C., Wilson, K. G., Gifford, E. V., Bissett, R., Piasecki, M., Batten, S. V., Byrd, M., & Gregg, J. (2004). A preliminary trial of twelve-step facilitation and acceptance and commitment therapy with polysubstance-abusing methadone-maintained opiate addicts. *Behavior Therapy*, *35*(4), 667-688. https://doi.org/10.1016/S0005-7894(04)80014-5

Heffner, J. L., Vilardaga, R., Mercer, L. D., Kientz, J. A., & Bricker, J. B. (2015). Feature-level analysis of a novel smartphone application for smoking cessation. *The American Journal of Drug and Alcohol Abuse*, *41*(1), 68-73. https://doi.org/10.3109/00952990.2014.977486

Heffner, M., Eifert, G. H., Parker, B. T., Hernandez, D. H., & Sperry, J. A. (2003, 2003/09/01/). Valued directions: Acceptance and commitment therapy in the treatment of alcohol dependence. *Cognitive and Behavioral Practice*, *10*(4), 378-383. https://doi.org/10.1016/S1077-7229(03)80055-X

Hernández-López, M., Luciano, M. C., Bricker, J. B., Roales-Nieto, J. G., & Montesinos, F. (2009). Acceptance and commitment therapy for smoking cessation: a preliminary study of its effectiveness in comparison with cognitive behavioral therapy. *Psychology of Addictive Behaviors*, *23*(4), 723. https://doi.org/10.1037/a0017632

Hofmann, S. G., Asnaani, A., Vonk, I. J. J., Sawyer, A. T., & Fang, A. (2012). The Efficacy of Cognitive Behavioral Therapy: A Review of Meta-analyses. *Cognitive Therapy and Research*, *36*(5), 427-440. https://doi.org/10.1007/s10608-012-9476-1

Houston, R. J., & Schlienz, N. J. (2018, 2018/01/01/). Event-Related Potentials as Biomarkers of Behavior Change Mechanisms in Substance Use Disorder Treatment. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, *3*(1), 30-40. https://doi.org/10.1016/j.bpsc.2017.09.006

Lanza, P. V., García, P. F., Lamelas, F. R., & González-Menéndez, A. (2014). Acceptance and Commitment Therapy Versus Cognitive Behavioral Therapy in the Treatment of Substance Use Disorder With Incarcerated Women. *Journal of Clinical Psychology*, *70*(7), 644-657. https://doi.org/10.1002/jclp.22060

Levin, M. E., Haeger, J., & Cruz, R. A. (2019). Tailoring acceptance and commitment therapy skill coaching in the moment through smartphones: Results from a randomized controlled trial. *Mindfulness*, *10*(4), 689-699. https://doi.org/10.1007/s12671-018-1004-2

Levin, M. E., Haeger, J., Pierce, B., & Cruz, R. A. (2017). Evaluating an adjunctive mobile app to enhance psychological flexibility in acceptance and commitment therapy. *Behavior modification*, *41*(6), 846-867. https://doi.org/10.1177/0145445517719661

Ly, K. H., Dahl, J., Carlbring, P., & Andersson, G. (2012). Development and initial evaluation of a smartphone application based on acceptance and commitment therapy. *SpringerPlus*, *1*(1), 11. https://doi.org/10.1186/2193-1801-1-11

Meyer, E. C., Walser, R., Hermann, B., La Bash, H., DeBeer, B. B., Morissette, S. B., Kimbrel, N. A., Kwok, O. M., Batten, S. V., & Schnurr, P. P. (2018). Acceptance and Commitment Therapy for Co-Occurring Posttraumatic Stress Disorder and Alcohol Use Disorders in Veterans: Pilot Treatment Outcomes [Article]. *Journal of Traumatic Stress*, *31*(5), 781-789. https://doi.org/10.1002/jts.22322

Moher, D., Liberati, A., Tetzlaff, A., & Altmann, D. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*, *6*(7). https://doi.org/10.1371/journal.pmed1000097

Najafi, L., & Arab, A. (2020). The Efficacy of Acceptance and Commitment Therapy on Psychological Resilience in Women with Substance Use Disorder. *International Journal of High Risk Behaviors and Addiction*, *9*(2). https://doi.org/10.5812/ijhrba.92102

Nestler, E. J., & Malenka, R. C. (2004). The addicted brain. *Scientific American, 290*(3), 78-85. http://www.jstor.org/stable/26047641

NIDA. (2019). *Treatment Approaches for Drug Addiction DrugFacts*. https://www.drugabuse.gov/publications/drugfacts/treatment-approaches-drug-addiction

Nowinski, J. (2000). Twelve-step facilitation. *Approaches to drug abuse counseling. Bethesda, MD: National Institute on Drug Abuse*, 95-102.

Petersen, C. L., & Zettle, R. D. (2009). Treating Inpatients With Comorbid Depression and Alcohol Use Disorders: A Comparison of Acceptance and Commitment Therapy Versus Treatment as Usual. *The Psychological Record, 59*(4), 521-536. https://doi.org/10.1007/bf03395679

Rehm, J., & Shield, K. D. (2019). Global Burden of Disease and the Impact of Mental and Addictive Disorders. *Current Psychiatry Reports, 21*(2). https://doi.org/10.1007/s11920-019-0997-0

Santa Ana, E. J., Martino, S., Ball, S. A., Nich, C., Frankforter, T. L., & Carroll, K. M. (2008). What is usual about “treatment-as-usual”? Data from two multisite effectiveness trials. *Journal of Substance Abuse Treatment, 35*(4), 369-379. https://doi.org/10.1016/j.jsat.2008.01.003

Shorey, R. C., Elmquist, J., Gawrysiak, M. J., Strauss, C., Haynes, E., Anderson, S., & Stuart, G. L. (2017). A Randomized Controlled Trial of a Mindfulness and Acceptance Group Therapy for Residential Substance Use Patients. *Substance Use & Misuse, 52*(11), 1400-1410. https://doi.org/10.1080/10826084.2017.1284232

Smout, M. F., Longo, M., Harrison, S., Minniti, R., Wickes, W., & White, J. M. (2010). Psychosocial Treatment for Methamphetamine Use Disorders: A Preliminary Randomized Controlled Trial of Cognitive Behavior Therapy and Acceptance and Commitment Therapy. *Substance Abuse, 31*(2), 98-107. https://doi.org/10.1080/08897071003641578

Svanberg, G., Munck, I., & Levander, M. (2017). Acceptance and commitment therapy for clients institutionalized for severe substance-use disorder: a pilot study. *Substance Abuse and Rehabilitation, Volume 8*, 45-51. https://doi.org/10.2147/sar.s132255

Telzer, E. H., Gonzales, N., & Fuligni, A. J. (2014). Family obligation values and family assistance behaviors: Protective and risk factors for Mexican–American adolescents' substance use. *Journal of youth and adolescence*, *43*(2), 270-283. https://doi.org/10.1007/s10964-013-9941-5

Thomas, T. P. (2013). The Effect of Personal Values, Organizational Values, and Person-Organization Fit on Ethical Behaviors and Organizational Commitment Outcomes among Substance Abuse Counselors. https://doi.org/10.17077/etd.uzvjk997

Torous, J., Levin, M. E., Ahern, D. K., & Oser, M. L. (2017). Cognitive behavioral mobile applications: clinical studies, marketplace overview, and research agenda. *Cognitive and Behavioral Practice*, *24*(2), 215-225. https://doi.org/10.1016/j.cbpra.2016.05.007

Twohig, M. P., & Crosby, J. M. (2010, 2010/09/01/). Acceptance and Commitment Therapy as a Treatment for Problematic Internet Pornography Viewing. *Behavior Therapy*, *41*(3), 285-295. https://doi.org/10.1016/j.beth.2009.06.002

Verdejo-Garcia, A. (2016, 2016/09/01/). Cognitive training for substance use disorders: Neuroscientific mechanisms. *Neuroscience & Biobehavioral Reviews*, *68*, 270-281. https://doi.org/10.1016/j.neubiorev.2016.05.018

Wilson, K. G., & Byrd, M. R. (2004). ACT for substance abuse and dependence. In *A practical guide to acceptance and commitment therapy* (pp. 153-184). Springer. https://doi.org/10.1007/978-0-387-23369-7_7