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ORIGINAL ARTICLE

The Role of Psychological Flexibility and Inflexibility in Substance Addiction, Abuse, or Misuse: A Systematic Review and Meta-analysis

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Abstract
Psychological inflexibility (PI) and psychological flexibility (PF) are transdiagnostic mechanisms involved in the development, maintenance and treatment of SUDs. Evidence on the relationship between their components and substance abuse has not been investigated using a meta-analytic approach. The aim of this meta-analysis was to quantify the association between the dimensions of PF and PI, and substance abuse. A systematic literature review was conducted in four databases. A total of 24 studies were included. The associations were quantified using Pearson's r correlation coefficients, and two separate meta-analyses were conducted: one for the association between mindfulness and substance abuse, and one for the association between experiential avoidance and substance abuse. The meta-analyses showed a low and negative mindfulness-substance abuse relationship (r = -0.25), and a moderate and positive experiential avoidance-substance abuse relationship (r = 0.34). One study reported a correlation of r = -0.17 between defusion and substance abuse. The search for studies on the remaining components was unsuccessful. Substance type and target population moderated the relationship between mindfulness and substance abuse. Clinical and empirical implications of these results are discussed, and recommendations and future research directions are outlined.

Keywords Psychological flexibility · Psychological inflexibility · SUDs · Substance abuse · Substance misuse · Meta-analysis

The corresponding author (Victoria Barrado-Moreno) has been authorized by all co-authors to act as an agent on their behalf in all matters pertaining to publication of the manuscript, and the order of names has been agreed by all authors.

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Introduction

The Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association 2013) defines substance use disorders (SUDs) as conditions involving cognitive, behavioural, and physiological symptoms. These symptoms include impaired control, physical dependence, social problems, and risky use arising from the continuous use of a substance or substances despite harmful consequences. The DSM-5 (American Psychiatric Association 2013) allows the severity of SUD to be specified according to the number of symptoms identified: 2 to 3 symptoms indicate mild SUD, 4 to 5 indicate moderate SUD, and six or more indicate severe SUD.

Over the years, there have been discrepancies about the definition and distinction between dependence, addiction, use, or abuse (American Psychiatric Association 2013). Dependence has traditionally been viewed as a physical response to substance consumption, including tolerance and withdrawal symptoms, without necessarily implying addiction (O'Brien et al., 2006; Szalavitz et al., 2021). Addiction involves a loss of control over the urge to use a substance, even when there are negative consequences (O'Brien et al., 2006; Szalavitz et al., 2021), and can include dependence symptoms. However, addiction was labelled as 'substance dependence' in the diagnostic manuals DSM-III-R (American Psychiatric and Association 1987), DSM-IV-TR (American Psychiatric Association, 2000), and the International Classification of Diseases-11 (ICD-11, World Health Organization [WHO], 2021) to be less stigmatizing (O'Brien et al., 2006). These diagnostic manuals distinguished between 'substance dependence' and 'substance abuse', with substance abuse being defined as the maladaptive or hazardous consumption of a substance leading to negative consequences without manifesting symptoms of tolerance, withdrawal, and compulsive consumption of the substance (American Psychiatric Association, 2000; WHO, 2021). The use of the term 'dependence' to mean addiction has led to the assumption, in both clinical and research practice, that tolerance and withdrawal symptoms are equivalent to addiction (O'Brien et al., 2006; Szalavitz et al., 2021). This is especially problematic in the case of the misdiagnosis of people with chronic pain on long-term opioid prescriptions (see Szalavitz et al., 2021 for further examples).

To address this issue, the former diagnoses of 'substance abuse' and 'substance dependence' have been merged into a single diagnostic category called SUD in the DSM-5 (American Psychiatric Association 2013). The DSM-5 allows the severity of the diagnosis to be specified. Thus, a diagnosis of 'mild SUD' would be equivalent to the former 'substance abuse', whereas 'moderate to severe SUD' would correspond to the former 'substance dependence' (addiction) (Szalavitz et al., 2021). It also allows for more flexibility in assessing SUD in people on prescribed medications, by considering symptoms of dependence (tolerance and withdrawal) as normal physiological responses to some substances (e.g., prescribed opioid medication) that do not necessarily imply addiction.

Finally, although not included in the diagnostic manuals, it is important to take into consideration substance misuse due to its association with health and social problems (McLellan, 2017). The term 'substance misuse' is referred to the use of illegal drugs (European Medicines Agency, 2013), or the use of legal substances (e.g., alcohol) at high doses or in inappropriate situations (McLellan, 2017); and when it applies to prescribed medications, any type of inappropriate use other than that prescribed (Blanch et al., 2015).

In view of the foregoing, research in this field could be affected by the use of different definitions, the interchangeable use of these terms, the diagnostic manual referenced, or the measurement instrument used, leading to unclear or mixed results.

Several psychotherapeutic approaches have been found to be effective in treating SUDs, such as Cognitive Behavioural Therapies (CBTs), contingency management, mindfulness-based therapies, motivational interviewing, drug counselling, and couples and family therapies (Gaznick & Judd, 2020). More recently, among the contextual CBTs, Acceptance and Commitment Therapy (ACT; Hayes et al., 1999, 2012) has been demonstrated to be a promising treatment for SUDs (Ii et al., 2019; Lee et al., 2015; Osaji et al., 2020).

ACT is a transdiagnostic therapy that aims to increase psychological flexibility (PF), defined as the ability to be in conscious contact with the present moment and to change or maintain goal-directed behaviour, and to decrease psychological inflexibility (PI), defined as a rigid pattern of behaviour guided by internal experiences or the avoidance of these experiences rather than by goals (Chin & Hayes, 2017).

The theoretical model of ACT, known as the Hexaflex Model (Hayes et al., 2013), is based on 12 core components, six of which relate to PF or the process of change for treatment (Levin et al., 2012a, 2012b): acceptance (the willingness to come into contact with unwanted experiences), contact with the present moment (the ability to contact and be aware of one's experiences), self as context (maintaining perspective of oneself as distinct from experiences), defusion (not getting attached to unwanted experiences), contact with values (connection with important areas), and committed action (behaviour consistent with values). The other six components relate to PI or problematic manifestations based on psychopathology (Levin et al., 2012a, 2012b): experiential avoidance (attempts to alter unwanted experiences), lack of contact with the present moment (not paying attention to one's experiences), self as content (conceptualization of oneself as equivalent to one's experiences), fusion (attachment to unwanted experiences), lack of contact with values (disconnection from important areas), and inaction (inability to behave consistently with personal goals).

The theoretical approach of ACT provides a transdiagnostic model of psychopathology, in which PI is a mechanism involved in the development and maintenance of a broad range of disorders including SUDs (Wilson & Luciano, 2014). Thus, PI would be a rigid and problematic pattern of behaviour driven by thoughts related to the use of the substance or the individual's inability to quit (Luciano et al., 2010), negative emotions, and impulses that conflict with personal values leading to psychological distress. In this sense, substance use would start as a response to avoid negative feelings or memories (e.g., drinking alcohol to forget or cope with a difficult situation), which would serve as a short-term emotional regulation strategy. Repeated over time, this pattern of substance use would persist either as a dysfunctional emotional regulation strategy, or as a way to avoid or alleviate the urge to use the substance and/or the negative symptoms that result from not consuming the substance, resulting in greater emotional distress and substance consumption. Therefore, by promoting PF, this pattern of rigid behaviour would be transformed into a pattern of awareness and openness to contact with thoughts and feelings, leading to changes or persistence in behaviour aligned with the pursuit of one's goals and values, depending on what the situation offers (McCracken & Morley, 2014).

Previous research has investigated the role of PI in problematic behaviour such as substance use, abuse, and misuse. In summary, the evidence suggests that PI is associated with substance use (Bond et al., 2011) and comorbidity with other problematic behaviour (Levin et al., 2014a, 2014b). Previous studies have highlighted its role as a mediator between maladaptive schemas and SUDs (Albal & Buzlu, 2021) or between psychological distress and alcohol-related problems (Levin et al., 2012a, 2012b). One study investigated the role of cognitive fusion and lack of contact with values as moderators between stress and substance misuse in a sample of sexual minority adolescents (Weeks et al., 2020). However,

the evidence remains unclear and incomplete due to research limitations, such as the conceptualization of PF and PI—which have been considered equivalent to acceptance and experiential avoidance, respectively (Cherry et al., 2021). This has led to the widespread use of the Acceptance and Action Questionnaire (AAQ-II; Bond et al., 2011), rather than assessing the different components of the Hexaflex Model (Rolffs et al., 2018; Ren et al., 2019). In addition, the variety of instruments available to assess the different components of this model makes it challenging to assess all of them in a single study due to size considerations.

In summary, although the Hexaflex Model encompasses 12 processes, to our knowledge there are few studies that disentangle the role of its processes in substance abuse, misuse, the development of SUDs, or in SUDs treatment success. This may be due to the lack of multidimensional measures aimed at assessing all the components of the model, and the cost of assessing these processes using different questionnaires. Several reviews and meta-analyses have investigated the efficacy of ACT in the treatment of SUDs (Ii et al., 2019; Lee et al., 2015; Osaji et al., 2020). However, to our knowledge, there are no meta-analytic studies that have investigated the association between the 12 components of the Hexaflex Model and SUDs.

Taking into account the confounding results or gaps in previous research resulting from the different conceptualizations of the substance-related terms, PF and PI, the present study used a meta-analytic approach to systematically investigate and quantify associations between the different components of PF and PI and substance abuse, addiction, misuse, and SUDs.

Method

This systematic review and meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA 2020; Page et al., 2021) guidelines. It was registered in the International Prospective Register of Systematic Reviews (PROSPERO) in October 2022 (ID: CRD42022369042).

Inclusion Criteria

To be included in this meta-analysis, the studies had to fulfil the following criteria: 1) cross-sectional, or longitudinal studies, case–control studies, cohort studies, intervention studies or randomized controlled trials (RCTs) that included pre-test data; 2) adult participants (at least 18 years of age); 3) without cognitive impairment; 4) with current medical or illegal substance abuse, misuse, or addiction assessed using validated tools (i.e., measures that have been tested on samples appropriate for what the instrument is designed to measure, have demonstrated appropriate psychometric properties, and were developed in accordance with the reference diagnostic manuals at the time); 5) psychometrically validated measures of general PF, PI, and their components (i.e., measures that have been tested on different samples, have demonstrated appropriate psychometric properties, and that measure the constructs according to their theoretical formulation); 6) to report sufficient statistical data to extract or calculate effect sizes (i.e., Pearson Correlation Coefficients [r], odds ratios [OR], t values, or means and standard deviations); 7) due to language limitations, the study had to be written in English or Spanish; 8) studies had to be published or conducted between 1999 (when the first manual of ACT was published [Hayes et al., 1999]) and 2022.

The review of the references was made taking into account the definitions of the components of PF and PI, as well as the definitions of addiction, abuse, dependence, misuse, and SUDs given above. In addition, the instruments used in the studies to assess these constructs were also carefully reviewed, excluding those that only assessed symptoms of withdrawal and physical dependence, the quantity of substance consumed, or used instruments that conceptualized the components of the Hexaflex Model (Hayes et al., 2013) differently from the way they are conceptualized by the authors.

Studies that only included context- or disorder-specific measures of PF or PI were excluded (e.g., studies that only assessed smoking-specific experiential avoidance or pain acceptance). The only exception was the AAQ-SA (Luoma et al., 2011) because it is a measure of experiential avoidance applied to substance abuse. This approach was taken because the objective of this study was to analyse associations between the components of PF and PI and substance abuse, misuse or SUDs that can be generalized to different populations, rather than being restricted to specific groups (e.g., measures developed specifically for the chronic pain population or for smokers). Studies assessing only physical symptoms of dependence, withdrawal, or craving were also excluded, because, as mentioned, these symptoms alone are not sufficient to constitute SUDs, abuse, or addiction.

Search Strategy

Four electronic databases were consulted: PsycINFO, PubMed, Web of Science, and the Spanish database PSICODOC. The last search was performed in December 2022. The following keywords were combined in English and Spanish using the Boolean operators "AND" and "OR": opioid, substance, drug, alcohol, cannabis, cocaine, benzodiazepines, nicotine, abuse, dependence, addiction, "use disorder", misuse, "psychological flexibility", "psychological inflexibility", "experiential avoidance", acceptance, mindfulness, "contact with values", "committed action", "cognitive fusion", "defusion", "self as context", "self as content". These terms had to be in the title or in the abstract (see supplementary information S1-S4 for more details on the searches conducted in the databases). The references of the retrieved studies were also reviewed. To locate unpublished papers, requests for papers were made via the email listserv of the Association for Contextual Behavioral Science. However, no additional studies were identified.

Substance was defined as any psychoactive compound that can cause health or social problems or even addiction, including legal substances (e.g., alcohol, tobacco), illegal substances (e.g., cocaine, heroin), and substances controlled by physicians and prescribed for medical purposes (e.g., opioids, benzodiazepines) (McLellan, 2017).

The searches included the term 'dependence' in order to locate all the available literature on this topic, given the background of the controversy over the distinction between addiction and dependence mentioned above, and because one of the inclusion criteria was that all retrieved references had to have been published between 1999 and 2022 (dates when DSM-III-R, DSM-IV-TR and DSM-5 were the reference diagnostic manuals).

The search retrieved a total of 4068 references (Fig. 1). After removing duplicates, 2019 studies remained to be screened by title and abstract. Of these, 1879 studies were excluded, and 140 studies were assessed for full-text eligibility. Of these, 116 studies were excluded because they did not meet the inclusion criteria: 49 studies recruited a sample receiving treatment for SUDs, 28 studies did not analyse the association between the variables of interest in this study, 15 studies did not measure the variables according to the theoretical model of ACT, two studies provided incomplete data on the measures of PF/PI used, one

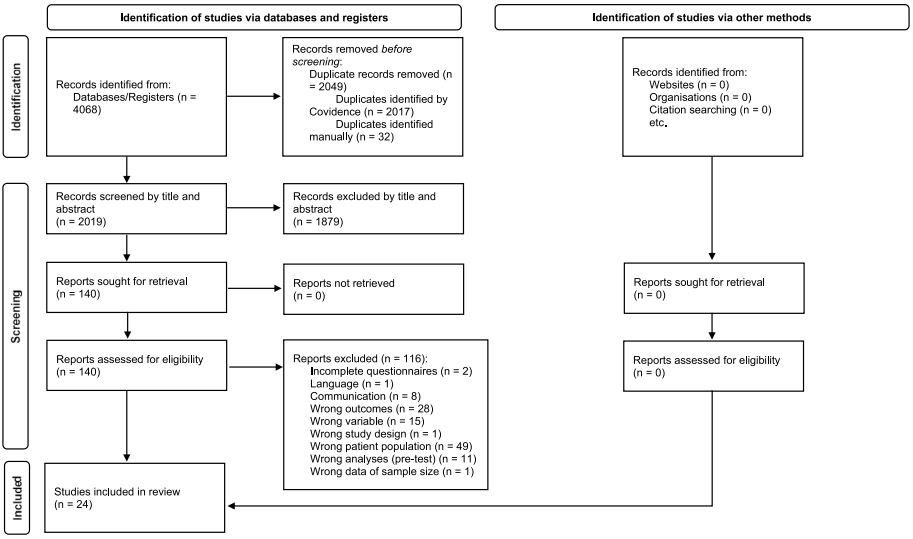

Fig. 1 PRISMA flowchart of the selection process of included studies (Source: Page et al., 2021)

study did not provide the sample size or the different groups that comprised the sample, 11 studies did not provide pre-test data to conduct the analysis in this study, eight references were communications, one study did not fulfil the language criteria, and one study was qualitative. As a result, 24 studies were included in the meta-analysis.

Data Extraction

To investigate the potential influence of the characteristics of the studies on effect sizes, study and participant variables were coded and extracted independently using a codebook and a variable registration protocol. Moderator variables related to the study were as follows: publication year, country and continent where it was conducted, language, statement of conflicts of interest, funding, and method of sample recruitment. Several participant-related variables were coded: target population, type of substance used, mean age of the sample in years, and gender distribution (percentage of women). The following methodological variables were coded: measures of the outcome (abuse, misuse, addiction, SUDs), measures of the exposure factor (PF, PI, and their components), study design, the presence of a comparison group, type of comparison group, mean age of the comparison group in years, and gender distribution of the comparison group (percentage of women).

Eligibility assessment and data extraction were performed independently by two researchers using Covidence systematic review software (Veritas Health Innovation, Melbourne). Disagreements were resolved by consensus between the two reviewers; in the event of disagreement, a third member of the team resolved the issue. Kappa coefficients and intraclass correlations were calculated to assess inter-rater agreement. The reliability of the data extraction was assessed by estimating the inter-rater agreement. For categorical variables Cohen's kappa coefficients ranged from 0.59 to 1.00 (mean = 0.82) and for continuous variables intraclass correlations ranged from 0.90 to 1.00 (mean = 0.98).

Risk of Bias

The current review and meta-analysis finally included case–control and cross-sectional studies. Thus, the methodological quality of the case–control studies included in the current review and meta-analysis was assessed using the Newcastle–Ottawa Scale (NOS) (Wells et al., 2015) for case–control studies (rated on a 0–9-point scale). This scale consisted of the following items: case definition, representativeness of the cases, selection and definition of controls, comparability of cases and controls, verification of the exposure, use of the same verification method for cases and controls, and non-response rate. The methodological quality of the cross-sectional studies included was assessed using the NOS for cross-sectional studies (rated on a 0–10-point scale). This scale consisted of the following items: representativeness of the sample, sample size, non-respondents, verification of the exposure (risk factor), comparability between subjects or control of confounding factors, assessment of the outcome, and quality of statistical tests.

Calculation of Effect Sizes

Correlation coefficients between PF and/or PI (and its components) and substance misuse and abuse were extracted from each study as an effect size index. If the study did not report a correlation coefficient, alternative formulas were applied to transform other effect size indices (e.g., odds ratio, standardized mean differences) into correlation coefficients (Borenstein et al., 2021; Botella & Sánchez-Meca, 2015; see supplementary material S5 for more detailed information). Following Cohen's (1988) guidelines, correlation coefficients of 0.10, 0.30 and 0.50 (in absolute value) were interpreted as reflecting a small, moderate, and large magnitudes.

Statistical Analysis

In order to avoid dependence problems, separate meta-analyses were conducted for each combination of PI and/or PF (and its components) and drug misuse and abuse. In the meta-analytic synthesis, each correlation coefficient was transformed into Fisher's Z to normalize its distribution and stabilize the variances. As heterogeneity between the effect sizes was expected, random effects models were applied such that each effect size was weighted by its inverse variance, defined as the sum of the within-study and between-studies variances (τ^2). The between-studies variance was estimated using restricted maximum likelihood. For each meta-analysis, a forest plot was constructed, and the average effect size and a 95% confidence interval (95%CI) were calculated. The 95%CI was constructed using the improved method proposed by Hartung and Knapp (2001; Sánchez-Meca & Marín-Martínez, 2008). Although the meta-analytic synthesis was conducted using Fisher's Zs, to facilitate the interpretation of the results, the forest plots and the average effect sizes (and their 95%CIs) were retransformed into the metric of the correlation coefficient. The practical significance of pooled correlations was assessed following Cohen's (1988) guidelines. Heterogeneity between effect sizes was assessed by calculating the heterogeneity Q statistic, the I^2 index, the between-studies variance (τ^2), and by constructing a 95% prediction interval around the average effect size (Higgins Thomas, 2019; Schmid et al., 2021). Meta-analyses with at least 10 studies, as well as a statistically significant Q test ($p < 0.05$), and an I^2 index above 25%, were

used to assess the influence of moderator variables by applying mixed-effects models. The influence of categorical variables on the effect sizes was assessed using subgroup analyses, whereas continuous moderators were investigated using meta-regression models. For both subgroup analyses and meta-regression models, the improved *F*-statistic developed by Knapp and Hartung (2003) was applied (Cooper et al., 2019). The proportion of variance explained by each moderator was calculated as $R^2 = 1—\tau_{res}{}^2/\ \tau^2$, where $\tau_{res}{}^2$ is the residual between-studies variance after removing the variability explained by the moderator from the total between-studies variance. To be considered relevant, a moderator should explain at least 10% of the variability in effect sizes. Publication bias was assessed by constructing funnel plots and by applying the Egger test and Duval and Tweedie's trim-and-fill method for imputing missing effect sizes to symmetrize the funnel plot (Rothstein, et al., 2005). Statistical analyses were conducted using the metafor package in R (Viechtbauer, 2010).

Results

Study Characteristics

A total of 24 articles were included in the meta-analysis. Two articles, each including different samples (Priddy et al., 2018) and comparison groups (Lebeaut et al., 2021), were divided into three and two independent studies, respectively, in order to facilitate statistical analyses. Therefore, the present meta-analysis included a final total of 27 independent studies, published between 2012 and 2022. Studies were conducted in USA ($k = 15$, 68.2%), Canada ($k = 2$, 9.1%), Brazil ($k = 2$, 9.1%), and in Israel, Spain and Turkey ($k = 1$ in each country, 4.5%). A total of 6954 participants composed the 27 samples (minimum = 31, maximum = 1268, median = 156). Target populations represented were community ($k = 9$, 33.3%), clinical ($k = 13$, 48.1%), and trauma ($k = 5$, 18.5%) samples. The average age of the samples of participants ranged from 18.5 to 60.6 years (mean = 36.1), and percentages of women varied between 0 and 100% (mean = 52.4%). The most common substances of abuse investigated in the studies were alcohol ($k = 9$, 33.3%) and opioids ($k = 6$, 22.2%), whereas there were few studies on cannabis, stimulants, and hypnotics/benzodiazepines ($k = 1$ per study, 3.7%). Nine studies (33.3%) investigated a range of substances. Table 1 shows the main study characteristics.

The methodological quality of the studies was assessed using the NOS version for cross-sectional and case–control studies. Of the 24 studies, 21 were cross-sectional studies and only three were case–control studies. Table 2 shows the degree of compliance of the cross-sectional studies with each of the NOS items. Item 4 (verification of the exposure-risk factor) and item 6 (assessment of the outcome) achieved full compliance, whereas item 2 (sample size justified and satisfactory) was satisfied by only two studies (9.5%). Taking into account that the NOS total score ranges from 0 to 9, the studies obtained scores between 3 and 8 (mean = 6.2), which can be considered satisfactory.

Analysis of Average Correlation and Heterogeneity

Separate meta-analyses were conducted to estimate the correlation between substance abuse and mindfulness and between substance abuse and experiential avoidance. As only one study (Michael and Juarascio, 2020) reported a correlation between substance

Table 1 Study characteristics

Study	Country	Population	Abuse	Mean Age	% Female	Design	*N*	r_M	r_A
Adams 2015	USA	General	Alcohol	42.4	50.9	Cross-sectional	399	−0.28	
Baker 2021	USA	Trauma	Alcohol	42.0	15.3	Cross-sectional	457	-	0.20
Barrington 2019	Canada	General	Alcohol	-	78.0	Cross-sectional	768	−0.07	
Barros 2018	Brazil	General	Hypnotics/Benzos	-	100	Cross-sectional	76	−0.01	
Davies 2019	USA	Trauma	Drugs (in general)	32.4	40.6	Cross-sectional	244	−0.12	
Droutman 2022	–	Clinical	Drugs (in general)	32.2	100	Cross-sectional	245	−0.28	
Elander 2014	–	Clinical	Opioids	44.5	82.0	Cross-sectional	112	−0.07	
Elices 2019	Spain	Clinical	Stimulants	35.1	18.6	Case–Control	60	−0.57	
Feingold 2021	Israel	Trauma	Alcohol	30.0	0	Cross-sectional	189	-	0.37
Frohe 2020	USA	General	Drugs (in general)	19.9	49.0	Cross-sectional	847	−0.02	
Kachadourian 2021	USA	Trauma	Alcohol	60,6	10.2	Cross-sectional	1,268	−0.22	
Lebeaut 2020a	USA	Trauma	Alcohol	37.8	4.8	Cross-sectional	298	−0.14	
Lebeaut 2020b	USA	Clinical	Alcohol	37.6	14.8	Cross-sectional	31	−0.20	
Levin 2014	USA	Clinical	Drugs (in general)	39.3	56.2	Case–Control	310	−0.12	
Levin 2012	USA	General	Alcohol	18.5	62,1	Cross-sectional	120	-	0.22
Michael 2020	USA	Clinical	Drugs (in general)	26.7	100	Case–Control	63	-	0.01
Murphy 2012	USA	General	Alcohol	20.3	80.5	Cross-sectional	116	−0.19	
Paltun 2017	Turkey	Clinical	Cannabis	29.1	0	Longitudinal	164	−0.46	
Petker 2021	Canada	Clinical	Drugs (in general)	37.9	100	Non-RCT	75	−0.21	
Priddy 2018a	USA	Clinical	Opioids	48.3	68.0	Cross-sectional	115	−0.28	
Priddy 2018b	USA	Clinical	Opioids	51.3	62.7	Cross-sectional	144	−0.43	
Priddy 2018c	USA	Clinical	Opioids	33.0	11.4	Cross-sectional	44	−0.42	
Rhodes 2021	USA	Clinical	Opioids	57.0	67.7	Cross-sectional	99	-	0.63
Serowik 2019	USA	General	Drugs (in general)	19.7	74.2	Cross-sectional	233	-	0.27
Silva 2020	Brazil	General	Drugs (in general)	38.3	7.5	Cross-sectional	40	−0.39	
Tarantino 2015	USA	General	Drugs (in general)	19.9	100	Cross-sectional	282	−0.14	
Villarreal 2020	USA	Clinical	Opioids	48.3	59.0	Cross-sectional	156	−0.64	0.53

N = sample size; r_M = correlation between substance abuse and mindfulness; r_A = correlation between substance abuse and experiential avoidance; benzos = benzodiazepines

Table 2 Compliance of the cross-sectional studies with the Newcastle–Ottawa Scale items

Study[a]	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Total score
Adams 2015	1	0	0	2	2	1	1	7
Baker 2021	1	0	1	2	2	1	1	8
Barrington 2019	1	0	0	2	0	1	0	4
Barros 2018	1	0	1	2	2	1	1	8
Davies 2019	1	0	0	2	2	1	1	7
Droutman 2022	0	1	1	2	0	1	1	6
Elander 2014	1	0	1	2	2	1	0	7
Feingold 2021	1	0	1	2	2	1	1	8
Frohe 2020	1	0	1	2	2	1	1	8
Kachadourian 2021	1	0	1	2	2	1	1	8
Lebeaut 2020	1	0	0	2	2	1	1	7
Levin 2012	0	0	1	2	2	1	1	7
Murphy 2012	0	0	0	2	0	1	0	3
Paltun 2017	0	0	0	2	1	1	0	4
Petker 2021	0	0	0	2	2	1	0	5
Priddy 2018	1	0	1	2	1	1	1	7
Rhodes 2021	0	1	1	2	0	1	1	6
Serowik 2019	0	0	0	2	2	1	0	5
Silva 2020	0	0	0	2	0	1	0	3
Tarantino 2015	0	0	1	2	2	1	1	7
Villarreal 2020	0	0	1	2	2	1	0	6
Compliance (%)	**52.4**	**9.5**	**57.1**	**100**	**76.2**	**100**	**61.9**	**Min. = 3; Max. = 8; Mean = 6.2**

[a] This table includes cross-sectional studies. Only three studies used a case–control design and were not included in these analyses. Item 1 = representativeness of the sample; Item 2 = sample size; Item 3 = non-respondents; Item 4 = verification of the exposure (risk factor); Item 5 = comparability between subjects or confounding factors control; Item six = assessment of the outcome; Item 7 = statistical tests quality. Maximum Total score = 9

abuse and defusion ($r = -0.17$, $N = 120$), the magnitude of this relation could not be analysed by meta-analysis. The search for studies on other dimensions of PI and PF was unsuccessful.

A total of 21 independent samples reported a correlation between substance abuse and mindfulness. Figure 2 shows a forest plot of the correlation coefficients, which ranged from −0.640 to −0.006. All individual correlations were negative, indicating that higher levels of mindfulness were associated with lower levels of substance abuse. A random-effects meta-analysis gave an average correlation of $r_+ = -0.25$ (95%CI = −0.33 to −0.16), of low-to-moderate magnitude following Cohen's (1988) guidelines, and statistically significant ($p < 0.001$). The individual correlations exhibited large heterogeneity: $Q(20) = 142.88$, $p < 0.001$, $I^2 = 89.3\%$. In fact, a 95% prediction interval calculated around the average correlation was very wide, with limits from −0.57 to 0.13. This implies that if a new study with similar characteristics to those included in this meta-analysis was conducted, the population correlation between substance abuse and mindfulness could even have a positive sign.

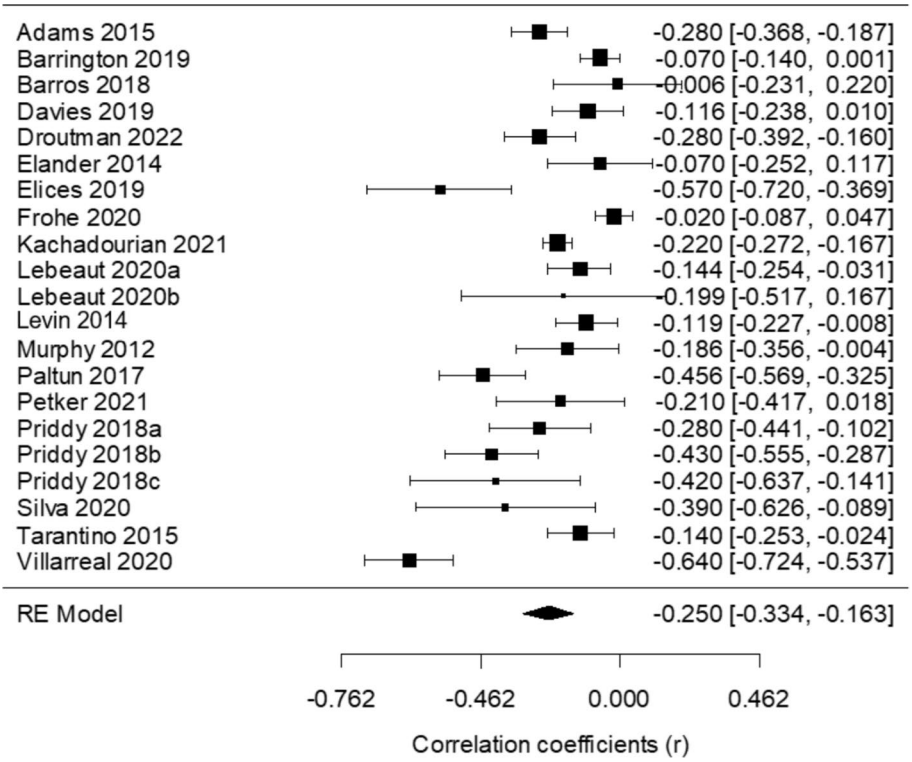

Fig. 2 Forest plot of the 21 correlations between substance abuse and mindfulness. RE model = Random-Effects model; Total sample size = 5793 (minimum = 31, maximum = 1261, median = 156)

Seven studies reported a correlation between substance abuse and experiential avoidance, with values ranging from 0.01 to 0.63. Figure 3 shows a forest plot of the correlations. All correlations had a positive sign, indicating that higher levels of substance abuse are associated with higher levels of experiential avoidance. The average correlation was $r_+ = 0.34$ (95%CI = 0.13 to 0.52), of moderate magnitude (Cohen, 1988), and statistically significant ($p = 0.009$). The correlations exhibited large heterogeneity: $Q(6) = 42.56$, $p < 0.001$, $I^2 = 89.1\%$. In addition, a 95% prediction interval gave limits from −0.26 to 0.73, indicating a large variability in the expected population correlation if a future study similar to those of this meta-analysis was conducted.

Publication Bias

Methods to assess the risk of publication bias in the meta-analytic results were separately applied for the two meta-analyses. Figure 4 shows a funnel plot of the meta-analysis of the correlations between substance abuse and mindfulness. The Egger test did not reach statistical significance: $t(19) = -1.58$, $p = 0.130$, and the trim-and-fill method of imputing missing correlations did not add any correlations. These results allowed publication bias to be ruled out. Figure 5 shows a funnel plot of the correlation between substance abuse and experiential avoidance. The Egger test did not reach statistical significance: $t(5) = -0.09$,

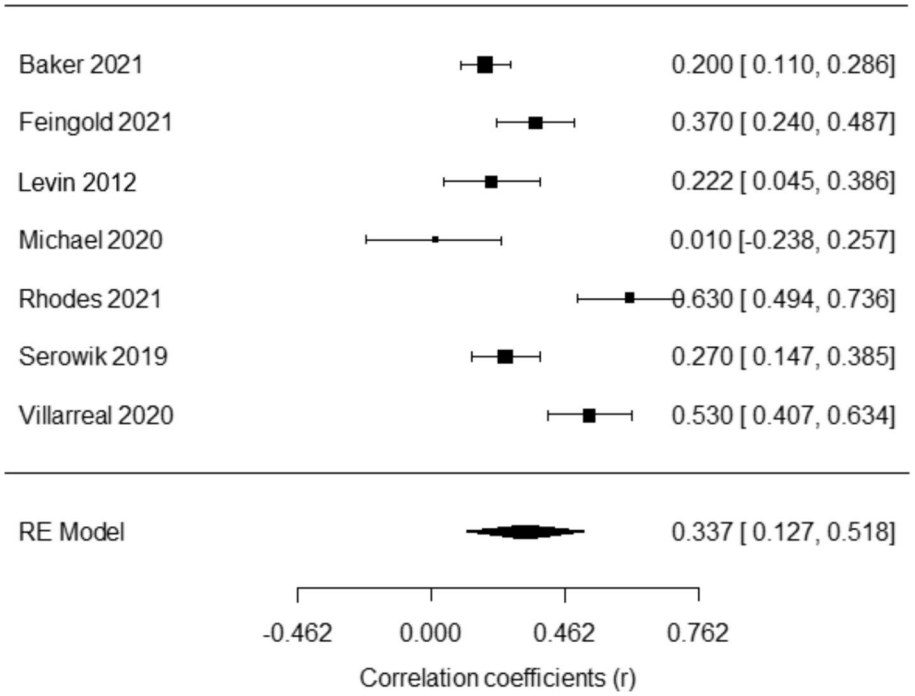

Fig. 3 Forest plot of the 7 correlations between substance abuse and experiential avoidance. RE model = Random-Effects model; Total sample size = 1317 (minimum = 63, maximum = 457, median = 156)

$p = 0.927$. In addition, the trim-and-fill method did not impute missing correlations, allowing the risk of publication bias in the meta-analytic results to be ruled out.

Moderator Analysis

Moderator analyses were conducted for the meta-analysis of the correlations between substance abuse and mindfulness, as this was the only meta-analysis that fulfilled all the conditions (i.e., at least 10 studies and relevant heterogeneity). Simple meta-regressions were applied for four continuous moderators: year of publication of the study, average age of the samples of participants, percentage of women, and sample size. Table 3 shows the results. None of these moderators exhibited a statistically significant association with the correlations between abuse and mindfulness ($p > 0.05$).

Subgroup analyses were conducted for six categorical moderators: target population, type of substance abuse, continent where the study was conducted, type of study design, funding, and statement of conflicts of interest. Table 4 shows the results. A statistically significant association was found between the target population and the correlations ($p = 0.047$), accounting for 27% of the variance. In particular, studies using samples extracted from clinical populations exhibited the strongest negative association between substance abuse and mindfulness ($r_+ = -0.35$), compared with samples presenting with posttraumatic stress symptoms (PTSS) ($r_+ = -0.18$) and the general population ($r_+ = -0.14$). Another moderator that reached statistical significance was the type of substance

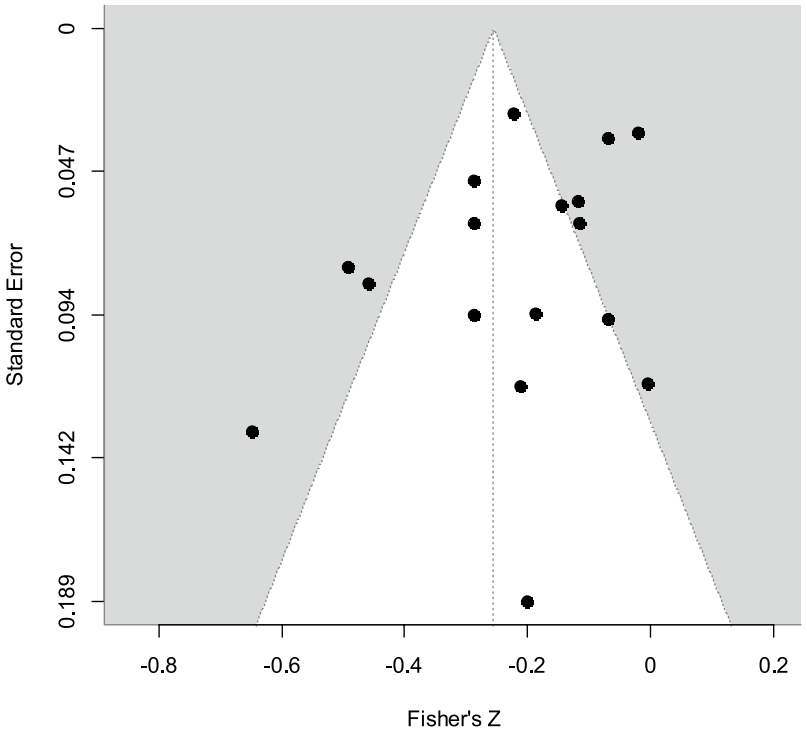

Fig. 4 Funnel plot of the 21 correlations between substance abuse and mindfulness. The Duval and Tweedie (2000) 'trim-and-fill' method did not impute additional correlations

($p = 0.030$), accounting for 47% of the variance. Thus, the strongest negative average correlations between substance abuse and mindfulness were found for stimulants ($r_+ = -0.57$), cannabis ($r_+ = -0.46$), and opioids ($r_+ = -0.39$); however, the results for cannabis and stimulants must be interpreted very cautiously as they were represented by only one study each.

Discussion

The aim of this meta-analysis was to investigate the association between the 12 components of the Hexaflex Model of ACT (Hayes et al., 2013) and substance use behaviours (including SUDs, abuse, addiction, and misuse.) Thus, 24 papers were selected that fulfilled the inclusion criteria, resulting in 27 independent studies that provided correlational data for analysis. To date, no meta-analysis has been conducted to summarize and quantify the association between PF and PI and/or their components, and SUDs, abuse, addiction, and/or misuse. Since ACT has been shown to be a promising treatment for SUDs and substance-related problems, a meta-analysis of this topic is relevant to understanding both the mechanisms that contribute to the onset and maintenance of SUDs and to the therapeutic process, or that may act as protective factors against SUDs.

The present meta-analyses found a significant low to moderate negative association between mindfulness and substance abuse. Although this result is similar to that found in the meta-analysis conducted by Karyadi et al. (2014), the association found in our study is stronger. This finding may be due to the samples included in their meta-analysis, which included problematic use behaviour such as dependence, substance use disorder, problematic levels of substance use, and quantity of substance as inclusion criteria. Furthermore, their samples were mainly non-clinical. The present study also found a significant moderate positive association between experiential avoidance and substance abuse. Only one study reported a low negative correlation between defusion and substance abuse. These patterns of association are consistent with the proposal of the Hexaflex model, which suggests that PI and its six components underlie various psychological problems, including SUDs (Levin et al., 2012a, 2012b). Thus, the positive association between experiential avoidance and substance abuse suggests that people would consume substances to avoid or escape from unpleasant experiences, memories, or feelings (Albal & Buzlu, 2021; Luciano et al., 2010). Conversely, PF and its components—which are considered mechanisms of change in ACT (Ren et al., 2019)—are associated with psychological well-being and general health (Gloster et al., 2017). Hence, the negative association between mindfulness and substance abuse suggests that people who pay attention to their feelings and experiences, and allow themselves to experience them consciously, report less substance abuse. In addition, the negative association between defusion and substance abuse suggests that individuals who can detach themselves from the disturbing thoughts, memories, or inner experiences associated with the consumption of substances would be more likely to successfully overcome cravings and urges to consume substances. They would be able to consciously choose not to consume substances, instead of being guided by their inner experiences and urges to consume.

The present meta-analysis also found that the target population—clinical, general, or with posttraumatic stress symptoms (PTSS)—of the studies analysed was a moderating variable in the association between mindfulness and substance abuse. The association was significantly stronger in clinical samples (Karyadi et al., 2014), but weaker in participants who had experienced trauma and participants from the general population. Mindfulness may be a stronger protective factor against clinical substance abuse (Karyadi et al., 2014). It is possible that clinical samples may have received previous training in mindfulness, which was not controlled for in the included studies. However, the weaker correlation in the samples that had experienced trauma is surprising, since posttraumatic stress disorder (PTSD) is highly correlated with substance abuse (Bartlett et al., 2019), and that mindfulness-based interventions have demonstrated efficacy in treating comorbid PTSD and substance use (Garland et al., 2016). This finding may be because these studies assessed PTSS and the participants did not have a clinical diagnosis of PTSD (Feingold & Zerach, 2021; Lebeaut et al., 2021; Baker et al., 2022; Kachadourian et al., 2021; Davies et al., 2019). In addition, the type of substance abused also moderated the association between mindfulness and substance abuse, accounting for 47% of the variance. Karyadi et al. (2014) also found that substance type was a significant moderator. However, they found that the strongest negative correlations were associated with alcohol and tobacco, whereas the present meta-analysis found that the strongest negative correlations were associated with stimulants and cannabis. These associations could be explained by the fact that these substances are strongly associated with craving (Enkema et al., 2020; Galloway et al., 2008), and mindfulness could counteract these symptoms. However, these correlations should be interpreted with caution since these substances were only included in one study each.

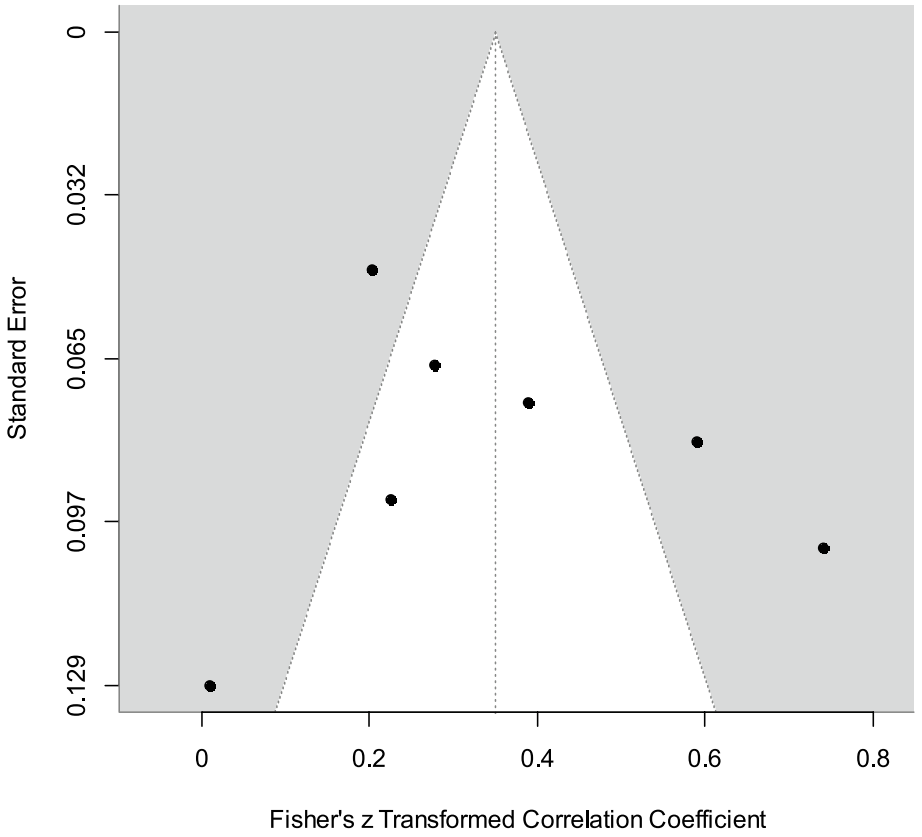

Fig. 5 Funnel plot of the seven correlations between substance abuse and experiential avoidance. The Duval and Tweedie (2000) 'trim-and-fill' method did not impute additional correlations

The search for studies analysing the remaining dimensions of the Hexaflex model was unsuccessful, and more research is needed to disentangle the role of these components in substance abuse. Hence, although the methodological quality of the included studies was satisfactory, the results of this meta-analysis highlight several shortcomings in research on substance abuse and SUDs, as well as the mechanisms of ACT associated with these conditions. These limitations are mainly due to the different conceptualizations of these terms, and the available measurement instruments, all of which require further discussion.

Definitional Consensus

There is a need for accurate, consistent, and consensual conceptualization and measurement of psychological constructs in psychological research (Cherry et al., 2021). In this regard, the definition of addiction has evolved from the DSM-III to the DSM-5: in the DSM-III and DSM-IV it was termed 'dependence' to be less stigmatizing (O'Brien et al., 2006), while in the DSM-5 it was termed SUDs. The use of the term 'dependence' as equivalent to 'addiction' has led to the assumption that symptoms of physical dependence

Table 3 Results of the simple meta-regressions for the correlations between substance abuse and mindfulness

Moderator variable	k	b_j	t	p	R^2
Publication year	21	−0.013	−0.79	.441	0
Sample size	21	0.0002	1.60	.126	0.09
Average age (years)	19	−0.005	−1.29	.214	0.05
% Female	21	0.002	1.51	.147	0.04

k = number of studies; b_j = regression coefficient t = Knapp-Hartung's improved t-statistic for testing the statistical significance of the moderator; R^2 = proportion of variance accounted for by the moderator

Table 4 Results of the subgroup analyses for the correlations between substance abuse and mindfulness

Moderator variable	***k***	r_+	**95% CI** $r_L r_U$	***F***	***p***	R^2
Continent:	1	−0.46	−0.57 −0.33	1.41	.281	0.11
Asia	1	−0.57	−0.72 −0.37			
Europe	15	−0.23	−0.31 −0.15			
North America	2	−0.19	−0.53 0.20			
South America						
Target population:	11	−0.35	−0.46 −0.22	3.64	.047	0.27
Clinical	7	−0.14	−0.23 −0.05			
General	3	−0.18	−0.24 −0.11			
Trauma						
Type of abuse:	6	−0.18	−0.26 −0.10	3.40	.030	0.47
Alcohol	1	−0.46	−0.57 −0.33			
Cannabis	7	−0.15	−0.24 −0.07			
Drugs (in general)	1	−0.01	−0.24 0.22			
Hypnotics/Benzos	5	−0.39	−0.57 −0.16			
Opioids	1	−0.57	−0.72 −0.37			
Stimulants						
Study design:	4	−0.25	−0.42 −0.06	0.00	.994	0
Case–control	17	−0.25	−0.33 −0.17			
Cross-sectional						
Interest conflict:	11	−0.31	−0.43 −0.18	2.18	.412	0
No	3	−0.16	−0.25 −0.06			
Yes	7	−0.20	−0.29 −0.10			
Not reported						
Funding:	1	−0.57	−0.72 −0.37	2.11	.151	0.11
No	12	−0.26	−0.36 −0.16			
Yes	8	−0.18	−0.28 −0.09			
Not reported						

k = number of studies. r_+ = average correlation. r_L and r_U = lower and upper around r_+ confidence limits. F = Knapp-Hartung's improved F-statistic for testing the statistical significance of the moderator. R^2 = proportion of variance accounted for by the moderator; benzos = benzodiazepines

and withdrawal are indicative of addiction (O'Brien et al., 2006; Szalavitz et al., 2021); however, addiction also implies a loss of control over the urges to take a drug despite the adverse consequences (O'Brien et al., 2006). This has led to shortcomings in research on substance abuse and SUDs, with an increasing number of studies assessing withdrawal and

dependence symptoms as indicative of substance abuse and SUDs, instead of considering the additional aspects of addiction.

Similarly, research on PF and PI faces challenges due to the way in which ACT has evolved. Experiential avoidance and acceptance were originally considered as the central constructs of ACT, until they were replaced by the terms of PI and PF, respectively (Cherry et al., 2021). Moreover, previous research has focused on experiential avoidance, rather than acceptance, perhaps because of the traditional emphasis in clinical psychology on symptoms, syndromes, and deficits (Doorley et al., 2020). Recent research shows discrepancies in assumptions about the constructs proposed in the Hexaflex model. While the theoretical model proposes two different constructs—PF and PI, each composed of six distinct-interrelated processes—researchers have considered them as a continuum, with PI being the inverse of PF, rather than two distinct yet related constructs (Cherry et al., 2021; Rolffs et al., 2018). Moreover, regarding the PF model, Hayes et al. (2012) suggested that the more deeply interrelated components can be grouped into three pairs: open (acceptance and defusion), centred (mindfulness and self-as-context), and engaged (committed action and values). In addition, Hayes et al. (2013) suggested that they can be reorganized in two ways: acceptance and mindfulness (including acceptance, defusion, self-as-context, and mindfulness), and commitment and behaviour change (including committed action, values, self-as-context, and mindfulness).

Measures of PF and PI

The results of this study were limited to two components of the Hexaflex Model that have been widely studied in substance abuse behaviour research: mindfulness (18 studies, 21 independent samples) and experiential avoidance (seven studies). In addition, only one study (Michael and Juarascio, 2020) considered defusion.

The large number of studies analysing the role of mindfulness in SUDs is not surprising, given the growing research on mindfulness-based treatment approaches in contextual therapies for substance abuse (Lee et al., 2015). The studies included in this meta-analysis used different measures of this component, such as unidimensional measures (i.e., MAAS, reported in eight studies) or multidimensional measures (i.e., FFMQ, reported in eight studies; MAIA, reported in one study; and KIMS, reported in one study). In the present study, these instruments were considered as measures of mindfulness, awareness, or contact with the present moment, but other authors consider that some subscales of these instruments (i.e., FFMQ or PHLMS) can be used as acceptance measures (Michael and Juarascio, 2020; Daks & Rogge, 2020). In addition, Daks and Rogge (2020) considered the MAAS as a measure of a lack of present moment awareness, as its items are formulated as inattention or distraction phrases, but it is reverse scored.

The experiential avoidance component was assessed in seven studies: six used the AAQ-II, and one used the MEAQ (Serowik & Orsillo, 2019). In the context of the aforementioned lack of consensus on definitions of PF and PI, the AAQ-II was initially developed as a measure of experiential avoidance. Previous authors have suggested that it can also be used as a measure of PI (Bond et al., 2011). However, this measure is used in research indistinctly as a measure of either experiential avoidance, PI, or PF (Cherry et al., 2021). The studies included in this meta-analysis used the AAQ-II as a measure of experiential avoidance (Michael and Juarascio, 2020; Feingold & Zerach, 2021; Levin et al., 2012a, 2012b), PF using reversed-scoring (Baker et al., 2022), and PI (Villarreal et al., 2020).

Finally, although Rhodes et al. (2021) described this questionnaire as a measure of experiential avoidance and PI, they reported their results in terms of PF.

The widespread use of the AAQ-II in research is surprising, as previous authors in recent years have noted their concerns about its discriminant validity (Tyndall et al., 2019), suggesting that it fails to discriminate PF or PI from psychological constructs such as neuroticism and negative affect (Rochefort et al., 2018). Moreover, despite the development of a specific measure for substance abuse samples—the AAQ-SA (Luoma et al., 2011)—none of the studies included in this meta-analysis employed it. In view of the foregoing, the results of this meta-analysis should be interpreted with caution.

Clinical Implications

Although previous meta-analyses have investigated the efficacy of ACT-based therapies for SUDs and suggested that these are promising therapeutic approaches, they have all drawn attention to the lack of identification of change processes as the main limitation of ACT research for SUDs (Ii et al., 2019; Lee et al., 2015; Ren et al., 2019). This is not surprising since, as mentioned above, few instruments have been developed to measure all the components of the Hexaflex Model, and the AAQ-II has been the most widely used of these measures (Cherry et al., 2021; Doorley et al., 2020).

Limitations of this Meta-Analysis

This study has some limitations. Firstly, the results of the included studies were based on cross-sectional data, so the direction of causality remains unclear. Therefore, these results have to be interpreted with caution. Secondly, the multidimensional measures of contact with the present moment (i.e., FFMQ) were transformed into single correlation coefficients to report coefficients that were comparable to the unidimensional measures used (i.e., MAAS). Thus, information on how dimensions of this construct relate to substance abuse may be missing. Thirdly, the review of the definitions and assessment of abuse (i.e., excluding studies that only assessed craving as a measure of abuse, or studies that only considered physical dependence as abuse) may have resulted in missing information. Fourthly, the wide variety of measures and samples included in the studies reviewed may have introduced heterogeneity into the estimates of the association between mindfulness, experiential avoidance, and substance abuse. Fifthly, moderator analysis could not be calculated for the meta-analysis of the correlations between experiential avoidance and substance abuse because the number of studies that reported this association was insufficient to reach statistical power in the moderation analysis. Sixthly, the variety of substances analysed in the different studies could have led to heterogeneity in the results of this study.

Reflections for Future Research

Research on ACT should focus on exploring the mechanisms of origin and maintenance of psychological disorders, as well as the change processes during the therapeutic process. To achieve this, researchers should use the multidimensional measures developed to assess the different components of the Hexaflex Model (Hayes et al., 2013).

In recent years, several multidimensional instruments have been developed. The PPFI (Kashdan et al., 2020) is considered the best measure of PF available (Cherry et al., 2021).

The MPFI is another instrument that attempts to address the six components of PF and the six components of PI (Rolffs et al., 2018). CompACT is another example of a measure of PF (Francis et al., 2016). Moreover, ACT research on SUDs, substance abuse, and addiction could use the specific measure of experiential avoidance for substance abuse (AAQ-SA, Luoma et al., 2011) to assess this component. As previous research has suggested (Cherry et al., 2021; Doorley et al., 2020), we encourage researchers to use these multidimensional measures to thoroughly assess the mechanisms of ACT.

Conclusions

The Hexaflex/Inflexahex model has great heuristic value, as it offers a transdiagnostic approach to the origin and maintenance of a variety of psychological problems, as well as mechanisms for enhancing psychological health and well-being. However, in line with previous research, the results of the present meta-analysis suggest that the potential of the model is yet to be empirically determined in SUDs. There is little information on the role of all six components of PI in the origin of SUDs, as experiential avoidance has been studied more than the other components. There is also limited data on ACT's six mechanisms of change for SUDs, since studies have focused on symptom improvement or have not measured the six components simultaneously. In the present meta-analysis, mindfulness was the most studied process of change. Given that the majority of the available evidence regarding the relationship between SUDs and ACT is based on experiential avoidance and mindfulness, further research is needed to clarify the empirical utility of the remaining components of the Hexaflex Model in SUDs research and therapeutic contexts.

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Declarations

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Conflicts of Interests No potential conflict of interest was reported by the authors. All the authors declare no conflicts of interest.

References

Adams, C. E., Cano, M. A., Heppner, W. L., Stewart, D. W., Correa-Fernández, V., Vidrine, J. I., Li, Y., Cinciripini, P. M., Ahluwalia, J. S., & Wetter, D. W. (2015). Testing a Moderated Mediation Model of Mindfulness, Psychosocial Stress, and Alcohol Use Among African American Smokers. *Mindfulness, 6*(2), 315–325. https://doi.org/10.1007/s12671-013-0263-1

Albal, E., & Buzlu, S. (2021). The effect of maladaptive schemas and psychological flexibility approaches on the addiction severity of drug addicts. *Archives of Psychiatric Nursing, 35*(6), 617–624. https://doi.org/10.1016/j.apnu.2021.09.001

American Psychiatric Association (2013). Diagnostic and statistical manual of mental disorders (5th ed.) https://doi.org/10.1176/appi.books.9780890425596.

American Psychiatric Association. (1987). Diagnostic and Statistical Manual of Mental Disorders (3rd ed., revised). https://doi.org/10.1176/appi.books.9780890420188.dsm-iii-r

American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.). https://doi.org/10.1176/appi.books.9780890420249.dsm-iv-tr

Baker, L. D., Stroman, J. C., Kalantar, E. A., Bock, R. C., & Berghoff, C. R. (2022). Indirect Associations Between Posttraumatic Stress Symptoms and Other Psychiatric Symptoms, Alcohol Use, and Well-being via Psychological Flexibility Among Police Officers. *Journal of Traumatic Stress, 35*(1), 55–65. https://doi.org/10.1002/jts.22677

Barrington, J., Weaver, A., & Brebner, K. (2019). Exploring mindfulness in relation to alcohol and cannabis use among first year university students. *College Student Journal, 53*(2), 163–174.

Barros, V. V., Opaleye, E. S., Demarzo, M., Bowen, S., Curado, D. F., Hachul, H., & Noto, A. R. (2018). Dispositional mindfulness, anticipation and abstinence symptoms related to hypnotic dependence among insomniac women who seek treatment: A cross-sectional study. *PLoS ONE, 13*(3), e0194035. https://doi.org/10.1371/journal.pone.0194035

Bartlett, B. A., Smith, L. J., Lebeaut, A., Tran, J. K., & Vujanovic, A. A. (2019). PTSD symptom severity and impulsivity among firefighters: Associations with alcohol use. *Psychiatry Research, 278*, 315–323. https://doi.org/10.1016/j.psychres.2019.06.039

Blanch, B., Buckley, N. A., Mellish, L., Dawson, A. H., Haber, P. S., & Pearson, S. A. (2015). Harmonizing post-market surveillance of prescription drug misuse: A systematic review of observational studies using routinely collected data (2000–2013). *Drug Safety, 38*, 553–564. https://doi.org/10.1007/s40264-015-0294-8

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., Waltz, T., & Zettle, R. D. (2011). Preliminary Psychometric Properties of the Acceptance and Action Questionnaire–II: A Revised Measure of Psychological Inflexibility and Experiential Avoidance. *Behavior Therapy, 42*(4), 676–688. https://doi.org/10.1016/j.beth.2011.03.007

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2021). Introduction to meta-analysis (2nd ed.). Wiley.

Botella, J., & Sánchez-Meca, J. (2015). *Meta-análisis en ciencias sociales y de la salud [*Meta-*analysis in social and health sciences].* Pirámide.

Cherry, K. M., Hoeven, E. V., Patterson, T. S., & Lumley, M. N. (2021). Defining and measuring "psychological flexibility": A narrative scoping review of diverse flexibility and rigidity constructs and perspectives. *Clinical Psychology Review, 84*, 101973. https://doi.org/10.1016/j.cpr.2021.101973

Chin, F., & Hayes, S. C. (2017). Acceptance and Commitment Therapy and the Cognitive Behavioral Tradition. In *The Science of Cognitive Behavioral Therapy* (pp. 155–173). Elsevier. https://doi.org/10.1016/B978-0-12-803457-6.00007-6

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.). Erlbaum.

Cooper, H., Hedges, L. V., & Valentine, J. F. (Eds) (2019). *The handbook of research synthesis and meta-analysis* (3rd ed.). Rusell Sage Foundation.

Daks, J. S., & Rogge, R. D. (2020). Examining the correlates of psychological flexibility in romantic relationship and family dynamics: A meta-analysis. *Journal of Contextual Behavioral Science, 18*, 214–238.

Davies, R. L., Prince, M. A., Bravo, A. J., Kelley, M. L., & Crain, T. L. (2019). Moral Injury, Substance Use, and Posttraumatic Stress Disorder Symptoms Among Military Personnel: An Examination of Trait Mindfulness as a Moderator. *Journal of Traumatic Stress, 32*(3), 414–423. https://doi.org/10.1002/jts.22403

Doorley, J. D., Goodman, F. R., Kelso, K. C., & Kashdan, T. B. (2020). Psychological flexibility: What we know, what we do not know, and what we think we know. *Social and Personality Psychology Compass, 14*(12), 1–11. https://doi.org/10.1111/spc3.12566

Droutman, V., Poppa, T., Monterosso, J., Black, D., & Amaro, H. (2022). Association Between Dispositional Mindfulness, Clinical Characteristics, and Emotion Regulation in Women Entering Substance Use Disorder Treatment: An fMRI Study. *Mindfulness, 13*(6), 1430–1444. https://doi.org/10.1007/s12671-022-01878-8

Elander, J., Duarte, J., Maratos, F. A., & Gilbert, P. (2014). Predictors of Painkiller Dependence among People with Pain in the General Population. *Pain Medicine, 15*(4), 613–624. https://doi.org/10.1111/pme.12263

Elices, M., Tejedor, R., Pascual, J. C., Carmona, C., Soriano, J., & Soler, J. (2019). Acceptance and present-moment awareness in psychiatric disorders: Is mindfulness mood dependent? *Psychiatry Research, 273*, 363–368. https://doi.org/10.1016/j.psychres.2019.01.041

Enkema, M. C., Hallgren, K. A., & Larimer, M. E. (2020). Craving is impermanent and it matters: Investigating craving and cannabis use among young adults with problematic use interested in reducing use. *Drug Alcohol Depend, 210*, 107957. https://doi.org/10.1016/j.drugalcdep.2020.107957

European Medicines Agency (2013). Guidelines on good pharmacovigilance practices (GPV). Module VI: management and reporting of adverse reactions to 5 medicinal products (Rev 1). European Medicines Agency. http://www.ema.europa.eu/docs/en_GB/document_library/Scientific _guideline/2012/06/WC500129134.pdf

Feingold, D., & Zerach, G. (2021). Emotion regulation and experiential avoidance moderate the association between posttraumatic symptoms and alcohol use disorder among Israeli combat veterans. *Addictive Behaviors, 115*, 106776. https://doi.org/10.1016/j.addbeh.2020.106776

Francis, A. W., Dawson, D. L., & Golijani-Moghaddam, N. (2016). The development and validation of the Comprehensive assessment of Acceptance and Commitment Therapy processes (CompACT). *Journal of Contextual Behavioral Science, 5*(3), 134–145.

Frohe, T., Leeman, R. F., Cheong, J., Belton, D. A., & Patock-Peckham, J. A. (2020). Novel Associations Among Trauma, Mindfulness, and Impaired Control Over Alcohol Use. *Mindfulness, 11*(3), 606–614. https://doi.org/10.1007/s12671-019-01285-6

Methamphetamine Treatment Project Corporate Authors. (2008). How long does craving predict use of methamphetamine? Assessment of use one to seven weeks after the assessment of craving. *Substance Abuse: Research and Treatment, 1*, 63–79. https://doi.org/10.4137/SART.S775

Garland, E. L., Roberts-Lewis, A., Tronnier, C. D., Graves, R., & Kelley, K. (2016). Mindfulness-Oriented Recovery Enhancement versus CBT for co-occurring substance dependence, traumatic stress, and psychiatric disorders: Proximal outcomes from a pragmatic randomized trial. *Behaviour Research and Therapy, 77*, 7–16. https://doi.org/10.1016/j.brat.2015.11.012

Gaznick, N., Judd, P.A. (2020). Psychosocial Treatment of Substance Use Disorders. In: Marienfeld, C. (eds). *Absolute Addiction Psychiatry Review* (pp. 71–85). Springer, Cham. https://doi.org/10.1007/978-3-030-33404-8_5

Gloster, A. T., Meyer, A. H., & Lieb, R. (2017). Psychological flexibility as a malleable public health target: Evidence from a representative sample. *Journal of Contextual Behavioral Science, 6*(2), 166–171. https://doi.org/10.1016/j.jcbs.2017.02.003

Hartung, J., & Knapp, G. (2001). On tests of the overall treatment effect in the meta-analysis with normally distributed responses. *Statistics in Medicine, 20*(12), 1771–1782. https://doi.org/10.1002/sim.791

Hayes, S. C., Levin, M. E., Plumb-Vilardaga, J., Villatte, J. L., & Pistorello, J. (2013). Acceptance and commitment therapy and contextual behavioral science: Examining the progress of a distinctive model of behavioral and cognitive therapy. *Behavior Therapy, 44*(2), 180–198. https://doi.org/10.1016/j.beth.2009.08.002

Hayes, S. C., Strosahl, K. D. y Wilson, K. G. (1999). *Acceptance and Commitment Therapy. An experiential approach to behavior change.* Guilford.

Hayes, S. C., Strosahl, K., & Wilson, K. G. (2012). *Acceptance and commitment therapy: The process and practice of mindful change* (2nd ed). Guilford Press.

Higgins, J. P. T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M., & Welch, V. (Eds.) (2019). *Cochrane* handbook *for systematic reviews of interventions Version 6.* The Cochrane Collaboration. Available from wwww.handbook.cochrane.org.

Higgins, J. P. T., & Thomas, J. (Eds.) (2019). *Cochrane handbook for systematic reviews of* interventions (2nd ed.). Wiley.

Ii, T., Sato, H., Watanabe, N., Kondo, M., Masuda, A., Hayes, S. C., & Akechi, T. (2019). Psychological flexibility-based interventions versus first-line psychosocial interventions for substance use disorders: Systematic review and meta-analyses of randomized controlled trials. *Journal of Contextual Behavioral Science, 13*, 109–120. https://doi.org/10.1016/j.jcbs.2019.07.003

Kachadourian, L. K., Harpaz-Rotem, I., Tsai, J., Southwick, S., & Pietrzak, R. H. (2021). Mindfulness as a mediator between trauma exposure and mental health outcomes: Results from the National Health and Resilience in Veterans Study. *Psychological Trauma, 13*(2), 223–230. https://doi.org/10.1037/tra0000995

Karyadi, K. A., VanderVeen, J. D., & Cyders, M. A. (2014). A meta-analysis of the relationship between trait mindfulness and substance use behaviors. *Drug and Alcohol Dependence, 143*, 1–10. https://doi.org/10.1016/j.drugalcdep.2014.07.014

Kashdan, T. B., Disabato, D. J., Goodman, F. R., Doorley, J. D., & McKnight, P. E. (2020). Understanding psychological flexibility: A multimethod exploration of pursuing valued goals despite the presence of distress. *Psychological Assessment, 32*(9), 829–850. https://doi.org/10.1037/pas0000834

Knapp, G., & Hartung, J. (2003). Improved tests for a random effects meta-regression with a single covariate. *Statistics in Medicine, 22*(17), 2693–2710. https://doi.org/10.1002/sim.1482

Lebeaut, A., Zegel, M., Leonard, S. J., Bartlett, B. A., & Vujanovic, A. A. (2021). Examining Transdiagnostic Factors among Firefighters in Relation to Trauma Exposure, Probable PTSD, and Probable Alcohol Use Disorder. *Journal of Dual Diagnosis, 17*(1), 52–63. https://doi.org/10.1080/15504263.2020.1854411

Lee, E. B., An, W., Levin, M. E., & Twohig, M. P. (2015). An initial meta-analysis of Acceptance and Commitment Therapy for treating substance use disorders. *Drug and Alcohol Dependence, 155*, 1–7. https://doi.org/10.1016/j.drugalcdep.2015.08.004

Levin, M. E., Dalrymple, K., & Zimmerman, M. (2014a). Which facets of mindfulness predict the presence of substance use disorders in an outpatient psychiatric sample? *Psychology of Addictive Behaviors, 28*(2), 498–506. https://doi.org/10.1037/a0034706

Levin, M. E., Hildebrandt, M. J., Lillis, J., & Hayes, S. C. (2012a). The Impact of Treatment Components Suggested by the Psychological Flexibility Model: A Meta-Analysis of Laboratory-Based Component Studies. *Behavior Therapy, 43*(4), 741–756. https://doi.org/10.1016/j.beth.2012.05.003

Levin, M. E., Lillis, J., Seeley, J., Hayes, S. C., Pistorello, J., & Biglan, A. (2012b). Exploring the Relationship Between Experiential Avoidance, Alcohol Use Disorders, and Alcohol-Related Problems Among First-Year College Students. *Journal of American College Health, 60*(6), 443–448. https://doi.org/10.1080/07448481.2012.673522

Levin, M. E., MacLane, C., Daflos, S., Seeley, J. R., Hayes, S. C., Biglan, A., & Pistorello, J. (2014b). Examining psychological inflexibility as a transdiagnostic process across psychological disorders. *Journal of Contextual Behavioral Science, 3*(3), 155–163. https://doi.org/10.1016/j.jcbs.2014.06.003

Luciano, C., Páez-Blarrina, M., & Valdivia-Salas, S. (2010). La Terapia de Aceptación y Compromiso (ACT) en el consumo de sustancias como estrategia de Evitación Experiencial. *International Journal of Clinical and Health Psychology, 10*(1), 141–165.

Luoma, J., Drake, C. E., Kohlenberg, B. S., & Hayes, S. C. (2011). Substance abuse and psychological flexibility: The development of a new measure. *Addiction Research & Theory, 19*(1), 3–13. https://doi.org/10.3109/16066359.2010.524956

McCracken, L. M., & Morley, S. (2014). The psychological flexibility model: A basis for integration and progress in psychological approaches to chronic pain management. *The Journal of Pain, 15*(3), 221–234. https://doi.org/10.1016/j.jpain.2013.10.014

McLellan, A. T. (2017). Substance misuse and substance use disorders: Why do they matter in healthcare? *Transactions of the American Clinical and Climatological Association, 128*, 112–130.

Michael, M. L., & Juarascio, A. (2020). Differences in eating disorder symptoms and affect regulation for residential eating disorder patients with problematic substance use. *Eating and Weight Disorders, 25*(6), 1805–1811. https://doi.org/10.1007/s40519-019-00789-3

Murphy, C., & MacKillop, J. (2012). Living in the here and now: Interrelationships between impulsivity, mindfulness, and alcohol misuse. *Psychopharmacology, 219*(2), 527–536. https://doi.org/10.1007/s00213-011-2573-0

O'Brien, C. P., Volkow, N., & Li, T. K. (2006). What's in a word? Addiction versus dependence in DSM-V. *American Journal of Psychiatry, 163*(5), 764–765. https://doi.org/10.1176/ajp.2006.163.5.764

Osaji, J., Ojimba, C., & Ahmed, S. (2020). The Use of Acceptance and Commitment Therapy in Substance Use Disorders: A Review of Literature. *Journal of Clinical Medicine Research, 12*(10), 629–633.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 372 https://doi.org/10.1136/bmj.n71

Paltun, S. C., Altunsoy, N., Özdemir, S. D., & Okay, I. T. (2017). Does trait mindfulness level affect quitting cannabis use? A six week follow-up study. *Archives of Clinical Psychiatry (São Paulo), 44*(6), 139–144. https://doi.org/10.1590/0101-60830000000139

Petker, T., Yanke, C., Rahman, L., Whalen, L., Demaline, K., Whitelaw, K., Bang, D., Holshausen, K., Amlung, M., & MacKillop, J. (2021). Naturalistic Evaluation of an Adjunctive Yoga Program for Women with Substance Use Disorders in Inpatient Treatment: Within-Treatment Effects on Cravings, Self-efficacy, Psychiatric Symptoms, Impulsivity, and Mindfulness. *Substance Abuse: Research and Treatment, 15*, 117822182110266. https://doi.org/10.1177/11782218211026651

Priddy, S. E., Hanley, A. W., Riquino, M. R., Platt, K. A., Baker, A. K., & Garland, E. L. (2018). Dispositional mindfulness and prescription opioid misuse among chronic pain patients: Craving and attention to positive information as mediating mechanisms. *Drug and Alcohol Dependence, 188*, 86–93. https://doi.org/10.1016/j.drugalcdep.2018.03.040

Ren, Z., Zhao, C., Bian, C., Zhu, W., Jiang, G., & Zhu, Z. (2019). Mechanisms of the acceptance and commitment therapy: A meta-analytic structural equation model. *Acta Psychologica Sinica, 51*(6), 662–676. https://doi.org/10.3724/SP.J.1041.2019.00662

Rhodes, A., Marks, D., Block-Lerner, J., & Lomauro, T. (2021). Psychological Flexibility, Pain Characteristics and Risk of Opioid Misuse in Noncancerous Chronic Pain Patients. *Journal of Clinical Psychology in Medical Settings, 28*(2), 405–417. https://doi.org/10.1007/s10880-020-09729-1

Rochefort, C., Baldwin, A. S., & Chmielewski, M. (2018). Experiential avoidance: An examination of the construct validity of the AAQ-II and MEAQ. *Behavior Therapy, 49*(3), 435–449.

Rolffs, J. L., Rogge, R. D., & Wilson, K. G. (2018). Disentangling Components of Flexibility via the Hexaflex/Inflexahex Model: Development and Validation of the Multidimensional Psychological Flexibility Inventory (MPFI). *Assessment, 25*(4), 458–482. https://doi.org/10.1177/1073191116645905

Rothstein, H. R., Sutton, A. J., & Borenstein, M. (Eds.). (2005). *Publication bias in meta-analysis: prevention, assessment, and adjustments*. Wiley. https://doi.org/10.1002/0470870168

Ruiz, F. J. (2010). A review of Acceptance and Commitment Therapy (ACT) empirical evidence: Correlational, experimental psychopathology, component and outcome studies. *International Journal of Psychology and Psychological Therapy, 10*(1), 125–162.

Sánchez-Meca, J., & Marín-Martínez, F. (2008). Confidence intervals for the overall effect size in random-effects meta-analysis. *Psychological Methods, 13*(1), 31–48. https://doi.org/10.1037/1082-989X.13.1.31

Schmid, C. H., Stijnen, T., & White, I. R. (Eds.) (2021). *Handbook of meta-analysis.* CRC Press.

Serowik, K. L., & Orsillo, S. M. (2019). The relationship between substance use, experiential avoidance, and personally meaningful experiences. *Substance Use and Misuse, 54*(11), 1834–1844. https://doi.org/10.1080/10826084.2019.1618329

Silva, D. P. R., & Rocha, M. M. D. (2020). Uso de substâncias em adultos em situação de rua e associação com mindfulness. *SMAD Rev Eletr Salud Ment Álcoo Drog (Edição Em Português), 16*(2), 25–33.

Szalavitz, M., Rigg, K. K., & Wakeman, S. E. (2021). Drug dependence is not addiction—and it matters. *Annals of Medicine, 53*(1), 1989–1992. https://doi.org/10.1080/07853890.2021.1995623

Tarantino, N., Lamis, D. A., Ballard, E. D., Masuda, A., & Dvorak, R. D. (2015). Parent–child conflict and drug use in college women: A moderated mediation model of self-control and mindfulness. *Journal of Counseling Psychology, 62*(2), 303–313. https://doi.org/10.1037/cou0000013

Tyndall, I., Waldeck, D., Pancani, L., Whelan, R., Roche, B., & Dawson, D. L. (2019). The Acceptance and Action Questionnaire-II (AAQ-II) as a measure of experiential avoidance: Concerns over discriminant validity. *Journal of Contextual Behavioral Science, 12*, 278–284. https://doi.org/10.1016/j.jcbs.2018.09.005

Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software, 36*, 1–48. https://doi.org/10.18637/jss.v036.i03

Villarreal, Y. R., Stotts, A. L., Paniagua, S. M., Rosen, K., Eckmann, M., Suchting, R., & Potter, J. S. (2020). Mindfulness predicts current risk of opioid analgesic misuse in chronic low back pain patients receiving opioid therapy. *Journal of Contextual Behavioral Science, 18*, 111–116. https://doi.org/10.1016/j.jcbs.2020.08.011

Weeks, S. N., Renshaw, T. L., Galliher, R. V., & Tehee, M. (2020). The moderating role of psychological inflexibility in the relationship between minority stress, substance misuse, and suicidality in LGB+ adolescents. *Journal of Contextual Behavioral Science, 18*, 276–286. https://doi.org/10.1016/j.jcbs.2020.10.007

Wells G, Shea B, O'Connell D, Peterson J, Welch V, Losos M, et al. (2015). The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp.

World Health Organization (2021). International Classification of Diseases, Eleventh Revision (ICD-11). https://icd.who.int/browse11.

Wilson, K. G., & Luciano, M. C. (2014). *Terapia de aceptación y compromiso (ACT) Un tratamiento conductual orientado a los valores*. Pirámide.