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EMOTION AND ADDICTION (K MORIE, SECTION EDITOR)

Dweck's Mindset Theory Applied to Addictions: a Scoping Review

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Abstract

Purpose of review Mindset theory has been applied to a wide range of educational and health topics, and more recently, to addictions. The present preregistered scoping review was conducted, following the PRISMA-ScR guidelines, in order to answer three questions: (1) To what extent has mindset theory literature been linked to addiction research (including substance addiction and behavioral addiction)? (2) What interventional tools based on mindset theory have been used, in this context, in order to improve patients' health, and to what effects? (3) What gaps and limitations exist in today's literature, and where to guide future research in order to properly assess the effects of mindset theory on addictions?

Recent findings Database search included APA PsychINFO and PubMed, and a manual search was also conducted. A total of 1903 documents were reviewed. Screening processes resulted in the inclusion of 18 articles. Analysis revealed that the field is still in a nascent state. More research is needed in order to properly evaluate the effect of mindset theory on addictions. Mindset interventions and manipulations have seldom been implemented. Most studies used cross-sectional designs, preventing from making causal inferences. Studies were also limited by the use of self-report data. Questions were raised concerning the hypothesis of similarity and specificity between mindset and addiction, and the place of mindset theory within known addiction frameworks.

Summary The present scoping review points out that more research, using intervention procedure and objective data collection, should be conducted in order to properly assess the impact of mindset theory on addictions.

Keywords Mindset theory · Addiction · Behavioral addiction · Scoping review

Introduction

Dweck's mindset theory [1, 2] posits that individuals can endorse two distinct views of their personal characteristics (e.g., intelligence, sociability, anxiety, etc.). With a fixed view, people believe their traits "are built in and fixed by nature (an entity theory or fixed mindset)" ([1] p. 614); with a malleable view, they believe that they can change their personal characteristics "through nurture and their own persistent efforts (an incremental theory or growth mindset)" ([1] p. 614). Since its inception, mindset theory has been applied to a variety of topics, such as improving academic transitions and achievement [3], decreasing weight and obesity [4, 5], anxiety and depression [6], or stress and coping [7].

Recently, researchers developed an interest in the relation between mindset theory and addiction [8•, 9, 10]. This scoping review aimed at understanding the nature and extent of this link, and informing the direction of research on this relatively new topic. Most reviews and meta-analytical works linking behavior change theories or behavior change techniques and addiction usually focused on one or two addictions (e.g. cannabis [11]; alcohol [12]; cocaine and amphetamine [13]; problematic gambling [14]; opioids [15]). As the aim of the present scoping review was to apprehend the entire scope of research covering mindset and addiction, it did not focus on a specific addiction and included both substance and behavioral addictions.

This article is part of the Topical Collection on *Emotion and Addiction*

Public health significance statements: This review found that mindset theory and interventions are increasingly being studied in relation to substance and behavior addiction. Results on addiction outcomes are encouraging, but more research is needed to fully assess their impact.

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Background

Addiction is defined as "a condition characterized by regular or poorly controlled use of a psychoactive substance despite adverse physical, psychological, or social consequences, often with the development of physiological tolerance and withdrawal symptoms; an instance of this" (Oxford University Press, 2010). The DSM-V [16] expanded this definition by including behavioral addictions like gambling disorder. Other addictions such as compulsive buying, excessive sexual behaviors and internet use were not included in the DSM-V but remained under consideration, as it was deemed that there was insufficient evidence to classify them as their own behavioral addiction, despite the interest they have garnered from researchers across the world [17]. Gaming addiction was also included in the DSM-V's appendix as a disorder gathering interest, but not viewed as a diagnostic category yet. The present scoping review aimed to assess the largest range of research linking mindset theory and addiction, and considered several behavioral addictions (e.g., sex, internet use, gambling, compulsive buying, excessive exercise, …), even if they were not yet labeled as such in international classifications like the DSM-V.

According to the World Drug Report (2021), about 5.5% (275 million people) of the world population from 15 to 74-year-old used drugs (not counting alcohol) at least once in 2018, a number that increased by 22% from 2010 to 2019. Approximately 13% (36.3 million) of the 275 million drug users would suffer from drug use disorders. Drug use disorders were linked to comorbid mental health disorders such as depression, anxiety or psychosis [18–20]. Cannabis remained the most commonly used drug, with 200 million users in 2018. Opioids, which were the most harmful drugs for users, were used by 62 million people, amphetamines by 27 million, and cocaine by 20 million. Alcohol and tobacco were also drugs that caused global risk factors for disability and premature loss of life [21]. In 2015, 18.4% of the world adult population reported at least one heavy episodic alcohol use in the past 30 days, with an age-standardized prevalence of dependence of 843.2 per 100,000 people [22]. Regarding tobacco, 15.2% of the global population reported daily tobacco smoking, considered as a significant indicator of dependence since daily smokers have very low chance of successfully quitting in any given attempt [23].

Behavioral addictions, if not a new phenomenon, are a relatively newly studied subject [24, 25]. It appeared that the neuroadaptation characteristic of substance abuse (i.e. tolerance and withdrawal from a substance) could also originate from behaviors such as gambling, shopping, eating or exercising [26•], thus creating dependence for the subject. Furthermore, studies showed that the brain would view rewards and pleasure without necessarily distinguishing between its potential sources, whether it be a substance or a behavior [24, 27]. Paired with the fact that addictions (both substance and behavior addiction) can be expressed in a wide range of behavioral patterns, some authors proposed a revised view of addiction. They can be seen as a specific object-focused disorder, or as a broader and more dynamic syndrome with common etiology (i.e. interactions between the subject, the object of addiction, and the environment) and multiple expressions [26•]. Behavioral addictions have had deleterious consequences for people and can increase the risk to develop other forms of addictions [26•]. Prevalence varied between addictions, ranging from 3 to 6% for hypersexual disorders, 1.5 to 8.2% for internet addiction, 8.6% for problematic gaming or 5.8% for compulsive buying [26•].

To treat such complex and evolving disorders, pharmacological treatments do not always suffice or are even pertinent, and a variety of psychosocial interventions is often employed. Cognitive Behavioral Therapy (CBT) and short Motivational Interviewing (MI) are both widely implemented and studied treatment techniques [26•]. They were effective for a variety of addictions, such as cannabis [11], alcohol [28], cocaine and methamphetamine [13], or gambling [14]. Concerning opioid addiction, however, evidence for the supposed rehabilitative effects (e.g. employment, quality of life) of psychosocial interventions was scant [15]. Relapses are considered a normal occurrence when undergoing addiction treatment, and do not mean that the treatment has failed. Nonetheless, the authors [26•] noted that this might, in part, be caused by the fact that treatments focused on specific objects (e.g., alcohol consumption; gambling problem; etc.) and not the underlying addiction syndrome, which can take many forms and evolve with time. New approaches and theories, such as Mindset Theory [1], might bring a fresh eye to this question, and potentially new answers.

Mindset Theory and Interventions

The scientific literature showed the beneficial consequences of having a growth mindset (vs. a fixed mindset) on a wide range of educational contexts and topics (see meta-analysis by [29]). More precisely, the growth mindset helped students to better adapt to academic transitions [30, 31], particularly when having a low socioeconomic status [32] or being academically at risk [3]. Growth mindset also positively impacted mental and physical health. Studies showed that students who entered high school perceived less stress and illness during the academic transition when having a growth mindset [33], and that students who transitioned to college expressed more proactive coping and

felt less stressed [34]. Mindset theory has been applied to health outcomes such as weight loss [4, 5], anxiety and depression [6], or psychological distress and coping [7], with individuals also benefiting from the growth mindset, compared to the fixed mindset. Recently, mindset theory has been applied to the domain of addiction [8•, 9, 10]. The authors defended that endorsing a malleable view of one's own substance or behavior addiction could be beneficial (as opposed to a fixed view), and help along the recovery process by focusing individuals on their potential to (positively) change. Given these apparent benefits and scarcity of research on the topic, this scoping review aimed at understanding the extent and the effects of mindset theory on addictions, and informing the direction of research on the subject.

A key point of mindset theory is its actionability via the use of psychosocial interventions, namely growth mindset (GM) interventions. GM interventions aimed at fostering a growth mindset among the targeted population [3, 5, 6]. They generally consist of exposing participants to a popularized scientific article (e.g. *Psychology Today* type article [7]) describing the malleability of the targeted attribute (e.g. intelligence, body weight, addiction). The article has a convincing presentation, and contains arguments, peer testimony and real-life examples of growth. This text is followed by two internalization exercises aimed at appropriating the growth mindset rationale. First, participants have to remember a personal example of growth. Second, they are asked to write a letter to a peer who might be experiencing hardship, by reusing the arguments presented in the article [30]. As described earlier, GM interventions have been used in a variety of domains such as education [29], weight loss [5], anxiety and depression [6], or more recently, addiction [35•]. According to the behavior change technique taxonomy [36], a tool aimed at classifying psychosocial interventions, GM would reflect the technique "4.3-reattribution" in the cluster "shaping knowledge". The second objective of this scoping review was to assess the characteristics of mindset interventions used in relation to addictions, and their effects on addiction outcomes.

Method

Protocol and Registration

The scoping review protocol was drafted using the Preferred Reporting Items for Systematic Reviews and Meta-analysis – Scoping Review (PRISMA-ScR [36]). The draft was revised and validated by the entire research team before being registered on the Open Science Framework on 1 December 2021 (https://osf.io/m6fdt/).

Objectives

The present scoping review aimed at mapping and categorizing the extent, range, and nature of evidence available in peer-reviewed literature linking mindset theory measures and interventions to addiction research, and identifying potential gaps and limitations to inform future research in the field. More precisely, it aimed at answering three research questions: (1) to what extent has mindset theory been linked to addiction research (both substance addiction and behavioral addiction)? (2) What interventional tools have been used in this context in order to improve patients' health using mindset theory, and to what effects? (3) What gaps and limitations exist in today's literature, and where to guide future research in order to properly assess the effects of mindset theory on addictions?

Design

The scoping review used the Preferred Reporting Items for Systematic Reviews and Meta-Analysis protocols for Scoping Review guidelines and checklist (PRISMA-ScR [37]. The general framework was also based on the five steps proposed by Arksey and O'Malley [38] expanded upon by Levac et al. [39]: (1) develop of a research question; (2) identify relevant studies; (3) select material to be included/excluded; (4) chart the data; and (5) collate, summarize and report the results.

Eligibility Criteria

The studies must include (a) a measure of mindset about the malleability of a human attribute (e.g., intelligence, anxiety, potential for addiction, etc.).

(b) A measure of addiction or addictive behavior (e.g., self-reported or physiological measure, observed behavior). In order to broaden the scope of included studies: research that included measures of addictive substance consumption or substance abuse were also addressed (even if they were not clearly conceptualized as clinical addictions in the related research), as well as research that included measures of intention, willingness or expectation to consume addictive substances or to adopt addictive behaviors. The rationale behind these guidelines was that even if the behavior or substance use reported by participants was not medically diagnosed as an addiction in the corresponding study, participants still presented problematic behaviors or usage that might lead to — or be symptomatic of — addiction as it was conceptualized in the current review (i.e., including both substance addictions and behavioral addictions). As such, studies that targeted

the general population of substance users (e.g., drinking [40]; smoking [41]) or problematic behavior endorser (e.g. problematic pornography use [42, 43]) were eligible.

Finally, (c) articles must be in French or English language.

Data Sources and Search Strategy

To identify relevant studies, the authors searched articles in the databases PsychINFO, PubMed and google scholar. The search employed keywords: "self-theor*" OR "lay theor*" OR "implicit theor*" OR "entity theor*" OR "incremental theor*" OR Dweck OR mindset* OR "growth mindset" OR "fixed mindset" (see Williams & Lewis, 2021 for a similar procedure) AND addict* OR abus* OR problem* OR dependenc* OR misus* OR overus* OR alcohol OR drug* OR substance OR gambl* OR "behavior* addict*" OR compuls* OR excess* (see Kourgiantakis & Ashcroft, 2018 for a similar procedure). The search dates were from 1988 (publication year of the princeps article on mindset theory by Dweck & Legget [2]), to 2022.

Study Selection and Data Extraction Procedures

We used an open-source reference manager (Zotero) to store the citations. The duplicates were removed before data extraction. The authors discussed and agreed upon a selection process for screening of titles and abstract and full-text articles. Two reviewers first screened titles and abstract independently in order to remove documents that clearly did not match the eligibility criteria. Discrepancies were solved by discussion (screening 1). Then, reviewers downloaded and screened the full text of the remaining articles for inclusion (screening 2). Nine information was abstracted for each document: (1) Title, year of publication and authors, (2) Type of document (e.g., article, thesis, editorial), (3) Type of study (i.e., correlational, interventional), (4) Methodology, (5) Population and sample size, (6) Nature of the mindset measured (e.g., intelligence, sociability, addiction), (7) Nature of the addiction measured (e.g., alcohol, opioids, gambling), (8) Main outcomes and (9) Main limitations. The process for data extraction was developed and pilot tested by the reviewers. The authors then conducted quantitative analysis using descriptive methods (i.e., frequencies, summary statistics).

Ethics Committee Approval

This research was exempted of the Ethics Committee Approval due to the nature of the paper (scoping review).

Data Availability Statement

The Zotero database used in this review is available at: https://osf.io/35fa6/?view_only=dba2a59fa0a44e3e9c36ebaeb38f608c

Results

Summary of Results

A flow diagram shows the screening process and the resulting selected articles (see Fig. 1). A total of 1903 unique citations were screened. After screening of titles and abstracts, 1866 articles were removed and 37 articles were fully reviewed. The two reviewers independently screened and reviewed each of the 37 articles to reach a consensus on inclusion or exclusion. Of those, 18 met the eligibility criteria and 19 were excluded (among the 18 documents included, 21 studies were conducted but only 18 studies met the eligibility criteria). Reviewers then charted the data of the remaining 18 articles, and recorded the information of interest (e.g., authors and the year of publication, type of article, …) as reported in Table 1.

Characteristics of the Included Studies

Studies Type, Sample Characteristics

Table 1 provides an overview of the characteristics of the included studies. Most documents were published from 2015 to 2021 (16 out 18), were research articles (15 out of 18; 3 theses), and used a quantitative approach.

Most studies were cross-sectional in design (12 out of 18) and conducted online (i.e. completion of online surveys by participants) (10 out of 18). Two studies were longitudinal [40, 53]. Two studies were two-armed randomized experiments [8•, 40], and one a 2 × 2 randomized experiment [45]. Three studies were interventional [35•, 42, 47].

Most studies used a US sample (13 out of 18). One study used an international sample [42], one a UK sample [44], one a Hungarian sample [43], and two a Chinese sample [10, 48].

Two studies were conducted on a clinical adult population (i.e. diagnosed for substance use disorder and medically supervised) [47, 53], nine on the general adult population (i.e. whom presented a potential substance use or problematic behavior adoption but were not medically diagnosed) [8•, 9, 35•, 41–43, 48, 49, 52], six on the general college student population [40, 44–46, 50, 51], and one on the adolescent population [10]. Sex was evenly distributed (51.98% of participants were women across all studies) with two exceptions of studies' samples almost exclusively composed of

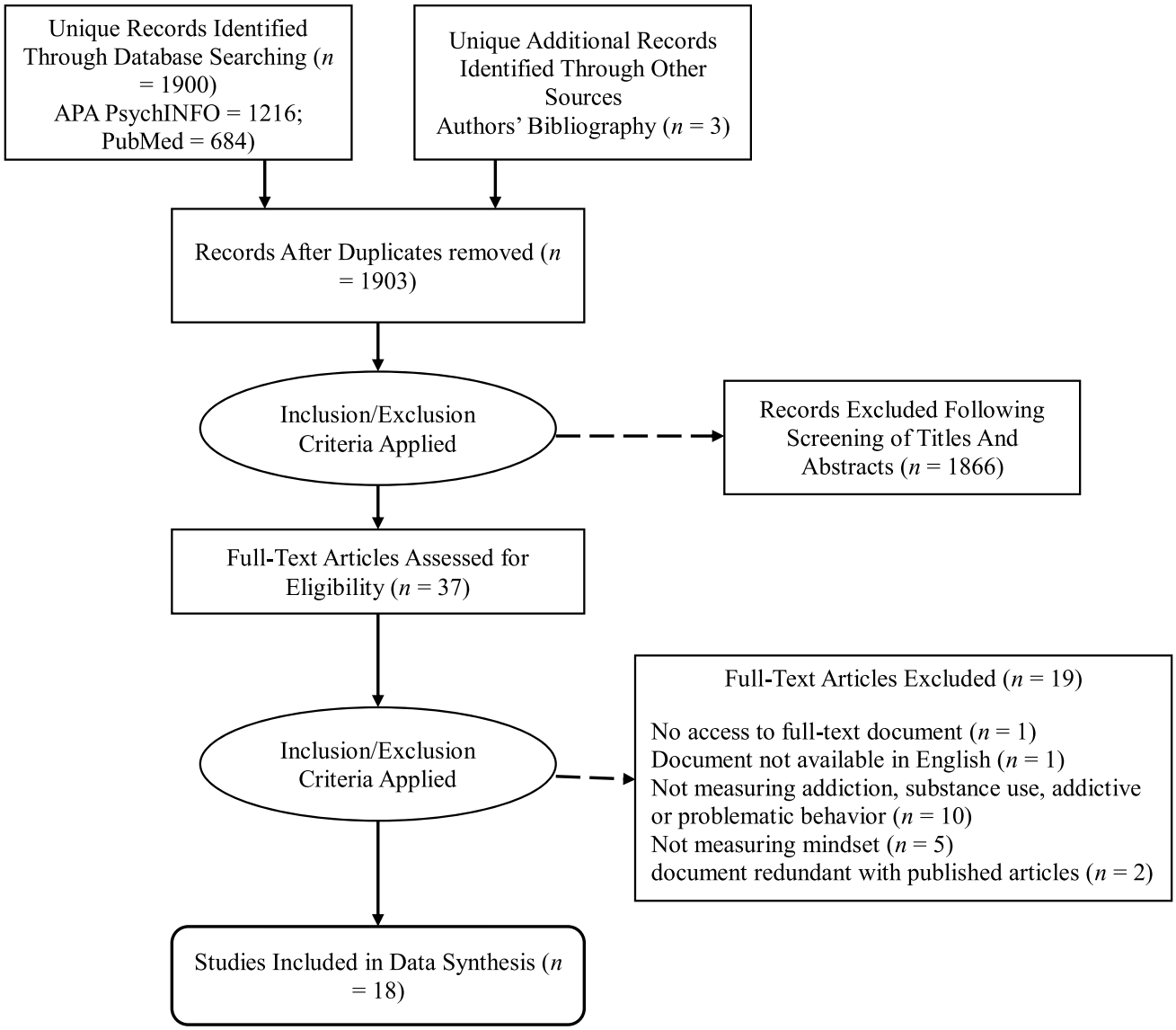

Fig. 1 PRISMA flow diagram showing the selection and screening process of documents for inclusion in the scoping review. This figure is original

males (96.2% male [42]; 82% male [47]). One study focused on minorities (US students of color [45]).

Characteristics of the Attribute(s) Targeted by the Mindset Theory

Among the 18 studies included in the review, no less than seventeen different attributes were targeted by mindset theory. Two studies targeted the sex mindset (i.e., malleability of sexual life [42, 43]), four the addiction mindset (i.e., malleability of addiction [8•, 9, 35•, 53]), three the intelligence mindset [44, 49, 51], one the morality mindset [44], one the racial prejudice mindset [45], four the smoking mindset [41, 46, 49, 52], one the substance abuse mindset [47], two the general mindset (i.e., malleability of personal characteristics [10, 48]), one the general mental-health mindset (i.e., aggregate between anxiety, emotion, personality, depression, social anxiety and drinking tendencies mindsets [51]), one the willpower mindset [50], one the alcoholism mindset [40], and one the anxiety, emotion, personality, depression, social anxiety and drinking tendencies mindsets [51].

Mindsets were measured with self-reported questionnaires focused on the attribute of interest (e.g., intelligence, sociability) whether the study was correlational, experimental, or interventional. There was not a defined number of items used for such questionnaires. Studies used one [41, 52], two [34, 54], three [8•, 40, 45, 47, 49], four [51], six [9, 35•, 42, 43, 46, 50, 53], eight [48], or up to twenty items [10]

Table 1 Characteristics of the included studies. This table is original

Author(s) (year)	Type of document	Methodology	Interventional study/content of the intervention	Population and sample size	Nature of the mindset measured	Nature of the addiction measured	Main outcomes	Main limitations
Böthe et al. (2021) [42]	Preliminary results of quantitative interventional research	Two-armed randomized interventional study (intervention vs. control group) 2 times of measure including baseline and 6-week follow-up	Self-help web-based intervention containing 6 modules	General male (96.2%) population from USA, England and Canada N = 264	Sex mindset 6 items (α = 0.81)	Pornography addiction *Problematic Pornographic Consumption Scale (PPCS)* *18 items (α = 0.90)*	Beneficial effects of the intervention at 6-week follow-up	Preliminary results No direct causal relationship between mindset and addiction Self-report data
Böthe et al. (2017) [43]	Two-studies quantitative research (scale validation + structural equation modeling)	Self-reported online cross-sectional studies	/	General Hungarian population Nstudy1 = 1534 (49.6% female) Nstudy2 = 10,463 (29.5% female)	Sex mindset 6 items (α = 0.89)	Pornography addiction *Problematic Pornographic Consumption Scale (PPCS)* *18 items (α = 0.91)*	Positive association between growth sex mindset and sexual and relationship satisfaction. Negative association with problematic pornography use	No direct causal relationship between mindset and addiction Other potential mediating variables Small effects Self-report data
Burnette et al. (2019) [8•]	Quantitative experimental research	Two-armed randomized experimental study (disease-fixed message vs. compensatory-growth message)	/	Probable US substance users (68% females) N = 214	Addiction mindset 3 items (α = 0.94)	Alcohol and drug use *CAGE-AID* *4 items*	Compensatory-growth (vs. disease-fixed) messages cause stronger growth mindset and efficacy and intention to pursue counseling and treatment	Experimental context, need to replicate findings with long-term interventional studies No distinction between different drugs Self-report data
Champagne et al. (2019) [44]	Quantitative cross-sectional research	Self-reported online cross-sectional study	/	Undergraduates at UK university (71% female) N = 420	Intelligence mindset 8 items (α = 0.94) Morality mindset 3 items (α = 0.90)	Smart drug use (methylphenidate, amphetamine, modafinil, beta-blockers or rivastigmine) *yes/no question*	Attitudes predictive of previous and future use, linked with perceived harmlessness, safety and unfairness	No link between intelligence or morality mindset and smart-drug use Cross-sectional design Self-report data
Fitz (2015) [45]	Quantitative experimental research thesis	2 × 2 randomized experimental study (entity vs. incremental prejudice theory x inclusion vs. exclusion)	/	US undergraduate students of color (63.8% female) N = 152	Racial prejudice mindset 3 items (α = 0.91)	Alcohol, cigarette and other drugs willingness *Scenario reading + 2 items (light/heavy use)*	Fixed mindset (vs. growth mindset) participants reported greater willingness to drink alcohol when excluded (vs. included)	Experimental manipulation bias No control condition Underpowered study Specific sample No measure of behavior Self-report data

Table 1 (continued)

Author(s) (year)	Type of document	Methodology	Interventional study/content of the intervention	Population and sample size	Nature of the mindset measured	Nature of the addiction measured	Main outcomes	Main limitations
Fitz et al. (2015) [46]	Quantitative cross-sectional research	Self-reported online cross-sectional study	/	Undergraduate US psychology students (64% female) N = 338	Smoking mindset 6 items (α = 0.89)	Smoking expectations *2 items*	Stronger incremental beliefs associated with greater expectations of trying smoking for nonsmokers, but lower expectations of becoming a regular smoker for smokers	Small sample Measure of expectations and not behavior Cross-sectional design Self-report data
Grand (2001) [47]	Quantitative research thesis	Two-armed randomized interventional study (intervention vs. control group) 4 times of measure including baseline, 2-week, 2-month, and 4-month follow-up	Group motivation intervention (GMI)	Diagnosed alcohol-dependent US participants (82.1% male) N = 117	Substance abuse mindset 3 items (α = 0.87)	Alcohol and drug use *Addiction Severity Index (ASI)*	Participants with fixed mindset (vs. growth) had less confidence in treatment and self-efficacy, higher appraisals of costs of change. No effect on treatment persistence	Methodological problems due to real-life setting (uneven conditions, contamination of experimental groups) Specific sample of non-intensive outpatient treatment
Japutra & Song (2020) [48]	Quantitative research (structural equation modeling)	Self-reported online cross-sectional study	/	General Chinese population (57.7% female) N = 421	General mindset 8 items (α = 0.92)	Compulsive buying *6 items (α = 0.85)*	Fixed mindset predicts compulsive buying through deal proneness, social comparison and hedonic motives. Growth mindset directly predicts compulsive buying	Limited sample from one culture (China) Cross-sectional design Other mediating and moderating variables to consider Self-report data
Johnson (2010) [49]	Quantitative cross-sectional research thesis	Self-reported cross-sectional study	/	Adult US smokers and ex-smokers (66% female) N = 197	Smoking mindset 3 items (α = 0.91) Intelligence mindset 3 items (α = 0.93)	Smoking *Fagerstrom test for nicotine dependence (FTND)* *6 items (α = 0.69)*	Smoking mindset, but not intelligence mindset, predictor of smoking cessation and intention to stop smoking. Domain specificities of both mindset	Reliability of the constructed questionnaire Convenience sample self-selection bias Self-report data

Table 1 (continued)

Author(s) (year)	Type of document	Methodology	Interventional study/content of the intervention	Population and sample size	Nature of the mindset measured	Nature of the addiction measured	Main outcomes	Main limitations
Lindgren et al. (2019) [50]	Quantitative experimental research	Two-armed randomized experimental study (more vs. less cognitively demanding task)	/	US heavy episodic undergraduate drinkers (47.6% female) N = 105	Willpower mindset 6 items (α = 0.81)	Alcohol *Daily Drinking Questionnaire (DDQ)* *Alcohol Use Disorder Identification Test (AUDIT)* *10 items (α = 0.71)*	Null findings	Weak experimental manipulation Ecological validity issues
Lindgren et al. (2020) [40]	Quantitative longitudinal research	Self-reported online longitudinal (3 times) study	/	US heavy-drinking graduate (59% female) N = 422	Alcoholism mindset 3 items (α = 0.89)	Alcohol *Daily Drinking Questionnaire (DDQ)* *Alcohol Use Disorder Identification Test (AUDIT)* *10 items (average α = 0.72)*	Alcoholism mindset negatively linked with drinking outcomes, and moderates the relationship between drinking identity and changes in drinking behaviors	Psychometric properties of self-reported measures Specific sample, hard to generalize results
Schroder et al. (2016) [51]	Two-studies quantitative research (latent variable approach)	Self-reported online cross-sectional study	/	US undergraduate students Nstudy1 = 952 (70,6% female) Nstudy2 = 405 (75,6% female)	Anxiety 4 items (α = 0.97) Intelligence 4 items (α = 0.95) Emotion 4 items (α = 0.73) Personality 3 items (α = 0.91) Depression 4 items (α = 0.96) Social anxiety 4 items (α = 0.98) Drinking tendencies mindset 4 items (α = 0.95) General health mindset factor (latent variable from the 7 specific mindsets)	Alcohol *Patient-Reported Outcome Measurement Information System (PROMIS) Alcohol Use Short From* *7 items (α = 0.90)*	Mental-health-related mindsets are both domain specific and grouped through a general dimension General mindset predictive of mental health symptoms (but not alcohol abuse). Specific mindset predictive of corresponding mental health symptoms	Student sample Cross-sectional design Self-report data

Table 1 (continued)

Author(s) (year)	Type of document	Methodology	Interventional study/content of the intervention	Population and sample size	Nature of the mindset measured	Nature of the addiction measured	Main outcomes	Main limitations
Sridharan et al. (2019a) [35•]	Quantitative interventional research	Two-arm randomized interventional study (intervention vs. control group) 2 times of measure including baseline and 2-month follow-up	Online GM intervention composed of a series of eight tips delivered by email every 3 days about addiction and its effects	Adult US daily smokers N = 398 (59% female)	Addiction mindset 6 items (average α = 0.705)	Smoking *Fagerstrom test for nicotine dependence (FTND)* *6 items* *Last cigarette smoked* *Cigarettes/day* *Quit attempts*	Intervention group (vs. comparison arm) showed higher smoking cessation rates	No true control group (intervention vs. nothing) Attrition due to technology-based intervention
Sridharan et al. (2019b) [9]	Two-studies quantitative research (scale validation + correlational study)	Self-reported online cross-sectional study	/	US daily smokers and non-smokers Nstudy1 = 600 (50% female) Nstudy2 = 200 (51% female)	Addiction mindset 6 items (average alpha α = 0.845)	Smoking *Fagerstrom test for nicotine dependence (FTND)* *6 items* *Cigarettes/day* *Quit attempts* *Intention to quit*	Development of addiction mindset scale Links between growth mindset of addiction and motivation, commitment and self-efficacy to reduce or quit smoking. Less ability attributions and reported barriers to cessation	Cross-sectional design, no causal link between mindset and quitting smoking Convenience sample maybe not representative Self-report data
Thai et al. (2018) [52]	Quantitative cross-sectional study	Self-reported online cross-sectional study (HINTS survey)	/	US adults (including smokers and non-smokers) N = 7307	Smoking mindset 1 item	Smoking status *2 items*	Smoking mindset associated with smoking status	Single-item mindset measure Cross-sectional design prevents causal inferences Self-report data
Thai et al. (2020) [41]	Quantitative cross-sectional study	Self-reported online cross-sectional study (HINTS survey)	/	US adult smokers N = 1784	Smoking mindset 1 item	Smoking status *2 items* *Consider quitting (1 item)*	Higher growth mindset not linked with having tried to quit, but linked with greater likelihood of considering quitting in the next 6 months	Cross-sectional design prevents causal inferences Addictive aspect of smoking not considered Single-item mindset measure Self-report data

Table 1 (continued)

Author(s) (year)	Type of document	Methodology	Interventional study/content of the intervention	Population and sample size	Nature of the mindset measured	Nature of the addiction measured	Main outcomes	Main limitations
Wang et al. (2019) [10]	Quantitative cross-sectional research	Self-reported cross-sectional study	/	Chinese adolescents (65,1% male, *M*age = 16.86) N = 1759	General mindset 20 items (α = 0.80)	Smoking, alcohol, illicit drug use *Substance use questionnaire in adolescents* 3 *items* *Substance Use Risk Profile Scale (SURPS)* 28 *items (average* α = *0.73)*	GM negatively linked to substance use. GM moderated the relationship between illicit drug use and reasoning	Limited sample from a secondary volitional school Different types of substance and duration of use not considered
Zeldman et al. (2004) [53]	Quantitative longitudinal research	Self-reported longitudinal (6 months) study	/	US methadone maintenance program outpatients (48,7% female) N = 74	Addiction mindset 6 items (α = 0.86)	Opioids (heroin and others) *Urine samples*	Fixed mindset linked to lower relapse and better attendance	Cross-sectional design Low sample size

in order to measure the mindset of interest. Some research focused solely on measuring the fixed beliefs about the chosen attribute [40], on growth mindset beliefs [8•], or both fixed and growth beliefs [10]. Measuring only fixed beliefs might protect from the social desirability bias of reporting malleable beliefs [40, 55], and is the standard practice in this research area [51, 56]. For the fixed belief measures, items might read as "you have a certain level of [attribute], and you can't really do much to change it" or "[attribute] is something about you that you can't change very much." For the growth belief measures, items might read as "you can always fundamentally change [attribute]" or "no matter what kind of person someone is, they can always change [attribute]." Participants were asked to rate their agreement with each item on a Likert-type scale. Items were usually coded so that a high score indicates a rather growth mindset [9, 35•, 40, 43, 50, 51, 57]. Despite this apparent variability, all mindset measures were based on a similar item construction process: the "find-and-replace" method [51]. This method consists of using previously validated measurement of mindset [4, 57], and replace the original concept with the one of interest (e.g., replacing the word "intelligence" with the words "drinking tendencies") [8•, 40, 51]. Reliability indicators (e.g., Cronbach's alpha) of mindset measures, even those with few items, were generally high and attested of the quality of the scales [57].

Characteristics of the Targeted Addiction, Addictive Behavior, Addictive Substance Use or Abuse

Six addictions were targeted in the reviewed documents. One study might target different addictions. Regarding substance addiction, six articles focused on alcohol consumption [8•, 10, 40, 45, 47, 50, 51], five on drug use (opioids and others [8•, 10, 45, 47, 53]); one on smart-drug use (prescription drugs such as methylphenidate, amphetamine, modafinil, beta-blockers or rivastigmine taken without a prescription or at a dose exceeding prescription [44]); seven on smoking [9, 10, 35•, 41, 46, 49, 52]. Concerning behavioral addiction, two articles targeted pornography addiction [42, 43], and one compulsive buying [48]. Most research measured actual substance use or problematic behavior adoption via self-reported questionnaires, one measured only substance use (i.e., alcohol and other drugs) willingness [45], one smoking expectations [46], and one used a physiological indicator (i.e., urine sample for opioid relapse [53]). Some authors reported specific inclusion methods or cut-off scores used for targeting substance users, others simply reported which measures were used to determine substance use or problematic behavior endorsement. Grand [47] use the Addiction Severity Index (ASI [58]) on clinically diagnosed alcohol-dependent participants (DSM-IV criteria). This scale as different substance-related categories such as

alcohol and drug consumption, crack use, drug injection and polydrug use. Lindgren et al. [40, 50] used the Daily Drinking Questionnaire (DDQ [59]), the Alcohol Use Disorder Identification Test (AUDIT [60]) and the Rutgers Alcohol Problem Index (RAPI [61]) to measure alcohol use and alcohol-related consequences. Lindgren, Burnette et al. [50] recruited participants whom reported consuming at least 4/5 drinks for women/men in the past 30 days. Lindgren, Baldwin et al. [40] recruited participants scoring 8 or higher on the AUDIT, the cut-off score commonly used for hazardous drinking [60]. Schroder et al. [51] measured alcohol abuse with the Patient-Reported Outcome Measurement Information System (PROMIS) Alcohol Use Short Form [62]. Fitz [45] asked participants to read a scenario in which the substance was available (alcohol, cigarette and other drugs) and to answer to two questions about light and heavy substance use willingness in this context.

Burnette et al. [8•] employed a screening process with the CAGE-AID questionnaire [63] to recruit probable substance users and to measure substance use. Wang et al. [10] used the substance use questionnaire in adolescents [64] to measure smoking, drinking and illicit drugs use in the past month. All participants reported smoking or drinking, or illicit drug use at least 1 or 2 times in the past month. Zeldman et al. [53] recruited participants from an outpatient methadone maintenance program (i.e., clinically diagnosed opioid dependent patients). The authors measured relapse with the percentage of random urine tests that were deemed positive. Champagne et al. [44] used a questionnaire created for the study to determine smart-drug use (methylphenidate, amphetamine, modafinil, beta-blockers or rivastigmine).

Johnson [49] used the Fagerström Test for Nicotine Dependence (FTND [65]) to measure smoking dependence. The author reported that the overall score for smokers and ex-smokers were relatively low (between 1 and 5 over 10). Sridharan et al. [9] recruited daily smokers (i.e., smoked an average of 10 cigarettes a day). To measure smoking history, current smoking and future quit intention, the authors used the FTND, asked participants the number of quit attempts they made (i.e., 24 h without willingly smoking) in the past 12 months, and if they intended to quit in the next week, month, year, later than a year, or not at all. Sridharan et al. [35•] recruited smokers and measured smoking behavior and cessation with the FTND, asked participants to report the last time they smoked a cigarette, how many cigarettes per day they smoked on average in the last 30 days, and how many quit attempts they made. Thai, Coa et al. [52] used two items to assess smoking status. Thai, Rice et al. [41] used two items to assess smoking status and included only current smokers. Fitz et al. [46] measured smoking expectations with a two-item questionnaire.

Bőthe, Baumgartner et al. [42] used the Problematic Pornography Consumption Scale (PPCS [66]) as a primary outcome measure and reported that participants had higher levels of problematic pornography use than the suggested cut-off score. Bőthe, Tóth-Király et al. [43] used the PPCS to measure problematic pornography use. Japutra and Song [48] measured compulsive buying with a validated six-item questionnaire [67].

Links Between Mindset and Addiction

The first goal of the review was to identify the extent to which mindset theory has been linked to addiction research (both substance addiction and behavioral addiction). Among the included studies, the majority (15 out of 18) hypothesized at least one direct link between mindset and addiction [8•, 9, 10, 35•, 40, 41, 43, 45–49, 51–53]. Other studies measured mindset as a secondary variable and did not include it in their hypothesis [42, 44, 50].

Most studies (11 out of 18) found statistical links between their measure of mindset and their outcome measure of addiction. Sex growth mindset was negatively associated with problematic pornography use ($r = -0.18$, $p < 0.01$), frequency of pornography watching ($r = -0.09$, $p < 0.01$), and time spent with pornography per occasion ($r = -0.04$, $p < 0.01$) [43]. Addiction growth mindset was negatively correlated with substance use ($r = -0.17$, $p < 0.01$) [8•], but a fixed addiction mindset was negatively linked with relapses for methadone maintenance treatment patients ($r = -0.23$, $p < 0.05$) [53]. Racial prejudice growth mindset was negatively associated with willingness to drink alcohol when being socially excluded ($F(1, 95) = 4.33$, $p = 0.04$, $\eta p2 = 0.04$) [45]. Smoking growth mindset was negatively associated with smoking status ($r = -0.35$, $p < 0.001$) [49], intention to stop smoking ($r = -0.28$, $p < 0.001$) [48] considering quitting in the next 6 months ($\beta = 0.22$, $p = 0.04$, OR 1.25, 95% CI [1.01–1.56]) [46], lower smoking expectations for smokers ($\beta = 0.36$, $p = 0.02$) and greater expectations to start smoking for non-smokers ($\beta = -0.19$, $p = 0.002$) [46]. General growth mindset was negatively associated with substance use ($r = -0.32$, $p < 0.01$) [10], while general fixed mindset was negatively associated with compulsive buying (direct effect $= -0.11$, $p < 0.01$), and was positively associated with compulsive buying through deal proneness and hedonic motives (indirect effect $= 0.039$; 95% CI [0.010–0.074]) [48]. Alcoholism growth mindset was negatively linked with drinking outcomes (T1 $r = -0.13$, T2 $r = -0.17$, T3 $r = -0.15$, $p < 0.01$) and moderated the relationship between drinking identity and changes in drinking behaviors ($\beta = 0.025$, $p = 0.02$, 95% CI [0.96–1.00]) [40]. Drinking tendencies growth mindset was negatively associated with alcohol abuse ($r = -0.41$, $p < 0.01$ [51]. Intelligence, morality, substance abuse, general health and willpower mindsets were not linked with addiction [44, 47, 50, 51].

According to these results, the growth mindset was generally associated with positive outcomes, compared to the fixed mindset. The fixed mindset appeared more beneficial in only one study [53]. The authors explained that this result might be due to the nature of the addiction targeted (opioid addiction), where patients tried to maintain their addiction in a benign form rather than to cure it.

Mindset Interventions and Manipulations in Addiction Research

The second objective addressed in the review was to assess which interventional tools have been used to improve participants' health using mindset theory, and to what effects. Out of the 18 studies identified in the review, five included interventions and/or manipulations. Two proposed global health interventions not related to growth mindsets [42, 47]. Only one study explicitly designed and used a growth mindset intervention in order to decrease tobacco addiction [35•]. The intervention was web-based. The authors extracted and refined six specific beliefs about the permanence of nicotine addiction from the literature: (1) addiction is permanent because it is genetic; (2) some people will always be addicted because they have an addictive personality; (3) addiction is permanent because it irreversibly changes the brain; (4) addiction is permanent because withdrawal symptoms may persist after cessation; (5) addiction is permanent because people can feel like smoking even years after quitting; (6) failure to quit smoking is indicative of a permanent habit. Then, the authors created six web-based lessons counteracting each belief, plus one introductory and one summarizing lessons. The lessons were based on scientific evidence on the malleability of the targeted addiction (i.e., nicotine), as is commonly done in the literature [5, 30, 54]. It also contained testimonies from peers who endorsed a growth mindset. The eight lessons were delivered by email every 3 days. The intervention followed the user-centered design recommendations of the literature on mindset intervention [55]. Results showed that participants in the intervention group had higher smoking cessation rates than the control group.

One study [8•] was conducted in an experimental, laboratory context. It aimed to foster a growth versus fixed mindset of addiction by respectively creating a "compensatory-growth" message versus a "disease-fixed" message. The compensatory-growth message took the form of a *Psychology Today* type article describing the many potential causes of addiction, and highlighting the possibility to change or offset the condition in the future. The disease-fixed message had a similar format, but described the fixed nature of addiction and focused on the neurological mechanisms leading to it. After reading the article, participants had to summarize its main theme in one sentence, to rate the understandability of the article for 9th graders, and to offer suggestions for improving the utility of the article. The authors observed positive effects of the compensatory-growth message condition (vs. disease-fixed) on perceived self-efficacy and intention to pursue counseling and treatment related to alcohol and drug use. The authors advanced that these preliminary results and the material used for the experimental manipulation could help to frame the message of mindset interventions targeting addiction. They suggested replicating and extending their findings using longer-term interventional approaches and longitudinal designs.

One author [45] manipulated lay theory of racial prejudice. They asked participants to read a popular press type article arguing about the changeability (or not) of racial prejudice attitudes of individuals. Participants had to rate the effectiveness of popular press articles in communicating psychological research findings to the public. They also had to summarize the article in one short paragraph and to rate how understandable, enjoyable and believable it was. The author observed that fixed mindset (vs. growth mindset) participants reported higher willingness to drink alcohol when being socially excluded (vs. included) in a cyberball paradigm.

This review showed that mindset interventions in addiction research are a nascent topic, and their potential effectiveness still need to be demonstrated. The same applies to mindset manipulations in experimental contexts, typically created as a precursor of interventions. Despite their seemingly beneficial effects, too few research has been conducted to draw clear conclusions.

Main Limitations and Gaps in the Literature

Finally, the present scoping review aimed at addressing the gaps and limitations that exists in today's literature, and guiding future research in order to better understand the effects of mindset theory on addictions.

Cross-Sectional Design Preventing Causal Inferences

The majority of studies were cross-sectional in design (12 out of 18). Thus, no causal inferences could be made between mindset and addiction, even if some studies showed correlations between the two (as described above). The links found between growth mindset and addiction led to think that having such a mindset is good for individuals, as literature on mindset in other domains aimed to demonstrate [3, 7]. Nonetheless, while having a growth mindset might motivate people to reduce their substance use or problematic behavior, it could very well be the other way around: motivated people might reduce their substance use or problematic behavior and develop a growth mindset as a consequence [9]. This major limitation in the current literature

on mindset and addiction needs to be addressed with more experimental and interventional research, explicitly testing the causal relationship between mindset and addiction outcomes [8•, 35•, 45].

Self-Report Data

Most studies, except six [10, 35•, 40, 47, 50, 53] used exclusively self-reported measures. This might be explained by the fact that the majority of the studies were conducted online (i.e., completion of online surveys by participants, with no real-life meeting with the research team, 10 out of 18), where objective data (e.g., urine sample) cannot be collected. Furthermore, it appeared difficult to properly assess drug consumption or addictive behavior other than with declarative measure, since it implied invasive medical testing (e.g., urine testing for opioids relapse [53]). Nonetheless, self-reported data about substance use, despite its potential biases (e.g., social desirability, recalling errors) was considered a valid and reliable method of data collection on substance use [68].

Similarity and Specificity Between Mindset and Addiction

The results of the included studies suggested that the link between mindset and addiction was stronger when the characteristics targeted by the mindset matched the targeted addiction. Out of the eleven studies finding a significant link between mindset and addiction, seven had a matching mindset and addiction: sex mindset and pornography use [43]; addiction mindset and substance use [8•, 53]; smoking mindset and smoking [41, 49]; alcoholism mindset and drinking [40]; drinking tendencies mindset and alcohol abuse [51]. The authors [50] showed that mental-health-related mindsets are both distinct from one another, and linked through a general dimension cutting across domain specific mindsets. However, in their study, only drinking tendencies mindset was linked to actual alcohol abuse, and not the general mental-health mindset. Mindsets about more general self-attributes such as personality, intelligence and morality would also be domain specific [69]. Mindsets such as intelligence, morality [44] and willpower [50] were not linked to addiction outcomes.

Further research is warranted to test the hypothesis that the degree of specificity (general vs. specific mindset) and similarity in the mindset — addiction pair plays a role in the strength of their link. That is to say, the closer the targeted mindset is related to the targeted addiction, the closer its predictability over actual drug use or addictive behavior. For example, in terms of specificity, alcoholism mindset would better predict alcohol abuse than the general mindset; and in terms of similarity, alcoholism mindset would better predict alcohol abuse than the smoking mindset. This is akin to the principles of compatibility, specificity and generality of the theory of planned behavior [70]. Indeed, it has been shown that the predictors (e.g., attitudes) of a specific behavior (e.g., drinking alcohol) must be defined with the same elements (e.g., attitude towards drinking alcohol during the day and drinking alcohol during the day), and with the same specificity (e.g., attitudes towards drinking three glasses of wine during the day and drinking three glasses of wine during the day). Those principles allowed to hold the most predictive power of behavior enactments. As a counter-argument, research showed that general mindset is significantly linked to substance use [10], or to compulsive buying [48], disregarding the principle of specificity. Thus, this hypothesis, still unproven, need to be explored further to better understand the impact of mindset on addiction. It would potentially allow to design better and more efficient interventions.

Addiction as a Disease: A Fixed or Malleable Belief?

Several research included in the review [8•, 9, 47, 53] referred to the disease model of addiction, and the role of mindset theory within this framework. The model posits that "the disease of addiction exists within the person and is thus a permanent trait to which patients must accommodate for the rest of their lives" [45 p. 680]. More recently, it evolved into the brain disease model of addiction (BDMA), which was strongly supported by part of the scientific community [71, 72]. This view of addiction has been challenged, and a more holistic approach was recommended by some scientists, taking into account the "social, psychological, cultural, political, legal and environmental contexts" of substance abuse [75 p. 40)]. This was the goal of the Addiction Theory Network (ATN) [73]. This begged the question: how does mindset theory fit into these models?

Concerning treatment seeking, a disease-centered view of addiction might reduce stigma related barriers to treatment [74], highlight the gravity and legitimacy of the symptoms [75] or even increase use of pharmacological treatments [76]. However, the authors [8•, 9, 77] argued that such an immutable conception of addiction, which implies a fundamental physiologic and genetic malfunction within the individual, will promote a fixed mindset of addictions. In turn, this might lead to a preference for biological treatment, to the detriment of behavior-based therapy [76], and weaken self-efficacy and perception of agency [77]. Burnette et al. [8•] argued for the efficacy of "compensatory-growth" messages that described the many potential reasons one might become addicted, and highlighted the potential to change or offset the condition in the future. This type of message would allow the adoption of a growth mindset of addiction, increasing self-efficacy without negatively impacting blame. Grand [47] found that individuals with a fixed mindset, who

believed that their condition was immutable (like a disease), began treatment as less confident, with lower positive feelings and higher ambivalence. The author concluded that addiction treatment with a disease-focused approach was detrimental for entity theorist patients. As a counterpoint, Zeldman et al. [53] noted that the nature of the addiction might play a role in the differential impact of endorsing a fixed or growth view of addiction. They showed that for methadone maintenance treatment (i.e., aiming to maintain the addiction at a more benign form rather than to cure it), having a fixed mindset, and seeing one's own addiction as an immutable disease, lead to better outcomes. In line with the Addiction Theory Network, some authors [73] argued for a different conception of addiction. They claimed that addicted individuals eventually quit, and do so without medical treatment [78]. They insist on the importance of personal empowerment and psychological help to facilitate recovery. Recovery, in itself, was not seen as a reversal of pathology, but as the growth of well-being [73]. Mindset theory, and its strong focus on the intrinsic potential to change and better oneself, might more easily align with this conception of addiction.

To sum up, mindset theory might be integrated into the disease model of addiction in considering that a disease-focused approach would necessarily foster fixed beliefs about addiction [7, 8•, 77]. These beliefs — except in certain cases [79] — might be detrimental for individuals' motivation and agency [76, 77]. To foster a growth mindset of addiction and positive outcomes, a potential solution would be to adopt an approach that focus on the multiple potential sources of an addiction, and the potential for growth and offsetting the condition in the future [7]. Other approaches, such as the Addiction Theory Network, by not focusing solely on the medical and neurobiological aspects of addiction but also its psychological components, would potentially allow for an easier integration of mindset theory [73]. However, to our knowledge, research linking mindset and addiction in this specific framework is still non-existent.

Discussion

This review aimed to answer three research questions: (1) To what extent has mindset theory literature been linked to addiction research (both substance addiction and behavioral addiction)? (2) What interventional tools have been used in this context to improve patients' health using mindset theory, and to what effects? (3) What gaps and limitations exist in today's literature, and where to guide future research in order to properly assess the effects of mindset theory on addictions?

As this work revealed, Dweck's mindset theory applied to addiction is still a nascent field, and the research scarce. Only 18 studies were included in the final review, among the 1903 unique citations screened. The majority of the included research were published between 2015 and 2022 (16 out of 18). Most studies were cross-sectional rather than experimental or interventional, and they mostly used self-report data. The different samples targeted across studies were quite diverse, and sex was mostly evenly distributed (51% women across all studies). As much as 17 different mindsets were measured (sex, addiction, intelligence, morality, racial prejudice, smoking, substance abuse, general mindset, general health mindset, willpower, alcoholism, anxiety, emotion, personality, depression, social anxiety and drinking tendencies) for four different substance addictions (alcohol, opioid and other drug use, smart-drug use, smoking) and two behavioral addictions (pornography and compulsive buying). Most studies (15 out of 18) hypothesized at least one link between mindset and addiction, and the majority of them found statistically significant links (11 out of 15). Growth mindset (vs. fixed mindset) was generally associated with positive outcomes.

In terms of gaps and limitations in the current literature linking mindset and addiction, most research was cross-sectional (12 out of 18) preventing causal inferences between a particular mindset and addiction outcomes. Mindset interventions in the domain of addiction were still almost non-existent, and some authors encouraged the use of interventional approaches and longitudinal designs to make progress in the field [8•]. Only one study designed and implemented a mindset intervention [35•] and two studies manipulated mindset in an experimental context [8•, 45]. Self-report data were favored (12 studies out of 18 used exclusively self-report data) despite the risks they carry (e.g., social desirability; recalling errors). Further studies should include more objective data measurements as a complement to self-report data.

The question of domain specificity of mindsets has been raised. Studies showed that a close match between the targeted mindset and the targeted addiction fostered stronger predictability, compared to less specific mindsets [40, 43, 51]. On the other hand, some studies showed that a general mindset was still linked to specific addiction outcomes [10, 48]. Furthermore, it was observed in two studies that mindsets not directly related to addiction (e.g. intelligence, morality, willpower) were not linked to addiction outcomes [44, 50]. Congruent with the principle of compatibility, specificity and generality identified within the theory of planned behavior [70], it could be argued that a construct (e.g., mindset) linked to a behavior (e.g., drug use) must be defined with the same elements (i.e., similarity) and have the same level of specificity to hold predictive power. Further research should test this hypothesis.

The place of mindset theory within the disease model of addiction [53, 71] was questioned. Disease-focused message

about addiction might foster a fixed mindset [7, 8•, 77], detrimental to individuals [76, 77], but not necessarily for all addictions [79]. Still, fostering a growth mindset might be possible when focusing on the potential to change and offset the condition in the future, and lead to better outcomes [7]. Other, more holistic approaches than the disease model, such as the Addiction Theory Network [73], might allow an easier incorporation of mindset theory in the treatment of addiction, but this point is still untested.

Limitations

This scoping review is not without limitations. Notably, few papers were included in the review. Despite an exhaustive literature search and the inclusion of theses as well as research articles, only 18 documents were retained. More databases might have been searched, potentially increasing this number. Nonetheless, the initial search wielded no less than 1903 documents to include all possible search terms combinations. It appeared that literature linking mindset and addiction is still lacking and that further research is warranted in this field.

Conclusion

This scoping review highlighted the role of Dweck's mindset theory on addiction outcomes. The literature linking mindset and addiction is new, and more research overall is needed to properly assess the relation between the two phenomena. Very few studies used mindset interventions or manipulations, despite their apparent beneficial impact on addiction outcomes. Concurrent to the lack of experimental and interventional studies, research in the field was largely cross-sectional, preventing causal inferences, and used potentially biased self-report data. In the future, researcher should focus on experimental and interventional approaches, with longitudinal assessments [8•] and behavioral or physiological measures complementary to self-report data. Future studies should investigate the hypothesis of similarity and specificity between mindset and addiction, and further test the integration of mindset theory within frameworks such as the disease model of addiction and the addiction theory network.

Author contribution Sacha Parada had the original idea for the article, Sacha Parada and Jean-François Verlhiac performed the literature search and data analysis, Sacha Parada drafted the article, Eve Legrand critically revised the work, Elsa Taschini, Xavier Laqueille and Jean-François Verlhiac reviewed and validated the final draft.

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Data availability Data regarding this review (i.e., Zotero Database) is available at: https://osf.io/35fa6/?view_only=dba2a59fa0a44e3e9c36ebaeb38f608c

Declarations

Ethical Approval This research was exempted of the Ethics Committee Approval due to the nature of the paper (scoping review).

Conflict of Interest The authors have no conflict of interest to declare. Authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Preregistration This study's design and analysis plan were preregistered; see https://osf.io/m6fdt/

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