

# BMJ Open User engagement with technology-mediated self-guided interventions for addictions: scoping review protocol

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## ABSTRACT

**Introduction** Technology-mediated self-guided interventions (TMSGIs) for addictive disorders represent promising adjuncts and alternatives to traditional treatment approaches (eg, face-to-face psychotherapy). However, meaningful evaluation of such interventions remains elusive given the lack of consistent terminology and application. Preliminary findings suggest that TMSGIs are useful but engagement remains modest for various reasons reported by users, including lack of personalisation. The aim of this review is to explore how TMSGIs have been defined and applied in addictions populations with an emphasis on technical and logistical features associated with greater user engagement.

**Methods and analysis** This scoping review protocol was developed in accordance with the Arksey and O'Malley framework. Articles from electronic databases (ie, PsycINFO, Embase, MEDLINE and CINAHL) will be included if they targeted adolescents or adults with one or more substance or behavioural addictions, excessive behaviours or aspects thereof (eg, cravings) using a privately accessible technology-mediated intervention. Two independent reviewers will screen titles and abstracts for relevance before commencing full-text reviews. Extracted data will be presented in descriptive, tabular and graphical summaries as appropriate.

**Ethics and dissemination** Ethics committee approval is not required for this study. Review findings will be used to guide the development of preliminary recommendations for real-time addiction intervention development and provision. Emphasis will be placed on practical considerations of user engagement, accessibility, usability and cost. Knowledge users, including clinicians, researchers and people with lived experience, will be engaged for development of one such intervention following publication of review findings.

**Registration** This scoping review was registered with the Open Science Framework on 15 April 2022 and can be located at <http://www.osf.io/3utp9/>.

## INTRODUCTION

Technology-mediated self-guided interventions (TMSGIs) represent promising low intensity supplements and alternatives to traditional treatment approaches<sup>1 2</sup> and have demonstrated practical utility when applied to numerous physical and psychological health conditions, including substance-related and

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The comprehensive search strategy was developed in consultation with three librarians to ensure relevance and sensitivity of searches.
- ⇒ A broad definition of addiction will help to ensure breadth of coverage of the extant literature.
- ⇒ In accordance with best practices for open and transparent science, this review protocol has been pre-registered with the Open Science Framework.
- ⇒ The current lack of clarity in technology-mediated self-guided intervention definitions limits the degree of specificity possible in this review protocol.
- ⇒ The exclusive focus on self-directed interventions is unlikely to capture the full extent of technology-mediated addiction interventions.

behavioural addictions.<sup>3</sup> Broadly, TMSGIs are self-directed psychosocial interventions delivered via technologies that can be privately owned, such as smartphones or personal computers. Often, they take the form of independently accessed online activities, but a range of formats exist.<sup>4</sup> The demand for TMSGIs is high among both treatment users and providers for several reasons<sup>5 6</sup> and appears to be outpacing robust scientific evaluation.<sup>7</sup> Some reasons for the high demand include cost-effectiveness,<sup>8</sup> accessibility and privacy<sup>1 2</sup> and lowered threshold for treatment access.<sup>9</sup>

There have been some efforts to review and map the technical structure of TMSGIs. According to Naughton,<sup>10</sup> intervention content within TMSGIs can be triggered by users, servers or contexts. User-triggered content is dependent on users deciding whether and when to access support (eg, texting HELP to an advice line or opening an application to access content). Server-triggered content is delivered according to fixed schedules, random timing or a combination of both; delivery timing can be generalised or tailored to users' needs and preferences. Finally, context-triggered contact involves the use of sensors to respond

based on triggers in users' environments; geolocation is the most common form of data used for this purpose.<sup>10</sup> These methods are increasingly combined to deliver interventions characterised by three core features: (a) proactive content that directly corresponds to real-time needs when users are at risk of engaging in negative health behaviours; (b) content and timing that is tailored based on ecological data collected and (c) inclusion of content that is not solely user-triggered.<sup>11</sup>

The addiction field in Canada and worldwide is ripe for applications of TMSGIs given the large degree of unmet needs<sup>12–14</sup> and increasing accessibility to substances and addictive behaviours.<sup>15,16</sup> Using contemporary technology (eg, sensors, global positioning system, audiovisual input/output), TMSGIs offer a new way to measure and respond to symptoms that fluctuate over short periods of time within individuals,<sup>17</sup> which is particularly relevant in the treatment of addictive disorders. For instance, proximal and transient factors (eg, cravings, mood lability, fluctuations in motivation, triggers) exert large influences on addiction maintenance, exacerbation and relapse<sup>18</sup> and represent optimal treatment targets.

Conceptualisation and development of TMSGIs remains challenging given the inconsistent definitions and applications.<sup>19</sup> Various forms of TMSGIs, for example, have been referred to as ecological momentary interventions, ambulatory interventions and just-in-time adaptive interventions (JITAI), among others. One systematic review<sup>20</sup> exemplifies the challenges associated with evaluations of TMSGIs. In this review, the authors evaluated the use of JITAI for substance use disorders and found mixed evidence for their effectiveness. However, most of the evidence was based on pilot studies with very small sample sizes. The authors thus did not draw any substantive conclusions for the use of JITAI in the treatment of substance use disorders. They did, however, conclude that it remains unclear what defines such interventions and how best to develop them for addiction populations. Understanding the differences among various types of TMSGIs thus remains an ongoing challenge. Despite this challenge, however, other reviews have found support for various forms TMSGIs. For instance, in their review of technology-assisted self-help programmes for addictions, Newman and colleagues<sup>21</sup> found that these interventions are often helpful in reducing both consumption and severity of various addictions, with medium to large effect sizes. Danielsson and colleagues observed similar patterns when including analysis of both telephone and web interventions.<sup>4</sup> Taken together, these findings suggest that TMSGIs are promising, yet the lack of clarity on their definitions and applications precludes meaningful evaluations of them.

While preliminary evidence demonstrates support for TMSGIs, successful treatment outcomes are often critically impeded by a lack of user engagement.<sup>21,22</sup> For example, a recent trial reported that over 40% of treatment-seeking individuals with gambling problems never logged in to the no-cost online self-help workbook

they signed up for despite rating the content itself highly.<sup>23</sup> More broadly, engagement reflects a combination of objective and subjective markers of treatment uptake, such as number of activities completed and subjective interest, respectively. These engagement factors then influence treatment success. There are several reasons that disengagement may occur, such as lack of treatment progress, lack of intervention personalisation, individual differences (eg, forgetfulness) or treatment goal changes or successes.<sup>24</sup> In sum, the low burden of TMSGIs may counteract obstacles to entering treatment but may also give rise to variable user commitment and utilisation.<sup>25</sup> Research is needed to elucidate which technical features facilitate or discourage treatment engagement in these highly demanded interventions.

## Objectives

The aim of this review is to clarify and summarise the extant literature on TMSGIs in addictions and provide a foundation for subsequent development.<sup>26</sup> Given the limited amount and variability in focus of the existing research, we will employ scoping review methodology to identify and describe TMSGIs for people with various substance-related and behavioural addictions. The definition of addiction will be broad to ensure all relevant articles are included (eg, TMSGIs that target 'heavy drinking' but do not explicitly refer to addiction). Interventions need not target addictions in their entirety but may instead focus on one or more aspects of them (eg, cravings, triggers). Specific emphasis will be placed on technical and logistical aspects of TMSGIs and their hypothesised impact on subjective or objective treatment engagement. Research findings will be aggregated in pursuit of a common glossary<sup>19</sup> and to make preliminary recommendations to guide development of future addiction TMSGIs with an emphasis on technical and logistical features that maximise user engagement (eg, frequency of notifications, medium of delivery).

## METHODS AND ANALYSIS

The review protocol was developed based on traditional frameworks and associated revisions<sup>26–28</sup> and in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) extension for review protocols.<sup>29</sup> Any protocol amendments will be documented in the Open Science Framework pre-registered project alongside the full protocol (online supplemental file 1) and manual (online supplemental file 2). Articles will be imported from electronic databases and reviewed in Covidence.<sup>30</sup> Results will be reported in accordance with the scoping review extension of PRISMA.<sup>31</sup>

## Research questions

The research questions were developed for broad identification of studies. The population of interest is adults and adolescents with one or more substance or behavioural addictions, excessive behaviours or aspects thereof (eg,

cravings, triggers). Addictions need not be defined specifically by diagnostic criteria. Excessive behaviours will also be included even if the term 'addiction' is not explicitly used (eg, heavy drinking, binge eating). Interventions of interest should offer technology-mediated non-pharmaceutical support, education, prevention, assessment or treatment for one of the aforementioned problems. Interventions must be delivered in the context of treatment users' natural environments via technology that is privately owned, accessed or operated, and not exclusive to professional settings. Outcomes must include both of the following: (a) at least one psychological construct directly related to the problem (eg, behaviour, cognition, emotion, motivation) and (b) at least one measure of participant engagement.

*Question 1.* What types of TMSGIs for addiction-related concerns exist?

*Question 2.* What impact do various technical and logistical features of TMSGIs have on user engagement?

### Relevant literature identification

In consultation with librarians, the search strategy was developed to encompass all empirical articles that evaluate TMSGIs for addictions. Search terms were selected to identify English-language articles on PsycINFO, Embase, MEDLINE and CINAHL (online supplemental file 3). Boolean operators were applied to combine and refine search terms. The initial search strategy was developed in PsycINFO and adapted to the remaining databases. Articles from each database were searched from inception to 5 April 2022; a second iteration will follow after full-text screening is initially completed to cover the period between 5 April and the date of the second search. Following full-text review, the reference sections of all included articles will be manually searched for other relevant articles to ensure completeness of results. A reflexive and iterative approach will be taken to refine search criteria and data extraction throughout the review process (ie, databases will be searched multiple times). This approach is critical given the rapidly evolving research base on treatments that incorporate new and emerging technologies and inconsistent use of terms to define such interventions.

### Study selection

Eligibility criteria were developed a priori by the research team. Two independent reviewers will apply these eligibility criteria to screen article titles and abstracts following automatic deduplication within Covidence. No reason for exclusion at this stage will be indicated as the purpose is only to remove clearly irrelevant articles. To pass title and abstract screening, articles must satisfy the following general criteria: (a) focus on one or more problems with substance use, behavioural addiction, excessive behaviour or aspect thereof (eg, cravings, triggers); (b) use of technology as a means to deliver non-pharmaceutical support, education, prevention, assessment or intervention for the problem defined in (a); (c) intervention technology

hardware must be privately owned, accessed or operated (eg, smartphone, watch, tablet, sensor, computer) and not exclusive to professional settings (eg, fMRI, other medical equipment); (d) focus on psychological constructs such as behaviour, cognition, emotion or motivation (ie, not genetic, animal or pharmaceutical studies) and (e) reported in the English language.

Following title and abstract screening, the review manual for full-text review will be tested on the first 20 articles to assess criteria and agreement with two independent reviewers. Then, these reviewers will commence full-text reviews. In addition to the eligibility criteria for title and abstract screening, articles in full-text review must satisfy the following conditions: (a) original empirical study that is not solely qualitative; (b) sample exclusively comprised of adults or adolescents aged 16 years or greater; (c) intervention is delivered at least partially without professional, clinical, social or technical support and (d) study measures and reports on at least one outcome associated with subjective or objective user engagement (eg, quality ratings, number of logins, number of completed activities, proportion of users that completed all activities). Articles that otherwise satisfy eligibility criteria will be discussed separately from the evidence synthesis if they are qualitative, non-empirical or grey literature. In the event that studies contain duplicate samples with different follow-up durations, only the study reporting the longest follow-up will be retained.

The pre-registered review manual contains specific instructions to be provided to independent reviewers. After both title and abstract screening and full-text review, disagreements that arose will be resolved through consultation with a third reviewer (author BB) until consensus is achieved. Interrater agreement for both title and abstract screening and full-text review will be assessed and reported with Cohen's kappa.<sup>32</sup> A kappa cut score of 0.80 will be used for both phases of article selection, indicating a substantial level of agreement.<sup>33</sup>

### Data extraction

Once articles have been selected for inclusion within Covidence, data will be extracted, exported and compiled in Microsoft Excel following recommended practices.<sup>26</sup> The following information will be extracted from each eligible article: (a) reference type (eg, peer-reviewed article, preprint); (b) publication year; (c) country or location; (d) research objectives; (e) research design (eg, two-arm randomised controlled trial); (f) sample size; (g) sample information, including eligibility criteria, mean age, ethnicity and sex/gender; (h) context and setting; (i) type of addiction(s) targeted; (j) whether the intervention was delivered in a standalone or supplementary manner; (k) intervention details, including theoretical orientation, content, features, software and operating system; (l) addiction-related measures and outcomes; (m) engagement-related measures and outcomes; (n) reported study limitations and (o) author conclusions related to the development and provision of relevant



interventions, particularly technical features (vs intervention content). The review protocol (online supplemental file 1) contains further details on the data that will be extracted from articles.

### Results collation, summary and reporting

A descriptive overview of the findings will be provided in tabular and graphical forms as appropriate. Narrative summaries will be provided alongside tables and graphics and directly reflect the information extracted from eligible articles. Results will be discussed from a transdiagnostic perspective, although significant differences that emerge among addictions will be noted. Important discrepancies in operational definitions will be highlighted (eg, differences in conceptualisation of TMSGIs or addictions). Recommendations will be derived based on the review findings to guide future research on the development and provision of TMSGIs with an emphasis on technical and logistical features associated with greater user engagement.

### Patient and public involvement

The overarching aim of our research programme is to develop a transdiagnostic addiction TMSGI delivered in real-time via smartphone application. Although the scoping review itself does not entail consultation or engagement with knowledge users, subsequent stages of this research programme will incorporate these strategies. Specifically, development and usability testing will solicit and address feedback from multidisciplinary addiction clinicians and researchers as well as individuals with past or present lived experience. Quantitative and qualitative feedback will be used to refine the intervention prior to deployment in the context of pilot testing.

### Ethics and dissemination

Ethics committee approval is not required for this review. The findings elucidated via this scoping review will be published in an open-access peer-reviewed academic journal and presented at an international conference. The generated preliminary recommendations will be framed not only to guide our own research programme but more broadly to guide research, development and practical implementation of TMSGIs for addiction-related concerns (eg, suggestions for optimising frequency of smartphone notifications). Considerations of accessibility, feasibility and cost will be central to the development of these recommendations. As previously mentioned, stakeholder engagement will help refine and apply these recommendations to our own research programme.

**Acknowledgements** We would like to acknowledge the librarians (Susan Beatty, Alix Hayden and Zahra Premji) that provided expertise and guidance in the development of our search strategy. We would also like to acknowledge the undergraduate research volunteers (Nicola Stuebing and Chelsey Pastershank) that will serve as the two independent reviewers for title and abstract screening and full-text reviews.

**Contributors** Both authors (BB and DH) made substantial contributions at each stage of this work, including drafting, revision and final approval. Based on the CRediT statement, BB (review guarantor) was responsible for conceptualisation,

methodology, formal analysis, investigation, data curation, writing—original draft, writing—review and editing, visualisation and project administration. DH was responsible for conceptualisation, methodology, validation, resources, writing—review and editing, supervision and project administration.

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**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not applicable.

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## User Engagement with Technology-Mediated Self-guided Interventions for Addictions Preregistered Scoping Review Protocol

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### Timeline

- Start date: March 2022
- End date (approx.): February 2023

### State of review

The search strategy and review manual were developed in March 2022, and the search was conducted on March 19, 2022. Title and abstract screening began in May 2022. The full text review eligibility criteria will be piloted following title and abstract screening to test criteria and reviewer agreement on the first 20 articles. The protocol manuscript was submitted for publication in May 2022 and is currently undergoing revisions.

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### Acknowledgements

We would like to acknowledge the librarians (Susan Beatty, Alix Hayden, and Zahra Premji) that provided expertise and guidance in the development of our search strategy. We would also like to acknowledge the two research volunteers (Nicola Stuebing and Chelsey Pastershank) that will assist with screening titles, abstracts, and full texts.

### Aims

The primary objective of the current scoping review is to explore how technology-mediated self-guided interventions (TMSGIs) for addictions have been used with an emphasis on technical and logistical features that facilitate treatment engagement or adherence. The findings will be synthesized and used to guide recommendations for the development of TMSGIs for addictive disorders.

## Research questions

- What types of TMSGIs for addiction-related concerns exist?
- What impact do various technical and logistical features of TMSGIs have on user engagement?

## Seed papers

- Gustafson et al. (2014): Alcohol
- Merkouris et al. (2020): Gambling
- Free et al. (2009): Smoking
- Dulin & Gonzalez (2017): Alcohol
- Hodgins et al. (2019): Gambling

## Search strategy

The following search terms were selected for PsycINFO and adapted as appropriate to other databases (Embase, MEDLINE, and CINAHL).

### Addictive substances and behaviours:

(addicti\* or substance or drug\* or prescription drug\* or opioid\* or opiate\* or narcotic\* or heroin or morphine or alcohol\* or drink\* or cannabis or marijuana or tobacco or nicotine or cigar\* or smok\* or vap\* or cocaine or crack or crack-cocaine or meth or methamphetamine\* or amphetamine\* or crystal meth\* or stimulant\* or caffeine or LSD or hallucinogen\* or psilocybin or phencyclidine or inhalant\* or gaming or video gam\* or gambl\* or eat\* or overeat\* or food or sedative\* or anxiolytic\* or hypnotic\* or benzo\* or ketamine or overwork\* or sex\* or internet or Internet or porn\* or social media or Facebook) adj2 (addict\* or dependen\* or behav\* or consum\* or abus\* or misus\* or use\* or using or inject\* or heavy or compuls\* or impuls\* or bing\* or excess\* or frequen\* or sever\* or daily or risky or cessat\* or reduc\* or abstain\* or abstin\* or quit\* or recover\* or disorder\* or urge\* or crav\* or problem\* or patholog\* or comorbid\* or subthreshold or subclinical or concurrent)

### Technology-mediated interventions:

(interven\* or assess\* or prevent\* or treat\* or therap\* or self-help or self-direct\* or self-guide\* or workbook\* or program\* or support or guided) adj2 (technolog\* or internet\* or Internet\* or computer\* or online\* or virtual\* or digital\* or mobile\* or smartphone\* or phone\* or app or apps or text\* or e-health or m-health or eHealth or mHealth or ecological or ambulatory or just-in-time or adaptive or naturalistic or handheld or web\*)

## Search results

The following search was conducted by author BWB in PsycINFO (Ovid) on March 19, 2022.

Search number	Concept	Number of hits
1	Addictive substances and behaviours	420,142
2	Technology-mediated interventions	42,036
3	1 and 2	6,476

The following search was conducted by author BWB in Embase (Ovid) on March 19, 2022.

Search number	Concept	Number of hits
1	Addictive substances and behaviours	1,136,571
2	Technology-mediated interventions	135,104
3	1 and 2	11,906

The following search was conducted by author BWB in MEDLINE (Ovid) on March 19, 2022.

Search number	Concept	Number of hits
1	Addictive substances and behaviours	842,291
2	Technology-mediated interventions	104,342
3	1 and 2	9,225

The following search was conducted by author BWB in CINAHL (EBSCO) on March 19, 2022.

Search number	Concept	Number of hits
1	Addictive substances and behaviours and technology-mediated interventions	6,562

The articles from each database were imported to Covidence and duplicates were automatically removed. In total, 34,169 articles were imported, 16,111 duplicates were removed, and 18,058 articles were yielded for title and abstract screening. Additional manual searches were conducted on April 5, 2022, and 4 articles were added for screening to yield a total of 18,062 articles.

## Screening and review procedures

Two independent reviewers (volunteers NS and CP) will screen article titles and abstracts during the initial screening phase for eligibility. No reason for exclusion at this stage will need to be indicated as only the clearly irrelevant articles will be removed. After this stage, the same two reviewers will conduct full text reviews of the remaining articles. Reasons for exclusion will be selected in accordance with the “eligibility criteria for full text review” as defined below. Only the first listed reason will be indicated for each excluded article during this stage even when multiple reasons could be selected. Disagreements during screening and full text review will be resolved by consulting a third reviewer (author BWB) until consensus is achieved. Articles will be screened using the program Covidence. The review manual contains specific instructions to be provided to independent reviewers for the purposes of screening and full text review.



**Eligibility criteria: Title and abstract screening**

- There must be some reference to one or more problems with substance use (e.g., smoking), behavioural addictions (e.g., gambling), excessive behaviours (e.g., overeating), or aspects thereof (e.g., cravings, triggers, coping skills, mindfulness); other mental/physical health problems may be targeted as well but not be the primary focus.
- There must be some reference to technology as a means to provide non-pharmaceutical support, education, prevention, assessment, or intervention for the problem as defined above. The hardware should be such that it could be privately owned, accessed, or operated (e.g., phone, watch, tablet, sensor, computer, laptop, handheld device) and not something exclusive to professional settings (e.g., fMRI, other medical equipment).
- The study should focus on human behaviour, cognition, emotion, motivation, or other psychological construct (i.e., not animal studies, genetic studies, pharmaceutical drug development, cardiac health, etc.).
- The study should be reported in English.

**Eligibility criteria: Full text review**

- Study 1: The article is not an evidence synthesis (i.e., scoping review, systematic review, meta-analysis).
- Study 2: The article is based on more than one or few individuals (i.e., not a case study, case report, case series, N=1 study, etc.).
- Study 3: The article is based on an original empirical study or existing empirical data.
- Study 4: The article is not solely qualitative in its approach and analysis.
- Sample 1: The sample contains mostly adults or adolescents aged 16 or greater.
- Sample 2: The sample presents with one or more problems with addiction, substance use, excessive behaviour, or aspect thereof (e.g., cravings, urges).
- Intervention 1: The intervention is at least partially delivered via technology (e.g., smartphone application, automated text message, internet workbook, digital diary).
- Intervention 2: The intervention is at least partially delivered without professional, clinical, social, or technical support.
- Intervention 3: The intervention is primarily non-pharmaceutical in approach (i.e., focus on cognitive, behavioural, emotional, or other non-medical changes).
- Outcome 1: The study measures and reports on at least one measure of the problem as defined above (e.g., frequency, severity, amount of use/consumption) with respect to intervention outcomes.
- Outcome 2: The study measures and reports findings related to participant engagement, adherence, or subjective experience (e.g., quality ratings, time spent with intervention, number of logins, number of modules completed, proportion of participants that completed treatment).
- Duplication 1: If not a unique sample, the article reports the version of the study with the longest follow-up time period.

## Data extraction

The following data will be extracted from each eligible article:

- Reference type (e.g., peer-reviewed article, preprint)
- Year of publication
- Country or location
- Research objectives defined by the authors
- Research design (e.g., two-arm randomized controlled trial)
- Sample information (i.e., sample size, eligibility criteria, mean age, proportion female, mode ethnicity, proportion mode ethnicity, addictions/behaviours of interest, and treatment status)
- Intervention context/setting, independence/augmentation, theoretical orientation, content, features, software, and operating system
- Addiction-related measures, outcomes, and results.
- Engagement-related measures, outcomes, and results.
- Reported study limitations, conclusions, and recommendations.
- Additional study limitations and conclusions.

## Data synthesis

A descriptive overview of the review findings will be provided in tabular and graphical forms as appropriate with an emphasis on intervention features that facilitate engagement and adherence. Narrative summaries will be provided alongside tables and graphics and directly reflect the information extracted from eligible articles. Important discrepancies in operational definitions will be highlighted (e.g., differences in conceptualization of ecological interventions or addictions) and a concept map will be proposed. Recommendations will be derived based on the review findings to guide future research on the development and provision of technology-mediated ecological momentary interventions for addictions.

## References

- Dulin, P. L., & Gonzalez, V. M. (2017). Smartphone-based, momentary intervention for alcohol cravings amongst individuals with an alcohol use disorder. *Psychology of Addictive Behaviors*, 31(5), 601–607. <https://doi.org/10.1037/adb0000292>
- Free, C., Whittaker, R., Knight, R., Abramsky, T., Rodgers, A., & Roberts, I. G. (2009). Txt2stop: A pilot randomised controlled trial of mobile phone-based smoking cessation support. *Tobacco Control*, 18(2), 88–91. <https://doi.org/10.1136/tc.2008.026146>
- Gustafson, D. H., McTavish, F. M., Chih, M.-Y., Atwood, A. K., Johnson, R. A., Boyle, M. G., Levy, M. S., Driscoll, H., Chisholm, S. M., Dillenburg, L., Isham, A., & Shah, D. (2014). A smartphone application to support recovery from alcoholism: A randomized clinical trial. *JAMA Psychiatry*, 71(5), 566. <https://doi.org/10.1001/jamapsychiatry.2013.4642>
- Hodgins, D. C., Cunningham, J. A., Murray, R., & Hagopian, S. (2019). Online self-directed interventions for gambling disorder: Randomized controlled trial. *Journal of Gambling Studies*, 35(2), 635–651. <https://doi.org/10.1007/s10899-019-09830-7>
- Merkouris, S. S., Hawker, C. O., Rodda, S. N., Youssef, G. J., & Dowling, N. A. (2020). GamblingLess: Curb Your Urge: Development and usability testing of a smartphone-delivered ecological momentary intervention for problem gambling. *International Gambling Studies*, 20(3), 515–538. <https://doi.org/10.1080/14459795.2020.1749293>

### Title and Abstract Screening

During this stage, you will refer only to the title, abstract, and keywords to exclude articles that are clearly irrelevant. Articles that you cannot be certain whether they meet inclusion criteria should be included for full text review. You do not need to select a reason for exclusion during this stage. However, you should use the following criteria to determine whether each article is eligible to proceed to full text review:

- There must be some reference to one or more problems with substance use (e.g., smoking), behavioural addictions (e.g., gambling), excessive behaviours (e.g., overeating), or aspects thereof (e.g., cravings, triggers, coping skills, mindfulness); other mental/physical health problems may be targeted as well but not be the primary focus.
- There must be some reference to technology as a means to provide non-pharmaceutical support, education, prevention, assessment, or intervention for the problem as defined above. The hardware should be such that it could be privately owned, accessed, or operated (e.g., phone, watch, tablet, sensor, computer, laptop, handheld device) and not something exclusive to professional settings (e.g., fMRI, other medical equipment).
- The study should focus on human behaviour, cognition, emotion, motivation, or other psychological construct (i.e., not animal studies, genetic studies, pharmaceutical drug development, cardiac health, etc.).
- The study should be reported in English.

### Full Text Review

Articles should be excluded based on the first exclusion criterion that is met, regardless of subsequent criteria. You will need to select one reason for exclusion for each article.

**Important:** If any articles are ineligible yet seem highly relevant for discussion anyway (e.g., a review of user experiences with smartphone interventions, a qualitative study of user experiences with an online workbook), use the “ineligible but relevant” tag within Covidence.

**Step 1:** Assess article type and general characteristics. Grey literature can be included as long as it satisfies all other eligibility criteria. Grey literature refers to that which is not published via traditional peer-reviewed academic streams (e.g., government policy, program evaluation, technical report, preprint, thesis, dissertation, white paper, research report, annual report, etc.).

Question	Examples	Action	Exclusion reason
(1) Is the article NOT an evidence synthesis?	<b>Ineligible:</b> Scoping review Systematic review Meta-analysis	If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(1) Article 1: Evidence synthesis
(2) Is the article based on more than one or few individuals?	<b>Ineligible:</b> Case study/report Case series N=1 study	If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(2) Article 2: Minimal cases
(3) Is the article based on an original empirical study or existing empirical data?	<b>Ineligible:</b> Editorial Study protocol Opinion piece Commentary Conference proceeding Theoretical discussion Framework proposal Intervention recommendation Special issue introduction Book/article review Book chapters  <i>Note:</i> Book chapters that report an original empirical study should be included.	If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(3) Article 3: Non-empirical
(4) Does the article report on any quantitative analyses?	<b>Ineligible:</b> Phenomenology study Grounded theory study Ethnography study Thematic analysis study  <i>Note:</i> Articles that contain both quantitative and qualitative analyses should be retained.	If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(4) Article 4: Qualitative



**Step 2:** Assess sample characteristics.

Question	Examples	Action	Exclusion reason
(5) Is the sample exclusively comprised of adults and/or adolescents aged 16 or greater?		If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(5) Sample 1: Age
(6) Does the sample present with one or more problems with addiction, substance use, excessive behaviour, or aspect thereof (e.g., cravings, urges)?	<i>Note:</i> Concurrent mental and physical conditions are acceptable (e.g., depression, fibromyalgia, cancer).  <i>Note:</i> Eating disorders satisfy this criterion if the focus is on bingeing (e.g., bulimia nervosa, binge eating disorder) but not if the focus is on purging (e.g., bulimia nervosa) or restriction (e.g., anorexia nervosa).	If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(6) Sample 2: Addiction

**Step 3:** Assess intervention characteristics. If the study contains multiple treatment groups, only one group needs to satisfy criteria in this step. However, it must be the same group that satisfies all criteria. Concurrent medical and/or psychological care is acceptable. Assessment studies are permitted if they satisfy all other criteria (e.g., ecological momentary assessment).

Question	Examples	Action	Exclusion reason
(7) Is the intervention at least partially delivered via technology that could be privately owned, accessed, or operated?	<b>Ineligible:</b> Paperback workbooks In-person health services fMRI Hospital assessments  <b>Eligible:</b> Smartphone application Automated text message Online program Internet workbook Push notifications Digital diary	If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(7) Intervention 1: Technology
(8) Is the intervention at least partially delivered without professional, clinical, social, or technical support?	<b>Ineligible:</b> Virtual synchronous therapy Telephone support Helplines Social/group interaction  <i>Note:</i> Social interaction is permitted ONLY if it is with treatment-seeking peers or significant others that are simultaneously engaged with the intervention (e.g., peer leaderboard on smoking cessation smartphone app).	If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(8) Intervention 2: Dependence
(9) Is the intervention primarily non-pharmaceutical in approach?	<b>Ineligible:</b> Pharmaceutical drug Nicotine replacement therapy (e.g., nicotine patch)  <b>Eligible:</b> Cognitive restructuring Behavioural activation Coping skills/strategies	If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(9) Intervention 3: Pharmaceutical

*Note:* “Without support” (8) means that intervention content, features, or activities are initiated and completed either automatically (i.e., no person initiates it, but contextual factors like GPS can) OR by the user without professional help/guidance.

**Step 4:** Assess quantitative outcomes.

Question	Examples	Action	Exclusion reason
(10) Does the study measure and report on at least one quantitative measure of the problem as defined above with respect to intervention outcomes?	<b>Eligible:</b> Frequency of behaviour (e.g., number of drinking days) Severity of diagnosis (e.g., number of criteria met) Amount of consumption Intensity of cravings Expenditures (e.g., daily, monthly) Blood alcohol content (BAC)	If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(10) Outcome 1: Addiction
(11) Does the study measure and report any findings related to participant engagement, adherence, or subjective experience?	<b>Eligible:</b> Quality ratings Time spent with intervention Number of times accessed Number of complete modules Completed activities Adherence rate Retention rate Attrition rate Treatment completion	If YES, proceed to next question.  If NO, exclude article and indicate exclusion reason.	(11) Outcome 2: Engagement

**Step 5:** Assess sample for duplication. Most duplicates will have been automatically removed already. Sometimes, however, the same sample of participants will be reported on in different articles based on data collected at different time points (e.g., two papers that represent a randomized controlled/clinical trial [RCT] with 12-month and 24-month follow-up data, respectively).

Question	Examples	Action	Exclusion reason
(12) If the study sample is not unique, is it the version with the longest follow-up time period?	<b>Ineligible:</b> Duplicate samples for which a longer follow-up is reported elsewhere	If YES, include article in this review and prepare for data extraction.  If NO, exclude article and indicate exclusion reason.	(12) Duplication 1: Follow-up time

## Search strategy

The following search terms were selected for PsycINFO and adapted as appropriate to other databases (Embase, MEDLINE, and CINAHL). English language filters were used for all databases. No date restrictions were imposed.

### OVID databases (PsycINFO, Embase, MEDLINE)

#### Addictive substances and behaviours:

(addicti\* or substance or drug\* or prescription drug\* or opioid\* or opiate\* or narcotic\* or heroin or morphine or alcohol\* or drink\* or cannabis or marijuana or tobacco or nicotine or cigar\* or smok\* or vap\* or cocaine or crack or crack-cocaine or meth or methamphetamine\* or amphetamine\* or crystal meth\* or stimulant\* or caffeine or LSD or hallucinogen\* or psilocybin or phencyclidine or inhalant\* or gaming or video gam\* or gambl\* or eat\* or overeat\* or food or sedative\* or anxiolytic\* or hypnotic\* or benzo\* or ketamine or overwork\* or sex\* or internet or Internet or porn\* or social media or Facebook) adj2 (addict\* or dependen\* or behav\* or consum\* or abus\* or misus\* or use\* or using or inject\* or heavy or compuls\* or impuls\* or bing\* or excess\* or frequen\* or sever\* or daily or risky or cessat\* or reduc\* or abstain\* or abstin\* or quit\* or recover\* or disorder\* or urge\* or crav\* or problem\* or patholog\* or comorbid\* or subthreshold or subclinical or concurrent)

#### Technology-mediated interventions:

(interven\* or assess\* or prevent\* or treat\* or therap\* or self-help or self-direct\* or self-guide\* or workbook\* or program\* or support or guided) adj2 (technolog\* or internet\* or Internet\* or computer\* or online\* or virtual\* or digital\* or mobile\* or smartphone\* or phone\* or app or apps or text\* or e-health or m-health or eHealth or mHealth or ecological or ambulatory or just-in-time or adaptive or naturalistic or handheld or web\*)

### EBSCO databases (CINAHL)

((addicti\* or substance or drug\* or prescription drug\* or opioid\* or opiate\* or narcotic\* or heroin or morphine or alcohol\* or drink\* or cannabis or marijuana or tobacco or nicotine or cigar\* or smok\* or vap\* or cocaine or crack or crack-cocaine or meth or methamphetamine\* or amphetamine\* or crystal meth\* or stimulant\* or caffeine or LSD or hallucinogen\* or psilocybin or phencyclidine or inhalant\* or gaming or video gam\* or gambl\* or eat\* or overeat\* or food or sedative\* or anxiolytic\* or hypnotic\* or benzo\* or ketamine or overwork\* or sex\* or internet or Internet or porn\* or social media or Facebook) n2 (addict\* or dependen\* or behav\* or consum\* or abus\* or misus\* or use\* or using or inject\* or heavy or compuls\* or impuls\* or bing\* or excess\* or frequen\* or sever\* or daily or risky or cessat\* or reduc\* or abstain\* or abstin\* or quit\* or recover\* or disorder\* or urge\* or crav\* or problem\* or patholog\* or comorbid\* or subthreshold or subclinical or concurrent)) and ((interven\* or assess\* or prevent\* or treat\* or therap\* or self-help or self-direct\* or self-guide\* or workbook\* or program\* or support or guided) n2 (technolog\* or internet\* or Internet\* or computer\* or online\* or virtual\* or digital\* or mobile\* or smartphone\* or phone\* or app or apps or text\* or e-health or m-health or eHealth or mHealth or ecological or ambulatory or just-in-time or adaptive or naturalistic or handheld or web\*))