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Measuring recovery capital for people recovering from alcohol and drug addiction: a systematic review

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ABSTRACT

Background: Recovery capital theory provides a biopsychosocial framework for identifying and measuring strengths and barriers that can be targeted to support recovery from alcohol and drug addiction. This systematic review analyzed and synthesized all quantitative approaches that have measured recovery capital since 2016.

Method: Three databases were searched to identify studies published from 2016 to 2023. Eligible studies explicitly stated they measured recovery capital in participants recovering from alcohol and/or drug addiction. Studies focusing on other forms of addiction were excluded.

Results: Sixty-nine studies met the inclusion criteria. Forty-six studies used one of the ten identified recovery capital questionnaires, and twenty-five studies used a measurement approach other than one of the ten recovery capital questionnaires. The ten recovery capital questionnaires are primarily developed for adult populations across clinical and community recovery settings, and between them measure 41 separate recovery capital constructs. They are generally considered valid and reliable measures of recovery capital. Nevertheless, a strong evidence base on the psychometric properties across diverse populations and settings still needs to be established for these questionnaires.

Conclusion: The development of recovery capital questionnaires has been a significant advance in the field of addiction recovery, in alignment with the emerging recovery-oriented approach to addiction recovery care. Additionally, the non-recovery capital questionnaire-based approaches to recovery capital measurement have an important place in the field. They could be used alongside recovery capital questionnaires to test theory, and in contexts where the application of the questionnaires is not feasible, such as analyses of data from online recovery forums.

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1. Introduction

Recovery from alcohol and drug addiction involves changes across biological, psychological, and social domains of life. In conceptualizing the recovery process, Robert Granfield and William Cloud introduced the biopsychosocial concept Recovery Capital (RC), defining it as: ‘... the sum of one’s total resources that can be brought to bear in an effort to overcome alcohol and drug dependency’ (1999, p. 179). More recently, RC was defined as the ‘resources and capacities that enable growth and human flourishing’ (Best and Ivers 2022). Central to the RC theory is the notion that more RC and fewer recovery barriers and unmet needs lead to better recovery outcomes, in comparison with less RC and more barriers and unmet needs (Best and Hennessy 2022); therefore, targeting recovery strengths and barriers can be used to support recovery journeys. The precise composition of these resources and capacities remains largely untested and differ across

conceptual models, specifically how they should be categorized into distinct ‘domains’, determining which ones are most crucial for specific populations (Best and Hennessy 2022), and whether a negative component should be included in the model (Cloud and Granfield 2008; White and Cloud 2008; Best and Laudet 2010). Commonly, the resources and capacities have been categorized across three main levels: a) an individual level (personal RC), b) an inter-individual level (social RC), and c) a broader environmental level (community RC) (Hennessy 2017). Personal RC refers to all the tangible and intangible resources and capacities at the level of the individual that are supportive of recovery, including a range of material resources and personal characteristics. Social RC relates to all the instrumental and expressive social capital that is accessible to the recovering individual through their relationships and social networks. Community RC consists of all the recovery-supportive resources that are available

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to the recovering individuals in their community, such as recovery treatment, recovery-supportive policies and attitudes, and recovery supportive environments such as libraries and colleges.

Another matter of discrepancy is how factors hindering recovery should be named and measured. Whereas some consider the RC construct as a continuum and refer to factors hindering recovery as ‘negative RC’ (e.g. Cloud and Granfield 2008), others prefer a summative approach, considering ‘negative RC’ as ‘recovery barriers and unmet needs’ (e.g. Best et al. 2020). Moreover, there is disagreement on whether the factors hindering recovery would be best considered within the three-level RC construct or as an entirely separate domain. Lastly, a related issue pertinent to how the RC theory has been tested in different contexts, is what the current research tells us about the relative importance of different kinds of resources and capacities for different populations. Altogether, the broad theoretical frames of the RC concept are predominantly established (Hennessy 2017), however a range of conceptual questions remain to be answered regarding both recovery-related strengths and capacities as well as factors hindering recovery.

The diversity of theoretical conceptualizations is reflected in the various approaches used to measure RC. Questionnaires developed to measure RC (hereafter called ‘RC questionnaires’) have been created based on different theoretical conceptualizations of RC, which likely contributes to their slightly different operationalizations of the construct. Recent reviews (Hennessy 2017; Best and Hennessy 2022) identified some of the most used RC questionnaires in the field: (a) the Assessment of Recovery Capital (ARC; Groshkova et al. 2013b), (b) the Brief Assessment of Recovery Capital (BARC-10, Vilsaint et al. 2017), (c) the REC-CAP (Best et al. 2017; Cano et al. 2017), (d) the Recovery Capital Questionnaire (RCQ; Burns and Marks 2013), and (e) the unnamed RC questionnaire by Sterling et al. (2008). Most of these have been found to have generally acceptable psychometric properties, but some have been critiqued for a perceived limited alignment with the RC theory and sometimes suboptimal psychometric properties across diverse populations (Hennessy 2017; Bowen et al. 2022). Overall, a range of RC questionnaires have been developed for use across practical and research settings since the systematic review by Hennessy (2017), and therefore an updated and more in-depth systematic synthesis of all currently available RC questionnaires is needed.

The RC measurement literature is not limited to RC questionnaires, as other measurement approaches have also been used in addiction recovery research. To date, only one publication has reviewed RC measurement approaches outside the RC questionnaires (Hennessy 2017). In this systematic review, eight of twelve quantitative studies used a measurement approach other than the available RC questionnaires (Hennessy 2017). Since Hennessy (2017), a few narrative reviews have included research on RC questionnaires (Best and Hennessy 2022; Bowen et al. 2022); nevertheless, alternative approaches to RC measurement have been largely overlooked. Since a growing amount of the

empirical evidence in the field comes from studies using measurement approaches other than an RC questionnaire, overlooking these studies in an RC measurement review would result in an incomplete picture of the field. Therefore, this systematic review includes RC questionnaires and all the other approaches used to measure the RC construct.

In summary, the diversity of the measures used to capture RC in this rapidly evolving field highlights the need for an up-to-date systematic review of the RC measurement approaches, including a focus on the approaches which are not based on RC questionnaires. Thus, this review synthesized the RC measurement literature with a further intention to aid researchers and practitioners in selecting the most-suited measurement method for capturing RC in their research. Specifically, we aimed to a) establish how RC has been quantitatively measured in studies published since Hennessy’s review (2017), examining not only the questionnaires used to capture RC but also other approaches and b) review findings related to the psychometric properties of the existing RC questionnaires.

2. Methods

This systematic review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA; Page et al. 2021).

2.1. Operationalization of RC in this review

To distinguish the use of preexisting RC questionnaires (e.g. the ARC) from other approaches in which RC may be captured, this systematic review classifies the RC measurement approach used in a given study into one of the following three categories: a) use of questionnaires specifically developed to measure RC (called ‘RC questionnaires’ in this systematic review); b) use of pre-validated questionnaires not initially developed to measure RC, but later used to capture RC (e.g. a questionnaire initially developed to measure abstinence self-efficacy and not tailored to measure the construct of RC), and c) any method used to capture indicators of RC which is other than a) an RC questionnaire or b) another pre-validated questionnaire. For example, a measurement approach in this category could be a social network analysis conducted to capture bonding (a component of social recovery capital) within a recovery community.

2.2. Inclusion criteria

The following inclusion criteria were applied: a) publication in English, b) quantitative study designed to measure RC with an explicit statement that ‘recovery capital’ was measured, and c) participants in recovery/treatment with a self-identified or clinically diagnosed alcohol or drug use disorder (excluding other forms of addiction). All available articles, including grey literature, were considered for review.

2.3. Data sources, and the search and screening process

Three academic databases were searched: ProQuest, PubMed and Web of Science. Additionally, the first 200 references on Google Scholar were assessed for inclusion (as per Bramer et al. (2017)). Across all databases, the search included studies published from February 1, 2016 through November 5, 2021 (updated search conducted in January 17, 2023). February 2016 was chosen as the start date to capture studies published after Hennessy's (2017) systematic review. The term 'Recovery Capital' was used across all searches. The article screening was conducted by a single screener using Rayyan (Ouzzani et al. 2016). Any issues regarding the selection of studies for the final review were discussed by three authors.

2.4. Data collection procedure

Data collection was conducted by one reviewer using a data extraction table which included the study authors' names, year of publication, design, location and setting, sample characteristics (number of participants, age, gender, race/ethnicity, primary substances of focus), the RC measurement method, RC questionnaire items, questionnaire development process, and psychometrics.

2.5. Systematic evaluation of the RC questionnaires' development process

To evaluate the quality of the included RC questionnaires more rigorously, we developed a REDCap (Research Electronic Data Capture) tool to systematically code RC questionnaire development and validation of the eight papers which reported doing so. To develop the tool, we reviewed existing scale development guidelines with nine domain steps (Identification of domain and item development; Content validity; Pre-testing questions; Survey administration and sample size; Item reduction; Extraction of factors; Tests of dimensionality; Tests of reliability; Tests of validity; Boateng et al. 2018) and consulted with an external expert in survey validation. Two coders tested the tool on one study and made adjustments to the coding tool. Following these adjustments, the two coders coded another study with 97% agreement. The remaining studies were coded by a single coder.

2.6. RC questionnaire item-level analyses

All RC questionnaire items were reviewed to identify the underlying constructs that the questionnaires were considered to measure and a figure of these constructs across all measures was created (Figure 2). For example, questions about individuals' housing situations were categorized as 'housing', and items regarding mental and physical health or wellbeing were categorized as 'health'. The RSQ (Rettie et al. 2019) and the RCI (Whitesock et al. 2018) questionnaires were not available online, but the articles (Whitesock et al. 2018; Rettie et al. 2019) specified each construct measured by the questionnaires and this information was used for the analysis. The figure was created based on the instructions and script by Fried (2017)

using R Studio version 4.0.2. The download link for the script used for this analysis can be found in the [Supplemental Materials](#). Additionally, the RC questionnaire constructs were overlaid with study sample characteristics to assess whether the RC questionnaire items varied depending on the population for which the RC questionnaire was developed.

3. Results

3.1. Literature search

Of the 206 studies remaining after duplicate removal, 141 were reviewed in full text. Fifty-four studies met the inclusion criteria. An updated literature search (January 2023) resulted in 15 additional studies. Thus, a total number of 69 studies were included in this review. Figure 1 presents the PRISMA flow diagram.

3.2. Study characteristics

Sample characteristics are summarized in Table S1. Sample sizes ranged between 20 and 8,925 participants (total $n = 60,806$ participants). Of the studies reporting gender or ethnicity, 67.2% were male-dominant (ranging 0–100%), and 79.5% had White-dominant samples (ranging 26 – 94%). Most studies were conducted in the US (60.1%), followed by the UK (13.0%) and Australia (7.2%). Forty-six studies (66.7%) measured RC using one of the RC questionnaires. The ARC (Groshkova et al. 2013b) ($k = 17$) and the BARC-10 (Vilsaint et al. 2017) ($k = 15$) were the most frequently used RC questionnaires. Other RC questionnaires included the Strengths and Barriers Recovery Scale (SABRS, Abreu Minero et al. 2022; Best et al. 2020, 2021) ($k = 3$), the REC-CAP (Cano et al. 2017; Härd et al. 2022; Best et al. 2023) ($k = 3$), the RCQ (Burns and Marks 2013, 2019; Burns and Yates 2022) ($k = 1$), the RSQ (Rettie et al. 2019) ($k = 1$), White's (2009) 35-item Recovery Capital Scale (RCS, Bray et al. 2022; Mahoney et al. 2023; Polcin et al. 2020) ($k = 3$), the short version of White's (2009) 35-item RCS (SRCS-10, Hanauer et al. 2019) ($k = 1$), the Recovery Capital Index (RCI, Whitesock et al. 2018) ($k = 1$), and the Social Recovery Capital questionnaire (SRC-IPA, Francis et al. 2022) ($k = 1$). Twenty-five studies (36.2%) used other approaches to measure RC, consisting of questionnaires that were not initially developed for the RC construct ($k = 14$) and other non-questionnaire-based approaches ($k = 11$).

3.3. RC questionnaires: questionnaires specifically developed to measure recovery capital

Detailed information regarding the psychometric properties of each RC questionnaire can be found in Table S2.

3.3.1. Assessment of recovery capital (ARC) and brief assessment of recovery capital (BARC-10)

The 50-item ARC includes ten subdomains: substance use and sobriety, psychological health, physical health, citizenship and community involvement, social support, meaningful activities, housing and safety, risk-taking, coping and life functioning,

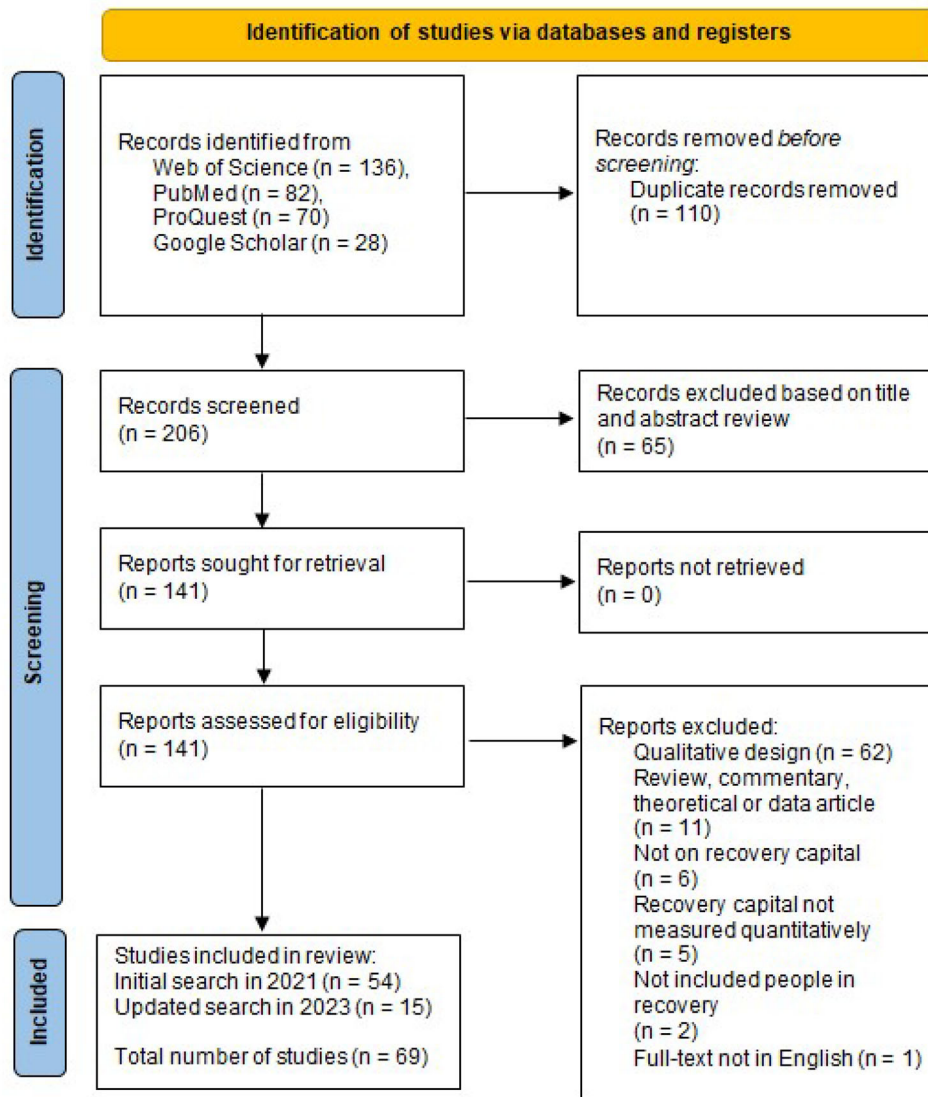


Figure 1. PRISMA Flowchart presenting the study identification and selection process.

and recovery experience. All ten subdomains have five items each and use a dichotomous rating. Like the ARC, the BARC-10 retains all ten subdomains. However, the number of items per subdomain has been reduced to one instead of five and the BARC-10 uses a 6-point Likert scale instead of a dichotomous rating.

Regarding psychometric testing, based on PCA (principal component analysis) and CFA (confirmatory factor analysis), both the ARC and the BARC-10 were reported to represent a single dimension or factor (i.e. RC) (Arndt et al. 2017; Vilsaint et al. 2017; Basu et al. 2019; Si3n et al. 2022). Furthermore, acceptable to high internal validity scores were found for the total ARC and BARC-10 scores and for each of the ten subdomains of the ARC (Arndt et al. 2017; Vilsaint et al. 2017; Basu et al. 2019; Si3n et al. 2022). Concurrent validity was good for the ARC and BARC-10, which significantly correlated with the WHO-QOLBREF and the ARC, respectively (Vilsaint et al. 2017; Basu et al. 2019). Acceptable convergent validity was found between the ARC in Spanish (VCR) and WHOQOL (Si3n et al. 2022). Significant divergent validity was established for the ARC with the Addiction Severity Index (Basu et al.

2019), and predictive validity with the finding that both questionnaires successfully differentiated individuals who had been in recovery for a year from those in recovery for less than a year (Vilsaint et al. 2017; Basu et al. 2019). Additionally, the ARC in Hindi yielded good retest reliability (Basu et al. 2019).

Lastly, whereas previous studies investigated the overall dimensionality of the ARC and BARC-10, Bowen et al. (2020) studied the ARC's specific 10-subdomain structure. The authors conducted confirmatory and exploratory factor analyses and found that while the 50 items loaded onto the ten subdomains, none of the subdomains had all its designed items loading onto it, indicating issues with internal consistency. Altogether, the ARC and BARC-10 appear to be generally valid and reliable measures of RC, however several psychometric issues have been reported.

3.3.2. Recovery capital questionnaire (REC-CAP)

The REC-CAP (Cano et al. 2017; H3rd et al. 2022; Best et al. 2023) was developed to capture the key components of personal, social, and community RC, resulting in a summary score of the individual's total level of strengths and barriers

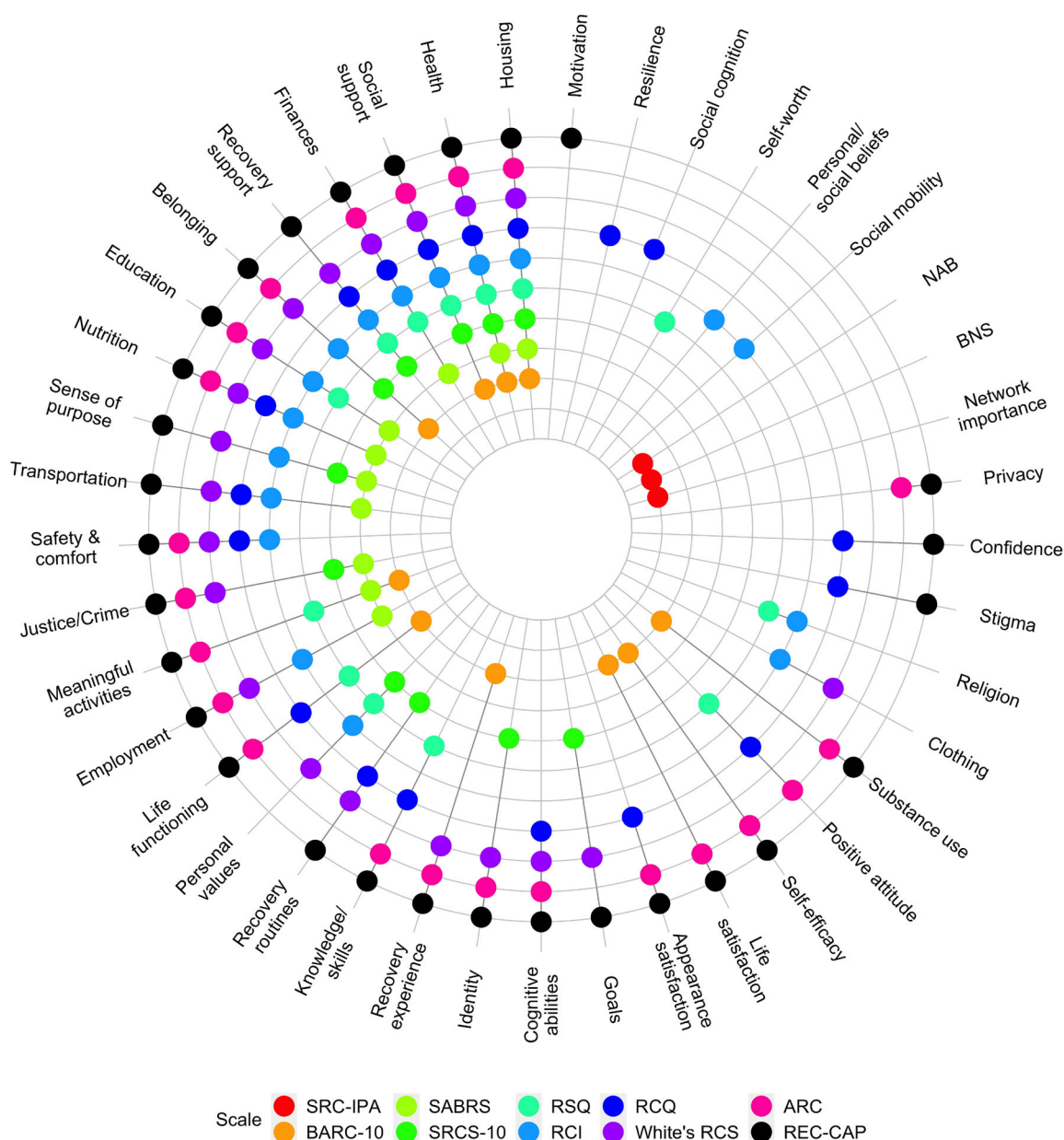


Figure 2. presents the 41 identified constructs across the ten RC questionnaires based on the review of 345 individual items (REC-CAP $n = 172$, ARC $n = 50$, BARC-10 $n = 10$, SABRS $n = 32$, RCQ $n = 36$, White's RC questionnaire $n = 35$, SRCS-10 $n = 10$) and 43 specific pre-identified constructs (RSQ $n = 15$, RCI $n = 25$, SRC-IPA $n = 3$). NAB = network abstinence behaviors, BNS = basic network structure, recovery support = other than social support.

in recovery (i.e. RC). The questionnaire was developed to address some limitations of the ARC, such as the lack of the assessment of community RC and limited directions offered to addiction treatment professionals or peer recovery champions in identifying the next stages of an individual's recovery journey, and transitioned from a paper-based model to an online one. In addition to the ARC, the REC-CAP consists of demographic data, parts of the Treatment Outcome Profile (Marsden et al. 2008) relating to quality of life, parts of the Maudsley Addiction Profile substance use grid (Marsden et al. 1998), the Recovery Group Participation Scale (Groshkova et al. 2013a), the Social Support Scale (Haslam et al. 2005), the Commitment to Sobriety Scale (Kelly and Greene 2014) and a measure of the level of engagement and satisfaction with ongoing specialist service engagement. Although the questionnaire is predominantly

quantitative, it also has four open-ended questions about the individual's recovery needs. The REC-CAP was designed for use in peer and recovery support services, and it can be used to plan and measure recovery progression and to facilitate engagement with community resources.

Regarding the psychometric properties of the REC-CAP, Cano et al. (2017) assessed the reliability and factorization of the questionnaire, finding that two subcomponents of the REC-CAP (i.e. quality of life measures and the ARC) both yielded a one-factor structure solution. Internal consistency was found satisfactory for the quality of life measures and excellent for the ARC.

3.3.3. The strengths and barriers recovery scale (SABRS)

The SABRS (Best et al. 2020, 2021; Abreu Minero et al. 2022) was developed by quantifying the findings from Life

in Recovery (LiR) surveys (Laudet 2013; Best et al. 2018b), which measure changes in a range of wellbeing measures as an individual transitions from active addiction into recovery. The questionnaire includes 32 recovery strengths ($n=15$) and barriers ($n=17$) across financial, work, legal, family, social, and citizenship domains, resulting in a single score representing the overall RC level. The SABRS was suggested as most suitable for peer and professional settings (Best et al. 2020). Psychometric testing of the questionnaire remains to be conducted in the future.

3.3.4. Recovery capital questionnaire (RCQ)

The 36-item RCQ (Burns and Marks 2013; 2019; Burns and Yates 2022) was developed for practical use based on the models by Cloud and Granfield (2008) and White and Cloud (2008). The questionnaire has four subdomains measuring social, physical, human, and community RC. The two former domains include nine questions each, whereas the latter two include ten and eight questions each, resulting in a single score of total RC.

As reported by Burns (2019), the assessment of the construct structure yielded a four-factor solution, supporting the four-subdomain structure of the questionnaire. The RCQ showed overall good internal consistency. Content and concurrent validity (with the WHOQOL and CD-RISC) were high. Lastly, test-retest reliability for the whole measure bordered on excellent. Nevertheless, several limitations were identified by Burns (2019). A single researcher mainly developed the questionnaire, the sample size was not supported by a power calculation, and its representativeness to the general population could not be concluded with certainty.

3.3.5. Recovery capital index (RCI)

The RCI (Whitesock et al. 2018) was developed for use in clinical settings to aid healthcare professionals, care team members, and peer coaches in assessing recovery progress across three RC domains (personal, family/social, and cultural). The RCI incorporates a range of pre-validated questionnaires, such as the Behavioral Risk Factor Surveillance System Questionnaire (Center for Disease Control and Prevention 2011). Based on correlational analyses, the three domains measured different aspects of a single underlying 'factor' (i.e. RC). The results indicated reliable internal consistency.

3.3.6. Recovery strengths questionnaire (RSQ)

The RSQ (Rettie et al. 2019) was developed based on the model by White and Cloud (2008). The measure has two subdomains: 'external strengths' and 'within-group strengths'. These include 15 questions measuring physical, personal, activity, attitudinal, and social recovery strengths (i.e. RC) on an 11-point Likert scale. The 'within-group strengths' assesses strengths and capacities that are developed through recovery group engagement. In turn, the 'external strengths' are strengths and capacities that are not associated with recovery group engagement. The RSQ was found to have high internal consistency and good

concurrent validity with the ARC. Predictive validity was established with the questionnaire moderately discriminating people who had been in recovery for less than six months from those in recovery for a longer time. Although the RSQ total score had a significant, albeit small, association with the length of time in recovery, only the 'within-group strengths' significantly correlated with time in recovery and time in the recovery group.

3.3.7. Social recovery capital questionnaire – Important people and activities instrument (SRC-IPA)

The Social Recovery Capital questionnaire (Francis et al. 2022) was developed based on the Important People and Activities Instrument ('IPA', Clifford and Longabaugh 1991; Longabaugh et al. 1998) to measure social RC of those in recovery from alcohol addiction. The IPA is a 20–30 min structured interview that aims to establish an overall picture of an individual's social network (Longabaugh et al. 1998). The SRC-IPA is a 10-item questionnaire that provides detailed information about recovering individuals' social network members and their relations with each other. The SRC-IPA has three subdomains: (1) network abstinence behaviors (maximum drinks per drinking day, average drinking status, drinking frequency, likelihood of others drinking during an activity, average support for abstinence), (2) basic network structure (network size, average contact, network diversity), and (3) network importance (average importance, average relationship length).

Regarding the psychometric properties of the SRC-IPA, EFA and CFA analyses yielded a three-factor structure (Francis et al. 2022). Acceptable internal consistency scores were found for the total questionnaire score, and for the network abstinence behaviors and basic network structure subdomains. Internal consistency was not considered acceptable for the network importance subdomain (Francis et al. 2022). Weak to moderate correlations were found between SRC-IPA and the Alcohol Expectancies Questionnaire (Brown et al. 1987), the Achenbach Self Report ('ASR', Achenbach and Rescorla 2003), and the Hassles and Uplifts scale (DeLongis et al. 1988) (Francis et al. 2022). The correlations for the network structure subdomain were low. Due to the high number of low to weak correlations, Francis et al. (2022) suggested that only the questionnaire's total score should be used and that subdomain scores should only provide descriptive information.

3.3.8. White's recovery capital scale (RCS) and the Short recovery capital scale (SRCS-10)

One study used the 35-item RCS by White (2009) (Polcin et al. 2020), which uses a 5-point Likert scale to assess a broad range of RC indicators such as social support, overall wellbeing, and access to recovery support in the local community. White's RCS was found to have high internal validity in Polcin et al. (2020).

Due to negative feedback from clinical professionals regarding the 35-item RCS' length of completion in busy practical settings, Hanauer et al. (2019) created a short 10-

item version of the questionnaire (SRCS-10). The authors used the BARC-10 to guide their selection of the ten items. This was considered to ensure adequate content validity of the SRCS-10. The findings on psychometric testing indicated that the unidimensional model best fitted the data and that the questionnaire was invariant across gender, ethnicity, and sexual orientation. Additionally, reliable internal validity was reported. Hanauer et al. (2019) suggested that future research should seek to further validate the questionnaire among nonwhite racial groups and evaluate whether the SRCS-10 is invariant over time.

3.3.9. Systematic evaluation of the RC questionnaires' development process

The best practice guidelines for questionnaire development checklist was used to review the development of eight RC questionnaires which had publications online regarding their development (the ARC, BARC-10, SABRS, RCQ, RSQ, SRC-IPA, SRCS-10, and the RCI). No study reported all steps of the checklist. Steps one (domain identification and item generation) and four (survey administration and sample size) were consistently reported in detail across all the RC questionnaire validation studies. Some parts of steps six (extraction of factors), eight (test of reliability), and nine (tests of validity) were also consistently reported across the studies. A table including evaluations of all eight questionnaires on each domain item can be found in Table S3). These findings indicate that the studies reporting RC questionnaire development processes have generally engaged with some of the best practice steps and in detailed reporting of their methods; however, engaging with even more rigorous and consistent reporting of the different steps of RC questionnaire development process would ensure as transparent and optimal development processes as possible.

3.3.10. RC questionnaire item-level analysis

The analysis of 345 items resulted in 41 distinct broad constructs across ten RC questionnaires. Figure 2 illustrates recovery strengths that were measured by each RC questionnaire, each color representing one questionnaire. Several pre-identified constructs from the RSQ and RCI were combined into one broad construct, for example 'family support', 'social support', and 'significant other' into 'social support'. The most often measured RC constructs were housing and health (including physical and mental health), found in nine RC questionnaires. The second most often measured RC construct was social support, found in eight RC questionnaires. Other commonly measured RC constructs were the financial situation of the recovering individual (measured in seven RC questionnaires), and recovery support, community involvement, education and training, and nutrition (measured in six RC questionnaires). The least commonly measured constructs were motivation, psychological resilience, social cognition, self-worth, personal and social beliefs, social mobility, network abstinence behaviors, and basic network structure (measured in one RC questionnaire).

3.3.11. RC questionnaire items and target population characteristics

Although ten unique RC questionnaires were reviewed, they largely overlap with each other in terms of their domains and in their target settings and populations (Table S4). The RC questionnaires were developed and tested predominantly in the UK and US, and appear to be most suited for use among adult populations, as evident in the participant samples used for their development and the inclusion of items that are not relevant for youth. For instance, the RCQ asks about significant financial debts, White's (2009) RCS asks about the recovering individual's financial resources to provide for themselves and their family, and the SABRS asks about ability to pay bills and about custody of children, primarily issues that would apply to older (non-minor) populations. Regarding the substance of focus, all measures apart from the SABRS appear to have been developed for use among people with alcohol and/or drug addiction. In terms of the recovery stage, the RCQ and the SRCS-10 were primarily developed for and tested among people in early recovery (e.g. where problems might be more severe and capital much lower), whereas the ARC, the BARC-10, and the RSQ were developed for people from all recovery stages. All RC questionnaires appeared to be generally suitable for both females and males across community and clinical settings, except for the RSQ, which was primarily developed for use only in recovery groups. Altogether, the current RC questionnaires appear broadly similar regarding their target populations and setting. This means that there are notable gaps in RC measures addressing younger or senior people and people from different cultures. Another notable gap in the RC literature is the predominantly binary gendered approach that has been used in the studies, meaning that currently there is a lack of testing of the RC questionnaires across gender diverse groups (e.g. individuals identifying as transgender or non-binary). Although some studies (i.e. the SABRS and the RSQ) included an 'other' gender group, they were limited in sample size.

3.3.12. Summary of the RC questionnaires

Ten questionnaires have been developed to measure RC across practical and research settings. Of these, the ARC has gained the most attention in the field, and it can be considered a generally valid and reliable measure of RC (Arndt et al. 2017; Basu et al. 2019), albeit some limitations exist (Burns 2019; Bowen et al. 2020). Of the remaining nine RC questionnaires, evidence on the psychometric performance is promising, although testing of the SABRS, and White's RCS remains to be conducted in the future. Moreover, research evidence of the RC questionnaires is mostly limited to only one or a few studies per each RC questionnaire, and therefore more research is needed.

Content-wise, the REC-CAP appears to be the most comprehensive RC questionnaire, capturing a range of personal, social, and community RC as well as recovery barriers and unmet needs of the recovering individual. It should be noted however, that the REC-CAP is comprised of several standardized scales rather than being a single scale and its overall

psychometrics have not yet been examined. Furthermore, with several open-ended questions included, it also provides an additional personalized level of information that can aid recovery planning. All ten RC questionnaires appear to be suitable methods of RC measurement; however, a strong evidence base on their validity and reliability across diverse populations and settings is still to be established.

3.4. Pre-validated questionnaires - not developed to measure the recovery capital construct

Fourteen studies used a pre-validated questionnaire that was not initially developed to measure the RC construct or one of its domains (e.g. social RC, Table S5). The most studied strengths and capacities were social RC (Ujhelyi et al. 2016; McGaffin et al. 2017, 2018; Gilbert and Kurz 2018; Baan et al. 2020), followed by human or personal (Ujhelyi et al. 2016; Baan et al. 2020), physical (Gilbert and Kurz 2018), and cultural RC (Baan et al. 2020). One study operationalized RC as internal and external resources (O'Sullivan et al. 2019)¹. Most of these questionnaires were used to measure a specific form of RC and not overall RC per se. The Substance Use Recovery Evaluator (SURE) was an exception as it was used to measure overall RC (although not initially developed to measure specifically the RC construct).

The studies in this review indicate that these pre-validated questionnaires appear to serve different functions compared with the RC questionnaires. These pre-validated questionnaires could be used for gaining an in-depth understanding of specific recovery-related strengths and capacities, beyond what could be achieved with the general RC questionnaires. For instance, if a study seeks to conduct detailed research on how a range of neighborhood-related RC factors may contribute to recovery, relevant pre-validated questionnaires could be combined with generic RC questionnaires to provide a more nuanced approach for the study. In turn, the pre-validated questionnaires in this section may be limited in their ability to holistically capture overall RC. These findings suggest that the pre-validated questionnaires and RC questionnaires may best be considered as complementary to each other in RC research.

3.5. Other approaches to the measurement of recovery capital (not based on RC questionnaires or other pre-validated questionnaires)

In eleven studies, the approaches to capture RC were not based on the previously reviewed RC questionnaires or other pre-validated questionnaires (Table S6): these were often studies utilizing secondary data analysis where the original design of the study did not utilize a RC tool, but the data provided could be reconceptualized as RC oriented (i.e. including factors that can be considered RC). Three studies measured RC across online settings by using observational

data analyzed by using Social Network Analysis (SNA) and computerized linguistic analysis, i.e. using Linguistic Inquiry Word Count software (LIWC; Pennebaker et al. 2015; Best et al. 2018a; Bliuc et al. 2017, 2019). The remaining six studies measured RC across traditional face-to-face settings. Several studies used models to create groups consisting of different RC classes or profiles (Hennessy 2018; Francis 2019; Witbrodt et al. 2019). One study included financial, human, community, and social RC domains to create an overall RC classification tree to predict recovery high school attendance (Hennessy and Finch 2019). Additionally, one study created two groups which they referred to as 'internal' and 'external' RC (Kelley et al. 2021), and another study measured employment RC (Sahker et al. 2019) using study-specific surveys created by the authors.

Altogether, it appears that multiple approaches exist to examine RC in face-to-face and online settings. One of the key advantages of these approaches is the flexibility of design that allows the measurement or analysis of RC across settings where the application of traditional questionnaires may be limited or where specific questionnaires do not yet exist to measure RC. These approaches of RC measurement, similar to the previous section, may best be considered as complimentary to the other approaches of RC measurement (e.g. RC questionnaires).

4. Discussion

This systematic review identified the current approaches to RC measurement and synthesized evidence on the psychometric properties of the available RC questionnaires. Ten RC questionnaires (eight full-length and two shortened versions) were identified in the RC literature. Of these, the ARC and the BARC-10 were the most used RC questionnaires. Moreover, approximately one-third of the studies used measurement approaches that were not one of the ten identified RC questionnaires. These consisted of a) a range of pre-validated questionnaires (i.e. not RC questionnaires) and b) other measurement/analysis approaches which were not pre-validated questionnaires or RC questionnaires (e.g. Social Network Analysis). Overall, the three main measurement approaches identified in this review were used to capture a range of recovery-related resources and capacities across the individual, inter-individual, and broader environmental levels of the recovering person.

This systematic review conducted an item-level analysis of RC questionnaires to synthesize the similarities and differences among these questionnaires to understand how RC has been operationalized in research. Not surprisingly, several key constructs were consistently measured across the ten questionnaires, while others were less so. Two types of resources, namely health and housing, were the most measured aspects of RC and were included in all RC questionnaires that measured overall RC. Items related to social support and finances of the recovering individual were also included in almost all ten RC questionnaires. In contrast, some resources and capacities, such as clothing (an important aspect of RC for example among recovering populations experiencing homelessness) and motivation, were measured

¹The studies by Jason et al. (2021) and O'Sullivan et al. (2019) were included in this section because they included pre-validated questionnaires, although they also included questionnaires that were made by the authors (and not pre-validated).

only by one or two RC questionnaires. This is the first time such an analysis has been conducted in the field of RC, and these findings help shape understanding of which resources and capacities are currently considered the most essential aspects of RC across the RC questionnaires. Subsequently, understanding the core components of RC across adult populations may help refine RC's operationalization for other populations (e.g. youth or senior populations) and so function as a basis for developing and testing RC measures across the other populations. While this systematic review was the first in the RC literature to conduct the item-level construct analysis across the RC questionnaires, this method could also be adapted to analyze other similar concepts in addiction recovery research and more widely in addiction research.

RC questionnaires have an essential role in developing, refining, and testing RC concepts (Best and Hennessy 2022). Similarly, other non-RC questionnaire-based measurement approaches can provide additional ways to contribute to RC theory and application in research and clinical settings. One way these approaches can add to RC theory development and concept testing is their design flexibility that allows testing of the RC concept in settings where direct application of the currently available RC questionnaires may be less feasible. For example, such research could include data analyses from public online forums and social network platforms (Bliuc et al. 2017, 2019; Best et al. 2018a). Furthermore, in the current shortage of questionnaires measuring RC in social environments (e.g. families, friends, institutions), these alternative measurement approaches can provide suitable solutions for such purposes. Lastly, although the ten identified RC questionnaires include comprehensive sets of resources and capacities, the non-questionnaire-based approaches can provide additional opportunities for gaining a potentially more objective as well as nuanced understanding of resources and capacities for specific populations (e.g. individuals experiencing homelessness). The integrated use of both RC-specific questionnaires and alternative approaches to measurement in the same study can help inform the development of RC theory and measurement approaches. Altogether, the use of diverse measurement approaches allows comprehensive and nuanced testing and development of the RC concept across different ecological levels and recovery settings.

Across the reviewed studies, RC was predominantly measured at the level of the recovering individuals, and all RC questionnaires currently measure RC at this level. Nevertheless, RC in the primary social environments likely has significant impacts on the recovering individual's recovery journey (Best and Ivers 2022). Moving forward, it remains essential to continue to extend research from measuring RC of the recovering individual to measuring RC of the groups and institutions in which the individual is embedded. However, this may necessitate theoretical reconceptualization and operationalization away from survey-type methods to baskets of indicators of recovery resource availability and accessibility to and for specific communities. For example, by extending the principles of the personal RC domain, measures at a broader level (such as recovery

support services and the capacity of peer workers to engage) could include aspects associated with the resources available to and provided by the services and staff for individuals in recovery. Similarly, by applying the concepts of social RC, measures could encompass factors pertaining to social climate, connectedness, and relationship quality within service settings. Integrating concepts from the community RC domain could encompass aspects concerning the presence of a recovery-oriented culture within recovery support services and the extent of connection with the wider community. There are some existing attempts to measure aspects of recovery capital across communities, such as through the recovery ecosystem score. These efforts could be built upon through cross-discipline collaboration between for example, addiction and community psychologists, to name a few areas. As the field progresses, we anticipate further work in this area because a greater understanding of the impacts of external capital on recovery journeys is necessary to broaden the conceptual development of the RC framework, for increasing our capacity at a systems level to support recovery capital growth, and for developing appropriate interventions to build individual RC. Moreover, the potential practical implications of this could include improved addiction recovery support and treatment that is well-aligned with the continuously expanding recovery-oriented approach to care.

Lastly, having an in-depth understanding of the psychometric properties of a questionnaire is essential for any psychometric tool. We used the nine-steps best practices guidelines to questionnaire development by Boateng et al. (2018) to create the questionnaire development assessment checklist that can now be used by other researchers. No authors of the RC questionnaires reported using all nine steps in the published manuscripts of their RC questionnaires. We recommend that any new RC questionnaire development study should ensure that the item development and scale development phases (phases one and two of the three main phases presented by Boateng et al. 2018) are comprehensively conducted and reported in detail. This is important considering that research on the scale evaluation phase (phase three) could be conducted at any time after the questionnaire has been published. In turn, the first two phases are an integral part of the questionnaire's development itself and ensure that the most appropriate items are included in the questionnaire.

4.1. Strengths and limitations

This review has several strengths as well as potential limitations. We did not find a previously developed tool to assess RC questionnaire development processes. To develop an as objective and thorough checklist as possible, we developed one based on previous research (Boateng et al. 2018). We consider this new checklist as an important addition to the field, and aim to publish it in the future. Due to language-related constraints, this review includes publications only in the English language, and therefore relevant studies in other languages may have been missed. Moreover, most of the reviewed studies were conducted in Anglophone countries and with participants of a White ethnic background, limiting

our current understanding of the approaches to RC measurement across culturally diverse populations and settings. The multi-author team is a strength of this review, yet, due to resource constraints, several parts were conducted by a single author (more details regarding the number of authors for different methodological aspects is reported in the methods). However, the plan for each step of the review process and any questions arising during the review process were discussed by a team of authors. Overall, the development of RC questionnaires has been a significant addition to addiction recovery research in the past decade, but the overall RC measurement research is still in its early days. The current paucity of research on the psychometrics of RC questionnaires combined with limitations noted in the literature indicates that building a more robust evidence-base regarding the validity and reliability of the available RC questionnaires is one of the key issues in the field that remain to be resolved.

5. Conclusions

The RC framework consists of a comprehensive set of resources and capacities that can be used to assess and plan recovery progression. The conceptualization of the framework has been diverse, which is also reflected in the range of approaches used to measure the construct. Currently, RC has predominantly been measured at the level of the recovering individual, likely driven by the fact that the existing RC questionnaires measure RC of the recovering individuals. Until RC questionnaires are developed and used to measure the construct at the broader social-environmental level, the alternative RC measurement approaches may provide ways to capture RC in the recovering individual's surrounding environment. Future research should also continue to expand the measurement of RC into contexts where the application of questionnaire-based methods may be limited, such as online communities which similarly to face-to-face communities can provide recovery-supportive environments. Overall, the RC framework is applicable to a diverse range of face-to-face and online recovery settings that may benefit from a range of approaches to measure RC in their specific contexts. Moving forward, it is essential that a range of questionnaire- and non-questionnaire-based measurement approaches are developed and simultaneously used in developing and refining the RC theory.

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