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COMPREHENSIVE REVIEW

Is the relapse concept in studies of substance use disorders a 'one size fits all' concept? A systematic review of relapse operationalisations

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Abstract

Issues. *Relapse is a theoretical construct and empirical object of inquiry. It is unclear how relapse is operationalised with regard to the various phases in substance use disorders (SUD). The aim was to investigate relapse operationalisations in SUDs studies after short- and long-term abstinence and remission, recovery and slip/lapse.* ***Approach.*** *Systematic review using the following databases: Epistemonikos, Cochrane Central Register of Controlled Trials (CENTRAL and DARE), MEDLINE, EMBASE, Google Scholar, CINAHL, Web of Science and PsycINFO. Search returned 3426 articles, with 276 meeting the following inclusion criteria: empirical study published in English in a peer-reviewed journal; samples meet diagnostic criteria for dependence syndrome or moderate–severe drug use disorder or alcohol use disorder; reports relapse, abstinence, recovery, remission, slip or lapse. Review protocol registration: PROSPERO (CRD42020154062).* ***Key Findings.*** *Thirty-two percent of the studies had no definition of 'relapse'. Most relapse operationalisations were defined according to measure (26%), time (17%), use (26%) and amount and frequency (27%). Of the 16 studies with a follow-up duration of up to 2 years, one (6%) contained a definition of 'long-term abstinence'. Of the 64 studies with a follow-up duration of more than 2 years, four (6%) contained a definition of 'long-term abstinence'. Of those, one (2%) mentioned 'early relapse' and one (2%) mentioned 'late relapse'.* ***Implications.*** *Future research is needed to explore the possible difference between early and late relapse. Moreover, working to increase consensus on relapse operationalisations in SUD research is warranted.* ***Conclusions.*** *We identified no consensus on relapse operationalisations nor agreement on the differentiation between early and late relapse. The clinical utility of current relapse operationalisations seems low and may compromise knowledge accumulation about relapse and implementation of research into treatment.* [Moe FD, Moltu C, McKay JR, Nesvåg S, Bjornestad J. Is the relapse concept in studies of substance use disorders a 'one size fits all' concept? A systematic review of relapse operationalisations. *Drug Alcohol Rev* 2021]

Key words: systematic review, substance use disorder, relapse, long-term abstinence, recovery.

Introduction

Substance use disorder (SUD) is most often defined as a chronic illness [1,2] involving a common repeating cycle of abstinence and relapse [3]. 'Relapse' refers to a return to a previous level of substance use after a period of considerable reduction or abstinence from substance use.

Miller [4] argues that the dichotomous classification of abstinence and relapse is too simple for such complex phenomena. He shows that the definition of the 'relapse' concept is elusive and does not adequately reflect how behaviour change occurs in SUD. For example, research shows that recovery and remission include periods of abstinence with gradual

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improvement in substance use and other psychosocial areas [4,5]; where periods of substance use and abstinence are common (for some people but not all). Thus, a binary distinction between abstinence and relapse does not capture that recovery is an ongoing dynamic behaviour change process, including diverse pathways, to attain and maintain recovery [6]. In this regard, Miller [4] shows how the 'relapse' concept is related to recovery and remission, and in turn, they are dynamic phenomena rather than static. Likewise, a *common* definition of relapse might be challenging to pinpoint, and thus specific definitions might be more useful. For example, a relapse might differ depending on the type of substance misuse, population characteristics and context. Additionally, a binary definition of relapse may leave out the subtle difference between a relapse and a slipe or lapse, that is, a minor set-back not as severe as a relapse.

Moreover, research on relapse, remission and recovery, both in SUD and in related fields, demonstrates that there is a plausible difference in causal factors between early and late relapse. In the long term, positive changes in functioning, including social and professional functioning, as well as a sense of community belonging and identity change, are more protracted processes than symptomatic relief or symptomatic remission [7–10]. Research by Martinelli *et al.* [11] shows that recovery is a gradual, long-term process that includes distinct phases involving various life domains beyond abstinence. Such results indicate that recovery is an ongoing dynamic process of behavioural change [6]. Individuals in long-term recovery typically have fewer problems related to housing, criminality and substance use, and they are more likely to have work or attend education than individuals early in recovery [11]. Thus, late relapse plausibly involves other challenges in social behaviours and functioning compared to early relapse. Further, studies on first-year abstinence suggest that cognitive functioning and learning ability are significantly reduced during the first year of abstinence, likely making these factors more prominent in early relapse [12,13]. Moreover, the early physical demands induced by symptoms of withdrawal [14] and the need for change in nutrition and physical exercise are more prominent in early relapse [15]. Hence, early relapse will plausibly involve reduced cognitive and physical capacity. In sum, these findings underscore that early and late relapses seem related to different life domains and are hence different phenomena.

Relapse after short-term abstinence (hereafter: early relapse) is associated with depressive emotions, mental illness, unemployment and lack of social support [16–18]. Relapse after extended abstinence (hereafter: late relapse) is associated with the use of avoidant coping style, low self-efficacy and not considering problematic substance use as a problem [19].

However, there is no consensus on operationalisations of relapse [9], nor on the application of time criteria. For early relapse, some studies used 2–6 months [17] while others used 3–12 months [16]. For late relapse, some studies used 18 months [20] while others used 3 years [19]. Hence, the existing literature makes it difficult to determine whether a relapse is in fact early or late.

Previous research [21] suggests that the concept of relapse in alcohol use disorder (AUD) has low heuristic value because it is operationalised differently in different studies. A suggested solution to this problem is to define 'relapse' as an absence of abstinence [22]. However, a too narrow or too broad definition of 'relapse' may hide phase-specific needs and challenges during the course of recovery and thus make it more difficult to implement well-timed and tailored treatment efforts. Furthermore, without a coherent operationalisation of relapse, there will be a risk that the phenomenon is inadequately represented, which makes it difficult to compare study results and implementing relapse prevention. Such risk bears similarities to what Hagger [23] denotes as the 'déjà-variable' phenomenon and the 'jingle' fallacy. When these concepts are taken together, they refer to the presumption that the same construct has similar meaning across studies when, in fact, different terminology has been applied to the same construct. This might lead reviewers to conclude that findings of relapse are inconsistent when, in fact, it is due to inconsistent terminology.

Aim

The aim of this study is to systematically review operationalisations of relapse after short-term and long-term abstinence and remission, recovery and slip.

Method

This review followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines [24–26]. The protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO) in October 2019 (registration number: CRD42020154062) (Appendix 1).

Search strategy

Two researchers (FM and JB) independently searched the literature using the following databases: Epistemonikos, Cochrane Central Register of Controlled

Trials (CENTRAL and DARE), MEDLINE, EMBASE, Google Scholar, CINAHL, Web of Science and PsycINFO. Variations and combinations of terms targeting five main concepts were used in the search: relapse, abstinence, remission, recovery and slip (See Appendix 2 for model search). An information scientist reviewed the search queries and safeguarded that the literature search was conducted correctly. A manual literature search was also performed using reference lists of reviews and meta-analyses identified in the main search. In cases of doubt, the full-text paper was read to determine eligibility. There was no time limit for the included studies. The last search was conducted on 8 January 2021.

Eligibility criteria

The included articles had to meet all of the following criteria:

1. Empirical study published in English in peer-reviewed journals.
2. Study sample meets diagnostic criteria for dependence syndrome in International Classification of Diseases, 10th revision [27], dependence syndrome in Diagnostic and Statistical Manual of Mental Disorders (DSM) IV [28], or moderate–severe drug use disorder or AUD in DSM-5 [29].
3. Reports relapse, abstinence, recovery, remission, short- or long-term, slip or lapse.

Exclusion criteria

1. Studies reporting on smoking or smoking and alcohol/AUD only.
2. Animal studies.
3. Case studies.

Data collection

All potential studies were exported into a reference citation manager (Endnote) before duplicates were removed. Two reviewers (FDM and JB) independently performed the screening of titles and abstracts and full-text analysis. In cases of doubt, the full-text paper was read to determine eligibility. The synthesis of the operationalisations (Table 1) and selection of outcomes were developed during 11 consensus meetings. Disagreements were resolved through discussion until consensus was reached. A third reviewer (JRM) was available to resolve disagreements and provide critical feedback.

Analytic methods and data extraction procedure

A narrative synthesis was performed for the included articles. A narrative synthesis is a textual approach seeking to 'tell a story' about the findings from the included studies focusing on questions beyond the effectiveness of a particular treatment [30]. The purpose was to assess different levels of detail in operationalisations and discuss the implications of comparing and implementing studies deploying different operationalisations of the same concepts. We aimed to use this analytic approach for mapping the diversity in the field. Hence, the synthesis focused on the separate elements building up the whole of the empirically based operationalisation.

The first step for each included article was to assess sample description and substance type; length of follow-up; study aim; frequency of measuring points; operationalisations of abstinence, remission, recovery, relapse and slip; measuring instruments and other relevant information for relapse assessment. The second step was to tabulate the articles' primary findings, focusing on the operationalisations of abstinence, remission, recovery, relapse and slip. In step 3, we conducted a step-by-step thematic classification of each of the five groups of operationalisations, and operationalisations were subdivided into separate categories/themes based on similarity; for example, every operationalisation of *relapse* that primarily used urine analysis, breathalyser or blood sample to assess relapse was grouped under the theme 'biomarker'. In step 4, we grouped themes from step three into overarching themes. Thus, operationalisations of relapse that used biomarkers or other measuring instruments, such as Drug Use Disorder Identification Test or Alcohol Use Disorder Identification Test, were grouped together under the overarching theme *measure*. The rationale was that *measuring* was a primary theme in the operationalisation of relapse (see Limitations for further elaboration).

Since each operationalisation was divided into several themes, the result was more themes than operationalisations. For example, *relapse* operationalisations often contained different time criteria and use criteria for assessing a relapse, and these criteria were subdivided into separate themes. This process led to several themes of both time criteria and use criteria. For example, when grouping time criteria together, we assessed similarity in length. Further, we determined which subdivided themes were more frequent than others. As there were several subdivided themes relating to time, time was chosen as an overarching theme, based upon agreed similarities. The rationale for subcategorising the operationalisations was to obtain a thorough overview of the relevant components of each operationalisation.

Table 1. *Number of sub-themes of the overarching themes from the operationalisations of abstinence, remission, recovery, relapse and slip from the 276 studies*

Operationalisations	Abstinence, *n* (%)	Remission, *n* (%)	Recovery, *n* (%)	Relapse, *n* (%)	Slip, *n* (%)
Use[a]	39 (42)	12 (22)	5 (29)[b]	47 (26)[c]	9 (31)[d]
Frequency and amount of use				49 (27)	
Amount					14 (44)
Time	43 (47)	18 (33)	5 (29)	30 (17)	6 (19)
Measure	9 (9)			47 (26)	
Diagnostic criteria		20 (37)			
Psychosocial			3 (18)		
Other	2 (2)	4 (7)	3 (18)	9 (5)	2 (6)

[a]No or some use. [b]Some or any use, and not previous level of use. [c]No or some use. [d]Any use.

To assess long-term studies and the frequency of measuring points that were used to define 'relapse' after long-term abstinence, the cut-off was set to studies with a follow up of at least 2 years. Following cut-offs in remission according to diagnostic guidelines in DSM-5 and International Classification of Diseases, 11th revision (12 months) [29,31] and research (3 years) [32,33], our 2-year criterion may be regarded as a practical tool and a minimum criterion for identifying long-term studies. To determine factors relevant for defining 'late relapse', we investigated time criteria for abstinence, remission and recovery since these factors are used to define periods of non-use and may be used to distinguish early from late relapse.

Results

Search results

The electronic search returned 3426 articles. After duplicates were removed, 1981 articles remained. A hand search of reference lists from reviews and meta-analyses returned a further 17 articles. We screened the title/abstract of the 1998 articles. A full-text evaluation was conducted for 366 articles, of which 276 met the inclusion criteria and were included in the final synthesis. Details of the search results are summarised in Figure 1.

Operationalisations of abstinence, remission, recovery, relapse and slip

What follows is a descriptive presentation of our results. In the discussion part, we will elaborate on the intersection between the five concepts. Details of the included operationalisations of abstinence, remission, recovery, relapse and slip are summarised in Table 1.

Operationalisations of abstinence. Three overarching themes emerged from the tabulation of the operationalisation of abstinence. Those were *Time* (47%), *Measure* (9%) and *Use* (42%), and included 98% of the included studies. Excluded criteria were diagnostic criteria and binary statements of yes/no, because they appeared infrequently. *Time* reflects varying ways of operationalising *time length*, such as a specific number of weeks/months for early, intermediate and long-term/sustained abstinence.

Operationalisation of remission. Three overarching themes emerged from the tabulation of the operationalisations of remission. Those were *Diagnostic criteria* (37%), *Use* (22%) and *Time* (33%), and included 92% of the included studies. The criteria of 'not hospitalised', 'not missed work' and 'no drinking problem' were excluded because they were infrequent. *Diagnostic criteria* reflect to what extent specific symptoms were used to assess remission. Some operationalisations stated that 0 symptoms of SUD or AUD counted as remission (50%), while others counted some but not all symptoms as indicative of remission (19%). Such operationalisations were often termed 'partial remission'. *Use* denotes both *no use* and *any use* of a given substance, but also *some use* or some specified amount, and frequency. *Some use* was not specified [34], but a specified amount was often stated as a particular level of use (e.g. three ounces) with a particular frequency (e.g. per day, week or month) [35,36]. Some of these operationalisations included non-use, while others used diagnostic criteria (e.g. no Research Diagnostic Criteria symptoms [37]). *Time* reflects the different usage of temporal criteria to assess remission. For example, the operationalisation of *remission* as abstinent for 1 to 36 months was categorised under *Time*.

Operationalisation of recovery. Three overarching themes emerged from the tabulation of the operationalisation of recovery. Those were *Psychosocial* (18%),

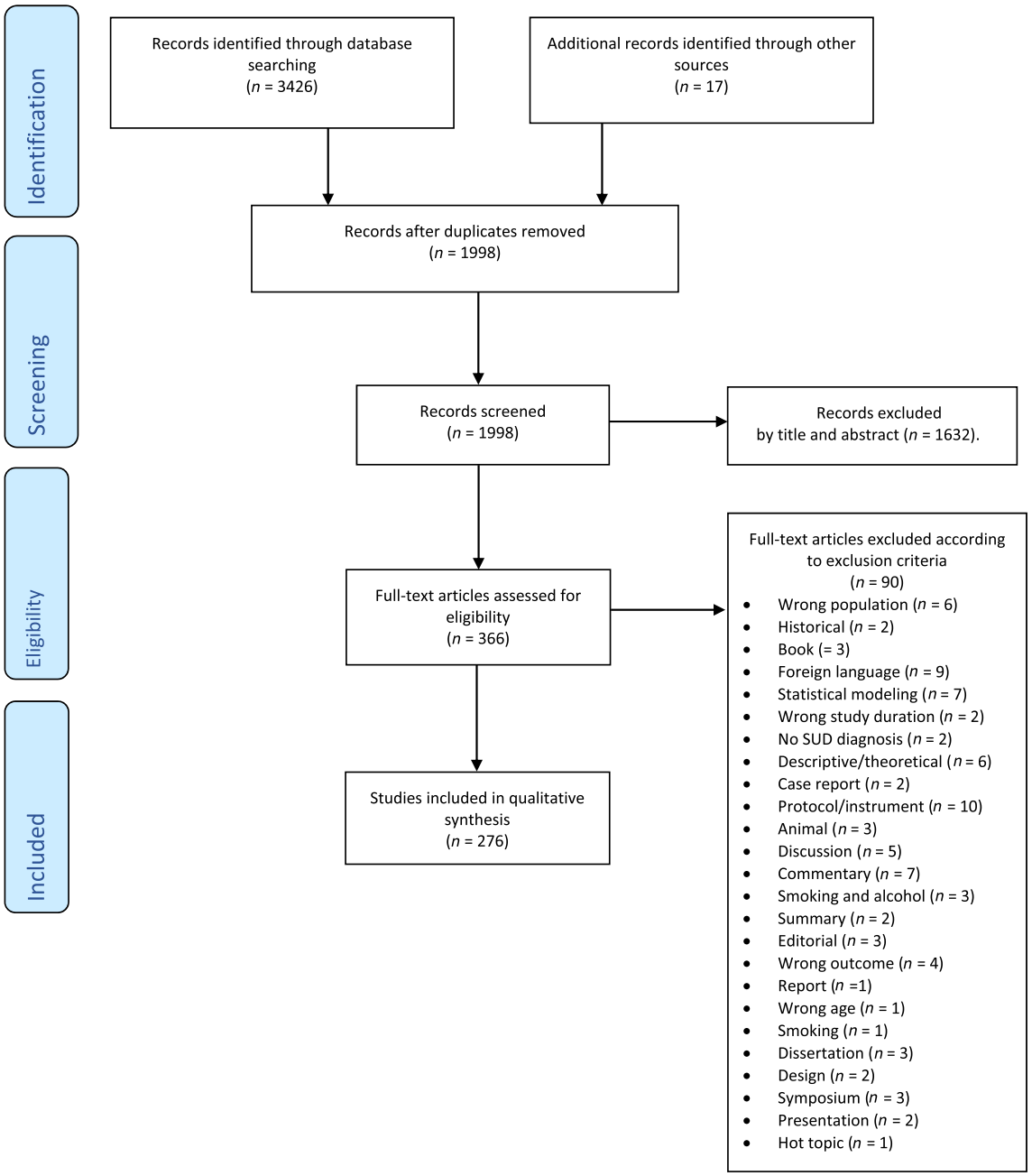

Figure 1. *PRISMA diagram of study selection process. SUD, substance use disorder.*

Time (29%) and *Use* (29%) and included 76% of the included studies. Excluded criteria were in treatment, no intoxication, measure and substance problems, as they were infrequent. Time specifications were more frequent than specific measures of recovery. *Psychosocial* reflects improvements in other areas of adjustment or functioning than substance use (e.g. housing, income, drug-free friendships and work/school [38]). However, not all of the studies specified the content of *psychosocial* [39]. *Time* and *Use* denote a specific time criterion (i.e. length of abstinence) and substance use (i.e. either non-use or some use). Two studies included some use [40,41].

Operationalisation of relapse. Four overarching themes emerged from the tabulation of the operationalisation of relapse. Those were *Measure* (26%), *Time* (17%), *Use* (26%) and *Amount and frequency* (27%), and included 96% of the included studies. One operationalisation of 'relapse' used illegal behaviour as a criterion. This criterion was excluded from the tabulation of relapse since it

was infrequent. *Measure* reflects different measuring instruments used to assess relapse. The measures used were self-reports (e.g. Drug Use Disorder Identification Test), biomarkers, interviews with family or close friends, surveys and diagnostic criteria (e.g. DSM). *Time* reflects the different usage of temporal criteria to assess relapse. For example, one study stated that 1 week or more of substance use counted as a relapse [42]. *Use* denotes any use of a given substances to assess relapse. *Amount and frequency* represents a specified amount of a given substance and a specified frequency of use when operationalising a relapse. For example, substance use on a regular basis on more than one-third of days from first use to follow up counted as a relapse [43]. The overarching themes *Measure*, *Use* and *Amount and frequency* overlap. All three are related to consumption. However, they represent different levels of detail in operationalising relapse. Whether a study operationalises relapse as any use [44] or 60/48 g of alcohol intake for a male/female on at least one drinking occasion [45] entails different levels of detail in the conceptualisation and measuring of relapse.

Operationalisations of slip or lapse. In this study 'slip' and 'lapse' are considered synonyms and are used interchangeably. Three overarching themes emerged from the tabulation of the operationalisations of slip. Those were *Use* (31%), *Time* (19%) and *Amount* (44%), and included 94% of the included studies. Excluded criteria were biomarker, treatment and health since they appeared infrequently. *Use* denotes any use, or some use, and not using a given substance at the previous level before achieving abstinence. *Time* represents a specified temporal criterion, such as drinking for 1 day or using a substance and then not using it for a week. *Amount* denotes a specified quantity of the substance used.

No operationalisation of relapse, follow-up duration and frequency of measuring points

Eighty-nine (32%) studies mentioned relapse but provided no definition. One hundred and ninety-five (71%) studies had a follow-up duration of less than 2 years, while 81 studies had 2 years or more. Sixteen (6%) studies had a maximum follow-up duration of 2 years and 65 (24%) studies had more than 2 years. Thus, there were more studies on short-term abstinence than on long-term abstinence.

The frequency of measuring points for studies with a maximum follow-up duration of 2 years ranged from 2 to 24 (see Table 2 for details). Forty-seven of the 65 studies with longer follow-up than 2 years contained 0–6 measuring points during follow-up. Fifteen of the 65 studies contained more measuring points. In total, 38 (47%) of the 81 studies did not provide an operationalisation of 'relapse'.

The time criteria in abstinence, remission and recovery

Forty-seven (17%) of the studies had definitions of 'abstinence' involving a time criterion specifying the duration of abstinence needed to be assessed as abstinence. See Table 2 for details. Of these studies, 28 (10%) contained a definition of 'long-term abstinence' or 'sustained' or 'protracted abstinence'. There were 15 different time criteria. Some of these definitions used *time range* as a criterion (e.g. 3–12 months). We reported the lowest number (i.e. three in 3–12 months). We also did not include a study that reported the average long-term abstinence [83].

Twenty-two (8%) studies included a definition of 'remission'. Seven studies used 26 weeks as the time criterion for abstinence to be considered remitted. Seven studies used 12 months. One study used 1–36 months. Two included moderate drinking [35,72]. Two (9%) studies contained several definitions of 'remission' [e.g. 74].

Seven (3%) studies included a definition of 'recovery' and five (2%) studies included a specific time criterion. Three studies used 12 months. One study used 2 years, while another study used 5 years.

These descriptive results show different use of time criteria within and between abstinence, remission and recovery operationalisations.

Relapse after long-term abstinence

Of the studies with a follow-up duration of 96 weeks, one (6%) contained a definition of 'long-term abstinence'. Of the studies with a follow-up duration of more than 96 weeks, four (6%) contained a definition of 'long-term abstinence'; one (2%) study reported on late relapse and long-term abstinence while one (2%) reported on early relapse and long-term abstinence. One (6%) study with a follow-up duration of 96 weeks did not report relapse or any other definition [84]. Seventeen (27%) studies with a follow-up duration of more than 96 weeks did not report relapse or any other definition (see Table 3 for details). The remaining studies reported definitions of either 'abstinence', 'remission' or 'recovery', or a combination of these. In total, there were six (8%) studies mentioning long-term abstinence, of which one (1%) included early relapse and one (1%) included late relapse.

Table 2. *Time criteria in abstinence, remission and recovery*

Study	Time criteria		
	Abstinence	Remission	Recovery
Marchesi *et al.* [46]	28 days		
Zou, Durazzo and Meyerhoff [47]	4–28 weeks[a]		
Davis *et al.* [48], Gazdzinski, Durazzo and Meyerhoff [49], Li *et al.* [50]	24 weeks		
Currie *et al.* [51]	48 weeks		
Huang *et al.* [52], Li *et al.* [53]	64 weeks		
Elsheikh [54]	3 months		
Ghita *et al.* [55]	<4 months		
Chen *et al.* [56]	6–8 months		
Su *et al.* [57]	8 months		
Litt *et al.* [58]	11 months		
Trabut *et al.* [59]	12 months		
Yang *et al.* [60]	15 months		
Daig *et al.* [61], Prosser *et al.* [62]	18 months		
He *et al.* [63]	1 year		
Bartels *et al.* [64], Boulze, Launay and Nalpas [65]	2 years		
Carroll *et al.* [66], Zou *et al.* [67]	3 years		
Zhu *et al.* [68], Weisner *et al.* [69]	5 years		
Hasin, Endicott and Keller [37], Hasin *et al.* [70], Samet *et al.* [71]		26 weeks	
Moos and Moos [35], Moos and Moos [72], Xie *et al.* [73], Xie *et al.* [39].		6 months	
Dawson *et al.* [41], Torgersen *et al.* [74], Rumpf *et al.* [75], Husky *et al.* [76], Dunlop and Tracy [77]		12 months	
Thoma *et al.* [78], Yeh, Che and Wu [79]		1 year	
Anthenelli *et al.* [80]		1–36 months[b]	
Dawson *et al.* [41]			12 months
Best *et al.* [81], Xie *et al.* [39]			1 year
Bjornestad *et al.* [38]			2 years
Hser [82]			5 years

[a]Long-term abstinence defined as 4–28 weeks of abstinence. [b]Remission defined as 1–36 months of abstinence.

Discussion

The most important finding in the present study is the detailed field description of the different operationalisations of key concepts for understanding relapse in SUD. Such variance is a challenge to the accumulation of knowledge, which is a central aspect of normal science [150]. Time and use appeared in all operationalisations. Other overarching themes were measure, diagnostic criteria, psychosocial and amount and frequency, thus indicating that time and use are the most common factors used to operationalise abstinence, remission, recovery, relapse and slip. However, the operationalisations varied. There were more short-term studies than long-term studies. Among the long-term studies, one reported on early relapse and long-term abstinence while another reported on late relapse and long-term abstinence. Consequently, this suggests that SUD research does not consistently differentiate between early and late relapse.

Conceptualising relapse

We find that the operationalisation of relapse varies, and it revolves around the four categories *measure*, *time*, *use* and *amount and frequency*. The four overarching themes vary across operationalisations depending on the specific study. Some operationalisations stated that any use counted as a relapse, while others specified the amount and frequency of using a given substance needed to count as relapse. Consequently, there are different levels of detail in relapse operationalisations. Operationalisations using *any use* of a substance or alcohol are probably comparable with each other [44,107]. However, defining 'relapse' as *any use* makes relapse challenging to separate from a slip. Operationalisations using reinstatement or return to the previous substance use level [151] may be more adequately categorised as *relapse* than *any use*. This is in line with the general idea that relapse is the return of symptoms of a disease after a period of improvement [152].

Table 3. *Frequency of measuring points for studies with follow up of 2 years and more than 2 years, including operationalisations of abstinence, remission, recovery, relapse and slip*

Study and follow up	Frequency of measuring points	Operationalisations
Dolsen and Harvey [84] (varies),[a] 96 weeks	2	No[b]
Rumpf *et al.* [75], 96 weeks	2	Remission
McKee, Bonn-Miller and Moos [85], 96 weeks	3	Relapse
Hasin, Endicott and Keller [37], 96 weeks	4	Relapse and remission
Costa *et al.* [86], 96 weeks	4	Abstinence
Bartels *et al.* [64], 96 weeks	5	Long-term abstinence
Kopak, Haugh and Hoffmann [87], 96 weeks	5	Relapse
Loosen, Dew and Prange [88], 96 weeks	5	Abstinence and relapse
Schmidt, Helten and Soyka [89], 96 weeks	5	Abstinence
Besson *et al.* [90], 96 weeks	6	Relapse
Burtscheidt *et al.* [91], 96 weeks	6	Abstinence, lapse and relapse
Harned *et al.* [92], 96 weeks	7	Relapse and remission
Corrao *et al.* [93], 96 weeks	8	Relapse
Scott, Dennis and Foss [94], 96 weeks	9	Recovery
Chen *et al.* [95], 96 weeks	24	Relapse
Wang *et al.* [96], 96 weeks	25	Relapse
Torgersen *et al.* [74], 384 weeks[c]	Varies	Relapse and remission
Trabut *et al.* [59], 288 weeks	Varies	Early relapse and long-term abstinence
Booth *et al.* [97], 144 weeks	1	No
Decker *et al.* [98], 240 weeks	1	No
Dore *et al.* [99], 108 weeks	1	Relapse
Lloyd [100], 1008 weeks	1	Relapse and abstinence
Lucey *et al.* [101], median of 252 weeks	1	Relapse
Merlo *et al.* [102], 240 weeks	1 (retrospective chart)	No
Mutschler *et al.* [103], more than 200 weeks	1, not specified	Relapse
Onishi *et al.* [104], mean follow up 245 weeks	1, retrospective	No
Pfitzmann *et al.* [105], median of 356 weeks	1, retrospective	No, lapse
Wu *et al.* [106], 240 weeks	1	Relapse
Brecht and Herbeck [107], 240 weeks	2	Relapse and abstinence
Cushman Jr. [108], 384 weeks	2	Relapse
de Soto, O'Donnell and de Soto [109], 192 weeks	2	Relapse
Deruytter *et al.* [110], mean follow up of 220 weeks	2	Relapse and slip
Evans *et al.* [111], 480 weeks	2	No
Fernandez-Hermida *et al.* [112], 384 weeks	2	Relapse
Haller *et al.* [113], 480 weeks	2	Remission and long-term recovery
Hser *et al.* [114], 1440 weeks	2	Relapse
Johnson-Greene, Adams *et al.* [115], 128 weeks	2	No
Marel, Mills *et al.* [116], 480–528 weeks	2	No
Price, Risk and Spitznagel [117], 1200 weeks	2.	Remission
Tan *et al.* [118], 120 weeks	2	No
Hser [82], 1584 weeks	3	Long-term recovery
Haastrup and Jepsen [119], 528 weeks	3	No
Lavee and Altus [120], 144 weeks	3	Late relapse and long-term abstinence
Rosenbloom, Pfefferbaum and Sullivan [121], 192 weeks	3	Relapse and abstinence
Li *et al.* [122], 240 weeks	3	Relapse
Weisner *et al.* [69], 240 weeks	3	Long-term abstinence
He *et al.* [123], 720 weeks	4	Long-term abstinence
Muller, Znoj and Moggi [124], 240 weeks	4	Abstinence
Schmeding *et al.* [125], 144–480 weeks	4	Recurrent
Scott, Foss and Dennis [126], 144 weeks	4	Relapse
Vanderplasschen, Bloor and McKeganey [127], 132 weeks	4	No
Finney and Moos [36], 480 weeks	5	Remission and relapse
Gual *et al.* [128], 960 weeks	5	Abstinence
Moos and Moos [35], 768 weeks	5	Relapse (remission)
Moos and Moos [72], 768 weeks	5	Non-remitted, remission
Pfefferbaum *et al.* [129], 384 weeks	1–5 times	Relapse

(Continues)

Table 3. (Continued)

Study and follow up	Frequency of measuring points	Operationalisations
Grella *et al.* [40], 288 weeks	6	Recovery
Rubio *et al.* [130], 288 weeks	6	Relapse
Vaillant *et al.* [131], 384 weeks	6	Remission and abstinence
Zhu *et al.* [68], 240 weeks	6	Long-term opioid abstinence
Maisto, McKay and O'Farrell [132], 120 weeks	7	Abstinence
Kassani *et al* [133], 192 weeks	9	Relapse
O'Farrell, Choquette and Cutter [134], 120 weeks	9	No
Brunette *et al.* [34], 480 weeks	10	Relapse and remission
Ge *et al.* [135], 240 weeks	11	Relapse
Hasin, Endicott and Keller [136], 240 weeks	11	Relapse and remission
Xie *et al.* [39], 480 weeks	11	Remission and recovery
Mueller *et al.* [137], 576 weeks	15	Recurrence and recovery
Dong and Kerr [138], 1008 weeks	16	No
Dennis *et al.* [139], 192 weeks	17	No
Hosseini *et al.* [140], 192 weeks	17	Relapse
Genberg *et al.* [141], 960 weeks	20	Cessation
Xie *et al.* [142], 480 weeks	21	Remission and relapse
Maremmani *et al.* [143], 144 weeks	36	Relapse and slip
Berlakovich *et al.* [144], 552 weeks	72	No
Maisto *et al.* [145], 480 weeks	4	Relapse
Huh, Kim and Hong [146], 432 weeks	1 (retrospective)	No
Stephens *et al.* [147], 136 weeks	6	Abstinence
Webb *et al.* [148], 192 weeks	3 (cross-sectional)	No
Bruguera *et al.* [149], 336 weeks	1 (retrospective)	Lapse, relapse, abstinence

[a]Some were measured more. [b]No means that there were no definition/operationalisation. [c]Expressed in weeks to show variation. This is done for all the 'more than two years' studies in the table.

Moving to the overarching theme, *amount and frequency*, specifying previous substance use makes it possible to include all levels of previous substance use and to assess the degree of a relapse. The amount and frequency of use should reflect substance use levels before reduced use or non-use for the current episode of use to be classified as a relapse. In this way, one could state that the individual had returned to a level of previous use. However, one challenge encountered when using such a criterion arises from the fact that individuals who use a different substance than previously would not be classified as relapsed. Further, focusing too much on the amount and frequency may give priority to substance use over other symptoms used to assess relapse, which is significant since SUD involves other factors than substance use, including social and professional functioning and other comprehensive and stable behavioural changes [11,153].

The operationalisation of *time* should reflect the duration of the relapse and separate a relapse from a slip. *Time* should also be related to *amount and frequency*, since how long a person uses, and with what frequency, gives information about the severity of the relapse. Using a *measure* to operationalise relapse was common. However, different measuring procedures were applied [38,154]. Measuring relapse solely by biomarkers [155] may be more useful with *any use* than with *amount and frequency*, since biomarkers often yield binary results. However, 'relapse' defined as *any use* and measured with biomarkers cannot differentiate between relapses. Such operationalisations sustain the focus on substance use or abstinence as the most important part of recovery.

The results show that there is no consensus on the operationalisation of relapse and that operationalisations focus mostly on substance use without considering behavioural changes over time, such as personal and social functioning [9,11]. In this regard, our results are on par with Miller [4] that the 'relapse' concept is mostly perceived as a binary judgement of either abstinent or relapsed. Operationalising relapse in this way appears to overlook how common relapse is in SUD recovery [4]. Further, omitting that the protracted behavioural changes occurring in personal and social functioning are heterogeneous and have different pathways [6]. Conceptualising 'relapse' in a binary fashion might substantiate 'relapse' as a static phenomenon that is the same whenever it happens in recovery. As such, the 'relapse' concept may neglect the relevance of behavioural change to maintain abstinence by

focusing too much on substance reduction. Furthermore, a binary conceptualisation hides that 'relapse' is a dynamic phenomenon influenced by the duration of abstinence and behavioural changes. Thus, a relapse is influenced by when it happens in the recovery process [11]. One possible consequence of viewing 'relapse' as static is that treatment studies and guidelines might differentiate poorly between early and late relapse. The various operationalisations of abstinence, remission, recovery, relapse and slip make it difficult to compare studies. Construct validity is accordingly low. *Construct validity* concerns the relatedness of a construct to its theoretical meaning [156]. For example, different operationalisations of 'remission' and 'recovery' indicate that the operationalisations are partially not related to their constructs theoretical meaning. Different operationalisations imply that different criteria are used to conceptualise and thus measure, for example, 'remission'. Since different operationalisations are used to refer to the same construct, it suggests that the operationalisations partially reflect the construct's theoretical meaning. A similar phenomenon has been acknowledged in social psychology, where inconsistent terminology about the same construct suggests impeding the accumulation of scientific findings of the particular construct [23]. Further, since the operationalisations differ about the same phenomena, their representations of reality differ. Thus, the same approaches may be used to prevent early and late relapse, implying poor differentiation and sub-optimal treatment.

The affinity between remission, recovery and relapse

Because SUD is characteristically cyclical in nature [2,3] remission, recovery and relapse are interrelated. We find that the operationalisations of remission and recovery mainly focused on use, time, psychosocial factors and diagnostic criteria. For remission, the differences in the use criteria mainly revolved around some use or no use of a substance or other symptomatology (i.e. diagnostic criteria) [36,41,75]. Some operationalisations of remission stated that 'some use' was defined as partial remission [92]. An operationalisation of this kind presumes that abstinence is the primary goal in approaches to SUD. However, this operationalisation appears not to take into consideration that SUD is often a cyclic process [3]. Some of the operationalisation of recovery also presumes that abstinence is the primary goal in approaches to SUD which is contrary to the theoretical meaning of recovery [6]. Thus, current operationalisations of remission and recovery give precedence to abstinence. As such, they do not properly observe the degree to which personal [7,8] and social [10] functioning are seen as paramount to the maintenance of stable substance reduction or abstinence [9]. Moreover, remission and recovery is attainable with and without substance reduction [157,158]. Consequently, these definitions fail to capture the multidimensional and heterogenic aspect of recovery [6] and that people in recovery may function well in spite of inebriety [5]. Further, relapse is not incorporated as a common aspect of SUD recovery and remission [4] since abstinence is given precedence in research operationalisations. Since relapse research influences SUD practice, the preference for abstinence in research operationalisations may influence clinicians' understanding of relapse in practice. The practical implication of this approach may be that a relapse is viewed as both common and a failure to recover rather than as a common set-back in recovery, which may in turn lead to poor motivation for patients in recovery, as transferring from 'full' remission or recovery to 'partial' indicates a failure in treatment, even though a relapse is expected to happen more times than not [2,19,159,160]. Thus, overlooking that recovery involves more than abstinence and remission from symptoms [161].

There were various time criteria in the operationalisation of remission and recovery [70,76,81,82]. The time criterion for remission was often 6 months, while for recovery, it was often 1 year. However, these time criteria appear to be too short when considering the vast behavioural changes SUD recovery requires [11]. The operationalisations of remission and recovery give priority to the ability to maintain abstinence over time while simultaneously minimising the behavioural changes needed for such maintenance [7,8,10,11]. The scope of this review was to investigate operationalisations in research, which overlaps with and influence clinical thinking. The narrow focus on abstinence makes it hard to take into account how common relapse actually is, and that relapsing is dependent on when it happens. Thus, relapse, remission and recovery cannot be assessed primarily from substance use and assessment should also take into account gradual and different behavioural changes.

Future research

One approach to improving operationalisations of relapse is to interview service users about personal challenges related to short-term versus long-term abstinence. In-depth interviews with service users may provide relevant information about constituents belonging to relapse and may increase ecological validity. Such studies may guide measure development and determining which time criteria to use in relapse research.

For example, separating short-term and long-term abstinence at 1 year could be a useful starting point. Precision in conceptualisation may also increase the focus on aspects other than substance use reduction. Thus, emphasising that other aspects than a reduction of substance use are important in remission and recovery. Since long-term abstinence involves a long time period of refraining from substance use, emphasis on the act of *refraining* is important. Future studies in statistical modelling could investigate change in factors relating to personal and social recovery. By dividing SUD service users into two categories, early and late relapse, it may be possible to analyse differences in relapse patterns. Another possibility is to investigate if the 'relapse' concept could be specified according to substance type or population, hence resulting in a more specific conceptualisation of relapse rather than a global all-encompassing one. In this regard, Skinner's [162] guide to the construct of control may be used as a foundation to mitigate the inconsistent terminology applied to the same concept, such as relapse.

Strengths and limitations

There are two notable strengths of the current study. PROSPERO registration ensured that the study protocol was publicly available before the study was conducted. Secondly, the review was conducted using the PRISMA guidelines. Additionally, two raters independently determined what studies were included. The incorporation of broad inclusion criteria to investigate all possible operationalisations related to the topic made it possible to investigate the uniformity of relapse operationalisations and if research differentiated between early and late relapse in SUD. However, some operationalisations may have been missed. Further, each operationalisation was analysed using narrative synthesis, which has methodological and conceptual limitations. Methodologically, the emerging themes were only one way of grouping the operationalisations. Hence, replicating the tabulation of operationalisations might result in different themes. Conceptually, the synthesis was an empirical and descriptive investigation, not theory-driven, which might complicate applying the results for theory building.

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Conflict of Interest

The authors have no conflicts of interest.

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Appendix 1

Medline search for replication

Database(s): *Ovid MEDLINE(R) ALL* 1946 to 7 January 2021
Search Strategy: relapse update

#	Searches	Results
1	substance-related disorders/ or amphetamine-related disorders/ or cocaine-related disorders/ or heroin dependence/ or inhalant abuse/ or marijuana abuse/ or opioid-related disorders/ or morphine dependence/ or opium dependence/ or phencyclidine abuse/ or psychoses, substance-induced/ or substance abuse, intravenous/ or substance abuse, oral/	
2	((heroin or marijuana or marihuana or hashish or cannabis* or amphetamine* or opioid* or cocaine or opiate* or opium* or morphine* or ecstasy or methamphetamine* or polydrug* or 'poly-drug*' or 'poly substance*' or 'polysubstance*' or multidrug* or 'multi drug*' or solvent or inhalant* or narcotic* or drug* or substance*) adj2 (abus* or misus* or addict* or dependen* or 'use*' or usage* or disorder*)).hw,kf,ti,ab.	
3	(sud or suds or sniff* or narcotism or addicts or addiction).hw,kf,ti,ab.	
4	Alcohol-Related Disorders/ or alcoholism/	
5	(alcohol* adj2 (abus* or misus* or addict* or dependen* or "use*" or usage* or disorder*)).hw,kf,ti,ab.	
6	(problem adj2 drinking).kf,ti,ab.	
7	(aud or auds).kf,ti,ab.	
8	1 or 2 or 3 or 4 or 5 or 6 or 7	
9	((recovery or recovering or autorecovery or remission or sober or sobriety or abstinen* or abstained or 'drug free' or 'alcohol free') adj3 (full or longterm* or 'long term*' or prolong* or 'long last*' or longlast* or lengthy or stable)).kf,ti,*ab.	
10	alcohol abstinence/	
11	(full or longterm* or 'long term*' or prolong* or 'long last*' or longlast* or lengthy or stable).kf,ti,ab.	
12	10 and 11	
13	9 or 12	
14	(relaps* or recurrence* or lapse* or slip).kf,ti,ab.	
15	recurrence/	
16	14 or 15	
17	8 and 13 and 16	
18	remove duplicates from 17	
19	smoking.m_titl.	
20	tobacco.m_titl.	
21	cessation.m_titl.	
22	nicotine.m_titl.	
23	19 or 20 or 21 or 22	
24	18 not 23	
25	exp animals/ not humans.sh.	
26	24 not 25	353
27	*limit 26 to (dt = 20 200 304–20 210 108 or rd = 20 200 304–20 210 108)*	*77*

Appendix 2

Deviation from the study protocol

1. Change of title and aim: focus shifted to investigating operationalisations of relapse after short-term and long-term abstinence and remission, recovery, and slip rather than focusing on relapse and lapse patterns and related trajectories.
2. Included studies with alcohol use disorder or alcohol detoxification.
3. Excluded studies with smoking, and smoking and alcohol.
4. Completion date was extended. The reason was that the review process took longer time.
5. A fifth co-author was included, which was not mentioned during PROSPERO registration.