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ORIGINAL ARTICLE

Application of Self-Determination Theory to Substance Use and Its Treatment: A Scoping Review of the Literature

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ABSTRACT

Background: Self-determination theory (SDT) may provide important insights for understanding substance misuse and treatment outcomes. However, to date, the literature applying SDT to substance use and its treatment is varied and difficult to integrate. *Methods:* The authors searched psycINFO and PubMed on October 26th, 2021 to identify articles applying SDT to substance use and its treatment. Eligible studies were published in peer-reviewed articles in English, on adult populations (18+), and explicitly applied SDT to the context of substance use or its treatment. Results were categorized as studies applying SDT in non-treatment or treatment settings and were synthesized within these categories by substance(s) of focus, primary outcome(s), component(s) of SDT utilized, and relevant findings. *Results:* The search revealed 38 articles applying SDT in non-treatment ($k=16$) and treatment ($k=22$) settings. Causality orientations and the basic psychological needs were the most frequently studied components of SDT. Studies that applied SDT in non-treatment settings placed a greater emphasis on causality orientations, whereas treatment studies more frequently targeted or measured basic psychological needs. *Conclusions:* SDT constructs consistently predicted both substance misuse and treatment outcomes in a theoretically consistent manner, however, several important gaps remain and opportunities for future research are discussed.

KEYWORDS

Self-determination theory; review; substance use; treatment; adults

Introduction

"Addiction is a family disease. One person may use, but the whole family suffers." – Unknown

Substance misuse negatively impacts the well-being and quality of life of both those using the substances and those close to them. Substance misuse is positively associated with intimate partner violence (Cafferky et al., 2018), child neglect (Walsh et al., 2003), job loss (French et al., 2011), and can result in death for the individual using the substance (e.g., overdose), or others (e.g., drunk driving fatalities; US Department of Health and Human Services (HHS),), 2016). Prevention and treatment efforts have the potential to reduce substance use-related harms (Nation et al., 2003; Prendergast et al., 2002). One theory which may advance our understanding of substance misuse and its treatment, and in turn inform evidence-based prevention and treatment interventions, is self-determination theory (SDT; Deci & Ryan, 2012).

Self-determination theory

SDT is a macro-level theory of human motivation whereby motivation is characterized as falling along a continuum that ranges from autonomous to controlled. Autonomous motivation is illustrated by behaviors that are driven by internal sources (e.g., enjoyment, interest). In contrast, controlled motivation is illustrated by behaviors that are driven by forces external to the actor (e.g., pressure, rewards). Autonomous motivation is positively related to behavioral indicators of motivation (e.g., task persistence; Moller et al., 2006). Conversely, findings regarding the relationship between controlled motivation and behavioral indicators of motivation are mixed; some studies show no relationship, others a negative relationship (Gaudreau et al., 2012; Pelletier et al., 2001).

Central to SDT is the recognition that the social environment can affect variability in motivation through psychological needs (Vallerand et al., 2008). According to SDT, there are three universal psychological needs; competence (i.e., feeling capable), autonomy (i.e., freedom to engage in a behavior), and relatedness (i.e., connectedness to others; Deci & Ryan, 2008). Social environments that support these needs foster autonomous motivation and thus improved behavioral adoption and maintenance (Deci & Ryan, 2008), whereas environments that undermine the needs tend to foster controlled motivation and reduced behavioral maintenance (Grolnick & Ryan, 1989; Milyavskaya & Koestner, 2011). In particular, much research has focused on the benefits (i.e., enhanced persistence, depth of processing) of autonomy-supportive environments compared to more

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controlling settings (Bureau et al., 2022; Vansteenkiste et al., 2004). Key elements of autonomy-supportive environments include, but are not limited to: 1) providing opportunities for choice; 2) providing non-controlling feedback; and 3) presenting the rationale behind adopting a specific behavior in a non-controlling manner (Cogswell & Negley, 2011).

In addition to environmental influences, SDT posits that motivation is affected by differences in causality orientations. Causality orientations refer to individual differences in how agentic individuals view their own actions to be (Gagné & Deci, 2005). Three types of causality orientations are relevant to SDT. Autonomous orientation, which describes one's tendency to view their behavior as internally driven. Controlled orientation, which is the tendency to view one's behavior as caused by pressures that may be internal (e.g., I *should* do this) or external. Impersonal orientation is one's tendency to view their behavior as beyond intentional control (Deci & Ryan, 1985). Autonomous orientation is positively related to autonomous motivation, controlled orientation is positively associated with controlled motivation, while impersonal orientation is negatively related to autonomous motivation and unrelated to controlled motivation (Hagger & Hamilton, 2021; Williams & Deci, 1996). In sum, whether one's motivation is more autonomous vs. controlled will depend on the extent to which their psychological needs are supported as well as individual differences in their causality orientation (Deci & Ryan, 2008).

Self-determination theory and substance use

The SDT framework complements other motivational perspectives that focus on understanding the reasons individuals choose to engage in or initiate substance use (Cooper et al., 2016; Cox & Klinger, 1988). Specifically, SDT offers a more refined perspective into how individual differences and environmental factors interact to influence substance use behavior. In doing so, SDT aligns itself with a personalized medicine approach (Chan & Ginsburg, 2011) and is well-situated to inform harm-reduction interventions aimed at preventing individuals from progressing from recreational use to harmful misuse. Regarding treatment, understanding factors that influence decisions to seek treatment and facilitating greater persistence and engagement through the course of treatment, can inform the design of both treatment and referral programs, increasing their effectiveness (Richards et al., 2021b).

SDT has been used in both non-treatment and treatment contexts to better understand substance misuse. However, the published literature is difficult to integrate because of the considerable breadth of application across contexts. For example, treatment and non-treatment contexts often differ with respect to the populations studied, substances of interest, and primary outcomes of interest. Additionally, researchers vary in how they label, describe, and operationalize SDT constructs. This variability prevents us from identifying the components of SDT and applications that are most effective for reducing substance misuse and its associated harms.

Present study

The objective of the present study is to conduct a scoping review of the literature that has applied SDT in both non-treatment and treatment contexts. Although scoping reviews and systematic reviews are similar, scoping reviews serve a different purpose. Scoping reviews are critical for characterizing nascent research areas. For example, scoping reviews describe evidence that is available on a topic, how research in a particular area is conducted, and the concepts most commonly included (Munn et al., 2018). In contrast, systematic reviews are used to test specific a priori hypotheses, often related to conflicting results within an established research area (Munn et al., 2018). Given the emerging status of the literature applying SDT to substance use, a scoping review was deemed most appropriate. Consistent with this decision, this review aimed to answer the following research questions: (1) How many articles have applied SDT to substance use and treatment contexts? (2) What substances are of primary focus? (3) What components of SDT are being investigated? (4) What are the primary outcomes SDT is being used to predict/target? (5) What are the relevant findings?

Methods

Information sources and search strategy

This scoping review was guided by the extension of Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR; Tricco et al., 2018).[1] Searches of the psycINFO and PubMed databases were conducted on October 26th, 2021 to identify relevant studies. Three steps were involved in the psycINFO search. First, the following combinations of keywords were combined as search terms: (SDT or Self Determination Theory or Self-Determination Theory) OR (Basic Psychological Needs or Basic Psychological Needs Theory). Next, the following combination of keywords related to substance use were entered as search terms: (Substance abuse or Substance use or Drug abuse or Drug addiction or Dependence or Drug use) OR (Drinking or Alcohol use or Alcohol Consumption or Alcohol*). Finally, these two searches were combined with the operator "AND." On the same day, a PubMed search was conducted using the same search terms in a single step.

To capture the full scope of how SDT has been applied to the context of substance use and its treatment, these searches did not include date restrictions. However, both searches were limited to peer-reviewed articles, written in English, on adult populations (18+), and excluded unpublished dissertations. After these initial searches, a manual search of the references of articles included in the review was conducted, as was a manual search of the SDT website (https://selfdeterminationtheory.org).

Inclusion and exclusion criteria

To be eligible for inclusion, SDT had to have been central to the design of the study and explicitly applied to the context of substance use or treatment. SDT was considered

central to the design if the theory-guided or informed the procedures, hypotheses, or methodology of a study or intervention. Two raters independently reviewed the introduction and methods sections of relevant articles. If SDT was not referenced in the introduction, or components of SDT were not explicitly measured, SDT was not considered central to the study design. This included articles in which Motivational Interviewing (MI) was the sole SDT-related component. Though MI has often been linked to SDT, it is an atheoretical, practice-based technique, and not derived from SDT (Dunn et al., 2001; Rollnick & Miller, 1995;). Therefore, its use does not represent the application of SDT to study design.

Additionally, only studies where SDT was explicitly applied to substance use or its treatment were included. Studies measuring SDT components and substance use or treatment outcomes without applying the SDT components to these outcomes were excluded. These criteria ensured only studies investigating the influence of SDT constructs on substance use or treatment outcomes were included, and excluded studies solely focused on developing or testing scales. When multiple publications reported duplicate findings from the same data source, using the same measures, and failed to contribute novel results, only the first published study was included. This decision was made to prevent potential double counting of a particular finding which might make the finding appear more robust than is the case. Finally, any study where performance-enhancing drugs (PEDs) were the only substance measured was also excluded. This decision was made because individuals do not typically demonstrate dependence on PEDs as they do with other substances (Buckman et al., 2009) and therefore could lead to the conclusion that SDT is underutilized in treatment contexts.

Screening procedures

Two researchers (JKB and LH) independently screened the titles and abstracts of every article to determine suitability for second-level review. Second-level screening involved two authors (JKB and LH) reviewing the full manuscripts to assess eligibility. In the case of disagreement between raters, article eligibility was discussed until a consensus was reached.

Bias assessment

As is standard practice for scoping reviews (Munn et al., 2018; Pollock et al., 2022), the articles were not reviewed for quality. This is because the breadth of the present scoping review captures a variety of different research designs (e.g., correlational, interventions, qualitative). Such heterogeneity in designs restricts the ability to identify a core set of characteristics for evaluating quality or bias.

Data charting process

Full-text search and data extraction were completed by the lead authors (JKB and LH) each of whom reviewed half. Afterwards, a third author (SR) independently assessed and reviewed a random selection of eight studies as an independent rater. Agreement between the lead authors and the third author regarding data extraction was acceptable (100%). All reviewers then contributed to a standardized data extraction chart designed for this study (Table 1). Discrepancies were resolved through discussion. The following information was extracted from each study: sample, study objectives, study design, primary intervention method, types of substances studied, SDT components utilized, and findings.

Results

How many articles have applied SDT to non-treatment and treatment contexts?

Thirty-eight articles met eligibility criteria and were included in this review. Figure 1 shows the screening process flow chart. SDT was applied in two distinct contexts, 1) to non-treatment contexts and 2) to treatment contexts. Sixteen of the 38 articles (42%; see Table 1) related to substance misuse behaviors and outcomes in non-treatment contexts. The remaining 22 articles (58%; see Table 1) assessed treatment outcomes. These two categories represent distinct research contexts with respect to the populations being studied and the primary outcomes of interest. Furthermore, the relatively even split of studies between treatment and non-treatment contexts suggests the field sees each as worthy of study. Therefore, the remaining four research questions that guided the scoping review are answered separately for each context.

Non-treatment settings

Substances of primary focus

Among the 16 articles applying SDT in non-treatment settings, 14 (88%) focused exclusively on alcohol, one (6%) examined cannabis, and one (6%) investigated substance use in general.

Outcomes measured

Substance use behaviors (e.g., frequency, quantity) were the most frequently studied outcome, measured in 11 (69%) articles, followed by risk and protective factors associated with substance use, measured in 10 (63%) of the 16 articles (see Table 1). Five (31%) articles measured alcohol-related problems as an outcome (see Table 1), while a single (6%) article ran a latent class analysis to determine whether there were distinct classes based on people's motivations for responsible drinking (Richards et al., 2020).

Components of SDT investigated

Among the articles utilizing SDT in non-treatment settings, causality orientations (seven articles [44%]) and motivation

Table 1. Characteristics of included studies.

Authors (year)	Sample/design	Substance of focus	Components of SDT investigated	Outcomes measured	Key findings
Non-treatment studies					
Carey et al. (2019)	379 Canadian university students; S1: cross-sectional, S2: daily diary	Alcohol	Psychological needs satisfaction, Motivation source	Alcohol self-control failure, ego depletion	Needs satisfaction buffered the effects of self-control demands on ego depletion for Sample 1 but not Sample 2. Endorsing relatively lower internal motivation associated with higher drink limits.
Caudwell and Hagger (2015)	286 Australian university student pre-drinkers; Longitudinal	Alcohol	Motivation source	Pre-drinking intentions, pre-drinking frequency, pre-drinking attitudes, norms, and PBC	Autonomous motivation was positively related to attitudes, negatively related to norms (approval of pre-drinking), and was unrelated to PBC. Controlled motivation was negatively related to attitudes and PBC but unrelated to norms. Autonomous motivation Directly affected intentions and pre-drinking but controlled regulation did not. Controlled motivation associated with pre-drinking via PBC.
Caudwell et al. (2019)	289 Australian university student pre-drinkers; Longitudinal	Alcohol	Motivation source	Implicit drinking identity, pre-drinking quantity, pre-drinking intentions, pre-drinking attitudes, norms, and PBC	Autonomous motivation positively associated with attitudes, norms (approval of drinking responsibly), PBC, and intentions. Controlled motivation positively associated with norms and intentions, and negatively related to PBC. Controlled motivation was not related to attitudes. The effect of autonomous regulation on intentions was partially mediated by attitudes. No other mediation paths were significant.
Chawla et al. (2009)	818 US first-year university student heavy drinkers; Cross-sectional	Alcohol	Causality orientations	Alcohol quantity, injunctive norms (peer and parental)	Controlled orientation was positively associated with alcohol use and peer injunctive norms. Autonomous orientation was negatively associated with alcohol use and injunctive norms (peer and parental). Peer injunctive norms mediated the association between causality orientation and alcohol use.
Cui et al. (2019)	473 US female university students; Cross-sectional	Alcohol	Psychological needs satisfaction	Self-control, alcohol use	Self-control mediated the association between psychological need satisfaction and alcohol use, such that need satisfaction positively predicted self-control which in turn negatively associated with alcohol use
Hagger et al. (2012)	659 European company employees; Longitudinal	Alcohol	Motivation source	Intentions, norms, attitudes, and PBC related to responsible drinking, alcohol quantity, binge drinking frequency	Identified regulation (T1) predicted intentions (T1) and alcohol units consumed (T2; one month later) via attitudes and perceived behavioral control (T1). A similar pattern of effects was found for the effect of T2 psychological variables on T3 (two months from T1) units of alcohol consumed. There was little support for the effects of the psychological variables on binge-drinking behavior.

(*Continued*)

Table 1. Continued.

Authors (year)	Sample/design	Substance of focus	Components of SDT investigated	Outcomes measured	Key findings
Hagger et al. (2014)	175 Australian and English university students; Longitudinal	Alcohol	Motivation source	Intentions to drink responsibly, alcohol use	Autonomous motivation to drink responsibly predicted use via intentions at four-week follow-up; external motivation negatively associated with use and was not mediated by intentions at four-week follow-up.
Hove et al. (2010)	313 US incoming heterosexual male student binge drinkers; Cross-sectional	Alcohol	Causality orientations	Alcohol use	Controlled orientation positively associated with alcohol use; autonomous orientation negatively associated with use.
Jerković et al. (2017)	438 Croatian university students; Cross-sectional	Cannabis	Causality orientations	Cannabis frequency, extraversion, conscientiousness, and neuroticism	Controlled (but not autonomous) orientation moderated the association between extraversion and conscientiousness and frequency of cannabis use.
Knee and Neighbors (2002)	S1: 74 US university students, S2: 53 US male fraternity volunteers; Cross-sectional	Alcohol	Controlled orientation	Extrinsic reasons for drinking, perceived peer pressure, alcohol use	Controlled orientation positively associated with extrinsic reasons for drinking, which in turn positively associated with perceived peer pressure, which in turn positively associated with alcohol use.
Neighbors et al. (2003)	560 US university students; Cross-sectional	Alcohol	Causality orientations	Alcohol expectancies, evaluation of alcohol effects, alcohol use, alcohol-related problems	Positive alcohol expectancies more strongly associated with greater alcohol consumption and alcohol-related problems among students who were lower in autonomy orientation, and among male students who were higher in controlled orientation. Favorable evaluations of positive alcohol effects associated with greater alcohol consumption among students who were lower in autonomy orientation and students, particularly men, who were higher in controlled orientation.
Neighbors et al. (2004)	204 US university students; Cross-sectional	Alcohol	Controlled orientation	Contingent self-esteem, drinking motives, alcohol use	Controlled orientation positively associated with social, enhancement, and coping motives, as well as drinking frequency and related problems, via contingent self-esteem.
Neighbors et al. (2006)	214 heavy-drinking US university students; Experimental	Alcohol	Causality orientations	Descriptive alcohol norms, alcohol quantity, alcohol-related problems	No main effect of causality orientation was observed on perceived norms, drinking, or alcohol-related problems. Control-oriented individuals who received normative feedback were more likely to reduce their alcohol problems relative to those in the control condition.
Richards et al. (2020)	1045 US university students; Cross-sectional	Alcohol	Motivation source, dispositional autonomy	Protective behavioral strategies (PBS), alcohol use, alcohol-related problems	Three motivational profiles based on SDT emerged: high quality, high quantity, and low quantity. The high-quality class indicated more frequent use of serious harm reduction PBS than the high-quantity class. The high-quality and high-quantity classes generally reported more use of PBS and less alcohol use and related problems than the low-quantity class.
Richards et al. (2021a)	1045 US university students; Cross-sectional	Alcohol	Psychological needs satisfaction, dispositional autonomy, motivation source	Protective behavioral strategies	Greater need satisfaction, dispositional autonomy, and autonomous motivations for responsible drinking positively associated with responsible drinking behaviors.

(*Continued*)

Table 1. Continued.

Authors (year)	Sample/design	Substance of focus	Components of SDT investigated	Outcomes measured	Key findings
Salazar et al. (2018)	37 US participants – 27 professionals, 10 young adults with foster care experience; Qualitative	N/A	N/A		Several strategies were developed for increasing autonomy, competence, and relatedness in foster youth transitioning to adulthood *via* substance abuse prevention programs.
Treatment settings studies					
Blevins et al. (2016)	74 US marijuana-dependent adults; Secondary Analysis of a Randomized Controlled Trial (RCT)	Marijuana	Causality orientations	Client-related outcomes (substance use), causality orientations,	Causality orientations did not change over the course of treatment. Controlled and autonomy orientations predicted improved treatment outcomes 9 months post-treatment but not at 3 months.
Caudwell et al. (2018)	202 Australian undergraduate students who had previously engaged in pre-drinking; Experimental RCT	Alcohol	Motivation source, BPN (autonomy)	Substance use behaviors, harm-reduction behaviors	Participants reduced pre-drinking and increased harm-reduction behaviors after 4 weeks. However, there was no significant effect of intervention components on these outcomes. Autonomy-support facilitated greater intervention engagement.
Cogswell and Negley (2011)	39 US individuals seeking outpatient treatment or transitioning to outpatient treatment from residential treatment programs; Experimental	Illicit substances (not specified or measured)	Motivation source, BPN (autonomy)	Treatment motivation, treatment engagement	There were no statistically significant effects of any intervention condition on autonomy-supportive climate or treatment motivation over the 4-month intervention.
Gustafson et al. (2014)	349 US patients who met DSM-IV criteria for alcohol dependence upon treatment entry to 3 residential programs; Experimental	Alcohol	BPN (competence, autonomy, and relatedness)	Substance use behaviors, abstinence	A-CHESS app participants reported significantly fewer risky drinking days at 4 and 12-month follow-ups, and were more likely to be abstinent at all timepoints relative to control participants. Perceived competence at 4 months mediated the effect of A-CHESS on risky drinking days at 8-months.
Kennedy and Gregoire (2009)	4,347 DATOS participants with complete Wave 1 & Wave 2 data (US); Cross-sectional Secondary Data Analysis	Primary substances: crack/cocaine (51.1%), opiates (20.6), alcohol (12.2)	Motivation source	Treatment readiness	Greater controlled motivation predicted status in the contemplation or action stage relative to the precontemplation stage. Motivation did not distinguish between contemplation and action stages. Autonomous motivation increased as individuals progressed through the stages of change.
Klag et al. (2010)	350 Australians in substance use treatment; Cross-sectional	N/A	BPN (autonomy, competence, relatedness), motivation source	Client engagement	The latent variable analysis demonstrated that autonomy support positively associated with more autonomous motivation and less amotivation at the start of treatment, and that this relationship was mediated by competence and relatedness. Amotivation was negatively associated with well-being but unrelated to treatment engagement during the initial stages of treatment.
Lim and Ha (2019)	60 Korean Oil-refinery workers who smoked at least 10 cigarettes a day; Quasi-Experimental with nonequivalent control group	Tobacco	BPN (autonomy, competence)	Substance use behaviors, abstinence	Intervention significantly increased autonomous motivation and perceived competence, and significantly lowered dependence and CO_2 exhalation at 6- and 12-week follow-ups relative to control groups and intervention baselines.

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Table 1. Continued.

Authors (year)	Sample/design	Substance of focus	Components of SDT investigated	Outcomes measured	Key findings
McTavish et al. (2012)	170 Swedish, alcohol-dependent individuals successfully leaving residential treatment; Longitudinal	Alcohol	BPN (competence, autonomy, and relatedness)	Client engagement (smartphone component usage)	Relatedness-focused intervention services demonstrated highest overall use, followed by autonomy and then competency services. Use of all services declined over the 4 month measurement period, with competence showing the steepest rate of decline, followed by autonomy and then relatedness.
Morse et al. (2014)	25 US participants – 8 women in drug treatment court, 9 providers, 8 court staff; Qualitative	N/A	N/A	N/A	The social-ecological model delineated drug treatment court participants' overlapping challenges that eroded or supported abilities to satisfy the three basic motivation needs of autonomy, relatedness, and competence in the context of profound intrapersonal, interpersonal, institutional, and community barriers.
Muroff et al. (2017)	79 Spanish-speaking, Latinx US adults who completed a bicultural residential treatment program; Longitudinal	Alcohol	BPN (competence, autonomy, and relatedness)	Client engagement (smartphone component usage)	Participants engaged with the app throughout the 4-months studied. Relatedness-focused intervention services demonstrated the highest overall usage, followed by autonomy and then competency services. Use of all services declined over the 4-month measurement period, with competence showing the steepest rate of decline, followed by autonomy and then relatedness. Compared to A-CHESS, usage of autonomy-related services was much more stable and had a slower rate of decline.
Patten et al. (2016)	312 US individuals unmotivated to quit smoking; Longitudinal, RCT	Tobacco	BPN (competence, autonomy)	Treatment readiness	Perceived autonomy support from friends at baseline was associated with an increased readiness to quit and motivation to quit at a 6-month follow-up.
Ryan et al. (1995)	S1: 109 new admissions to a US outpatient alcohol treatment unit; Cross-sectional, S2: 98 patients seeking treatment at an outpatient alcohol treatment clinic; Longitudinal.	Alcohol	Motivation source	Client engagement, client-related outcomes	Autonomous motivation was associated with greater treatment involvement and retention over the 8-week follow-up. High levels of both autonomous and controlled motivation predicted the best outcomes. Controlled motivation was positively related to treatment outcomes only when autonomous motivation was also high. Problem severity was related to higher levels of autonomous motivation.
Simoneau and Bergeron (2003)	140 Canadian, French-speaking clients of an outpatient treatment center; Longitudinal	N/A	Causality orientations, BPN (competence, autonomy), motivation source	Treatment readiness	SDT is a useful framework for understanding changes in motivation during the course of treatment. Goal attainment, reduction of drug problems, and competence feedback predicted perceptions of competence. Perceptions of competence and treatment context predict motivation.

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Table 1. Continued.

Authors (year)	Sample/design	Substance of focus	Components of SDT investigated	Outcomes measured	Key findings
Solloway et al. (2006)	55 British, self-selected regular smokers who wanted to quit; Experimental	Tobacco	BPN (competence & autonomy), motivation source	Substance use behaviors, abstinence	Autonomy-support group demonstrated increased autonomous motivation and decreased controlled motivation relative to control groups. No significant differences in smoking abstinence between intervention and control groups.
Wild et al. (2006)	300 Canadian adults seeking treatment at an outpatient addiction treatment center; Longitudinal	Primary and secondary substances measured but not reported	Motivation source	Client engagement	Client's reasons and motivations for seeking treatment are more predictive of engagement than coercive social events. Identified treatment was positively related to client engagement, perceived benefits, and treatment efforts relative to other motivations. Controlled motivation was generally unrelated to engagement at the start of treatment, controlled motivation presented mixed findings with regard to engagement.
Wild et al. (2016)	325 Canadian adults entering a residential addiction treatment program; Cross-sectional	Primary Substance: Alcohol (63.4%) Cocaine/Crack (15.4%) Cannabis (7.1%)	Motivation source	Client engagement, client-related outcomes	Legally mandated clients reporting low autonomous or controlled motivation at admission demonstrated faster dropout relative to highly motivated, legally mandated clients. Controlled motivation at admission positively predicted cognitive involvement among legally mandated clients at a 6-week follow-up. SDT components did not predict outcomes for non-legally mandated clients.
Williams et al. (2002)	239 US nicotine-dependent patients; Experimental	Tobacco	Motivation source, BPN (competence)	Substance use behaviors, abstinence, treatment motivation	The intervention did not have an effect on quit rates; the autonomy-supportive intervention was rated as more autonomy supportive, that rated autonomy support predicted autonomous motivation, and that autonomous motivation predicted cessation at all points in time (6, 12, 30 months); perceived competence predicted cessation only at 6 months.
Williams et al. (2006a)	1006 US smokers in intention-to-treat analysis, 866 in as-treated analyses; Experimental	Tobacco	Motivation source, BPN (competence, autonomy)	Substance use behaviors, abstinence	Relative to the control condition, participants in the intervention condition reported greater 6-month abstinence, more serious attempts to quit, and greater perceived autonomy support. Participants also reported greater autonomous motivation and perceived competence, which in turn predicted 6-month prolonged abstinence.
Williams et al. (2006b)	1006 US smokers in intention-to-treat analysis; Experimental	Tobacco	Motivation source, BPN (competence, autonomy)	Substance use behaviors, abstinence	Relative to the control condition, intervention participants demonstrated significantly higher 12-month tobacco abstinence. Abstinence was significantly predicted by change in SDT constructs.

(*Continued*)

Table 1. Continued.

Authors (year)	Sample/design	Substance of focus	Components of SDT investigated	Outcomes measured	Key findings
Williams et al. (2009)	1006 US smokers in intention-to-treat analysis; Experimental	Tobacco	Motivation source, BPN (competence, autonomy)	Substance use behaviors, abstinence	Relative to the control condition, intervention participants demonstrated significantly higher 24-month tobacco abstinence. Abstinence was significantly predicted by change in SDT constructs. Change in autonomous motivation and perceived competence partially mediated the effect of treatment on 24-month tobacco abstinence.
Williams et al. (2016)	820 current US smokers; Experimental	Tobacco	Motivation source, BPN (competence, autonomy)	Substance use behaviors, abstinence	Relative to baseline intervention participants, extended intervention participants demonstrated increased maintenance of tobacco abstinence at 12 months and increased use of smoking-cessation medications. Changes in SDT constructs were positively associated with achieving 12-month abstinence and the total number of days since the last cigarette. Changes in perceived competence were the strongest indicator.
Zeldman et al. (2004)	74 patients attending an outpatient methadone maintenance clinic; Cross-sectional	Opioids	Motivation source, BPN (autonomy)	Client engagement, client-related outcomes	Over the course of 6-months, autonomous motivation predicted better treatment outcomes including less missed attendance, lower relapse, and faster progression to take-out achievement. Controlled motivation predicted worse treatment outcomes including less attendance and higher positive drug screenings. Interaction between autonomous and controlled motivation was observed such that individuals high in controlled motivation and low in autonomous motivation performed the worst on treatment outcomes. Higher perceived autonomy predicted greater positive treatment outcomes and was positively related to autonomous motivation.

*Note: BPN refers to basic psychological need and PBC refers to perceived behavioral control.

source (i.e., autonomous or controlled; seven articles [44%]) were the most commonly studied constructs. The next most commonly studied constructs were the basic psychological needs which were included in three articles (19%). These three studies measured satisfaction of the needs collectively (i.e., combining competence, autonomy, and relatedness to obtain a composite "need satisfaction" score). None investigated the independent effects of the needs, nor did they examine need frustration. Finally, one (6%) qualitative article utilized the needs framework to explore the needs satisfaction of participants.

Relevant findings

Relevant findings of the studies that applied SDT to substance use in non-treatment settings are described below. The findings centered on the following constructs: causality orientations, motivation source, psychological needs, and motivational profiles.

Causality orientations. Multiple studies documented a positive cross-sectional association between control orientation and alcohol quantity (Chawla et al., 2009) and frequency (Neighbors et al., 2004). However, several other studies failed to find a significant association between control orientation and substance use (see Table 1). When alcohol-related problems were the outcome of interest, studies revealed a positive cross-sectional association with control orientation (Hove et al., 2010; Neighbors et al., 2004). There was also evidence that an intervention (i.e., normative feedback) aimed at reducing alcohol-related problems was more effective among individuals reporting higher control

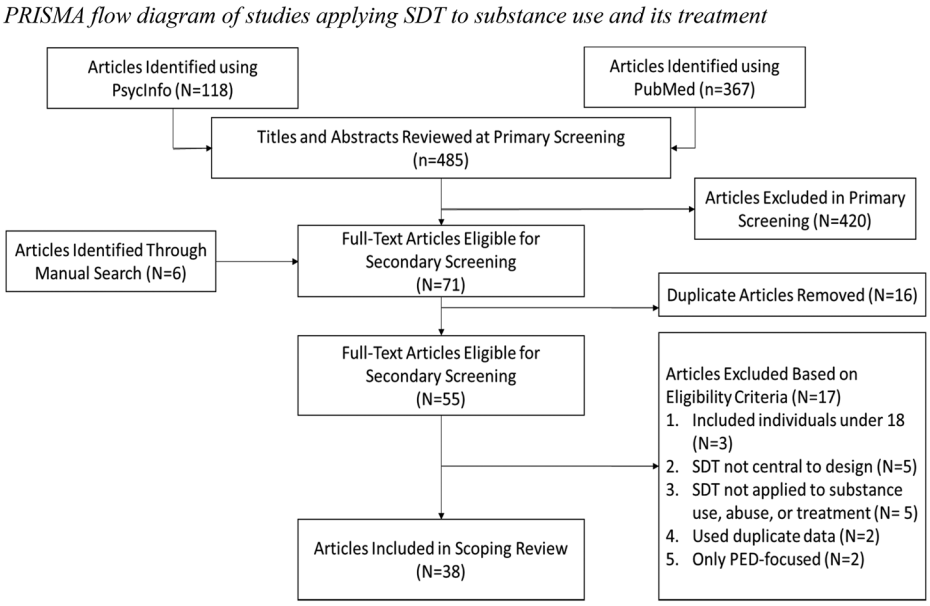

Figure 1. PRISMA flow diagram of studies applying SDT to substance use and its treatment.

orientation relative to those reporting lower control orientation (Neighbors et al., 2006). Regarding autonomy orientation, cross-sectional research revealed autonomy orientation was negatively related to weekly alcohol consumption (Chawla et al., 2009; Hove et al., 2010) and unrelated to alcohol-related problems (Hove et al., 2010).

In sum, findings imply that control orientation is positively associated with some forms of alcohol use and related problems, whereas autonomy orientation is negatively related to alcohol use but unrelated to alcohol-related problems. Furthermore, the cross-sectional association between causality orientations and alcohol use outcomes may depend on one's gender (Neighbors et al., 2003).

Finally, in addition to assessing alcohol use and problems as outcomes, studies also examined the extent to which scores on control orientation predicted scores on individual differences related to drinking (i.e., extraversion and neuroticism) and alcohol-related cognitions (e.g., perceived norms). These studies reported positive cross-sectional associations between control orientation and extraversion and neuroticism (Jerković et al., 2017), perceived injunctive norms for approval of friends (Chawla et al., 2009), and drinking motives (Neighbors et al., 2004). Conversely, negative cross-sectional associations were found between autonomy orientation and alcohol-related perceived injunctive norms for approval of friends and family (Chawla et al., 2009). Autonomy orientation was positively associated with extraversion and conscientiousness (Jerković et al., 2017).

Motivation source

At the bivariate level, autonomous motivation to limit alcohol consumption was negatively associated with reported alcohol use at one and two-month follow-ups, whereas controlled motivation was positively associated with alcohol use at both time points (Hagger et al., 2012). Moreover, autonomous motivation to engage in specific substance use behaviors (e.g., drinking responsibly) was positively related to engagement in those behaviors four weeks later whereas external motivation was negatively associated with subsequent engagement (Caudwell & Hagger, 2015; Hagger et al., 2014). Additionally, when undergraduate students reported lower autonomous motivation for limiting alcohol on a given day, they tended to set higher drink limits for the same night (Carey et al., 2019).

Several studies tested whether one's motivation source predicted alcohol-related cognitions drawn from the theory of planned behavior (TPB; Ajzen, 1991; see Table 1). Results showed autonomous motivation was positively associated with attitudes, subjective norms (e.g., perceived approval of drinking responsibly), and intentions related to pre-drinking/drinking responsibly but were inconsistently associated with perceived behavioral control (Caudwell & Hagger, 2015; Caudwell et al., 2019; Hagger et al., 2012). In contrast, controlled motivation is negatively associated with attitudes and perceived behavioral control (Caudwell et al., 2019; Hagger et al., 2012). Finally, both autonomous and controlled forms of motivation to drink responsibly were positively related to the use of protective behavioral strategies, whereas amotivation was negatively associated with the use of protective behavioral strategies (Richards et al., 2021a).

Psychological needs

Although relatively few studies included psychological needs, studies that did focused exclusively on need satisfaction. Need satisfaction was inversely associated with substance use and ego-depletion, and positively associated with self-control (Cui et al., 2019). Additionally, Salazar et al. (2018) highlighted several strategies for implementing substance misuse

prevention programming based on increasing need satisfaction.

Motivational profiles

Richards et al. (2020) conducted a latent class analysis to identify different motivational profiles for responsible drinking based on SDT constructs. Three motivational profiles based on SDT emerged: high quality of motivation (i.e., high autonomous motivation and low on all other sources of motivations), high quantity of motivation (i.e., comparatively high on all motivational sources), and low quantity of motivation (i.e., comparatively low on all motivational sources).

SDT in treatment settings

Studies related to treatment settings reflected two broad categories. One focused on the evaluation of SDT-guided interventions (10 articles [48%], see Table 1). These studies detailed interventions that leveraged SDT components (e.g., enhanced autonomy support) to facilitate behavior change. The other category utilized the SDT framework to identify which STD constructs predict adherence or engagement with treatment and treatment-related outcomes (11 articles [52%], see Table 1). Studies that utilized SDT in this way did so without employing an intervention. Instead, these studies measured SDT constructs to identify how individuals enrolled in inpatient and outpatient programs would respond to treatment, both in terms of substance use-relevant (i.e., substance use, abstinence), and treatment-specific (i.e., engagement, retention) outcomes. These two categories varied with respect to primary research questions and thus findings are discussed separately for each.

Development of SDT-guided interventions

Substances of primary focus. Among the 10 articles focused on evaluating SDT-guided substance misuse interventions, seven focused exclusively on tobacco (70%) and two focused exclusively on alcohol (20%). The remaining article did not focus on a single substance, instead measuring any substance use (Cogswell & Negley, 2011).

Outcomes measured. Five outcomes were targeted in intervention studies; substance use behaviors, harm-reduction behaviors, treatment motivation, treatment engagement, and abstinence. All but one of the intervention-related articles targeted substance use behaviors (90%, see Table 1). Abstinence was included as an outcome in eight studies (80%, see Table 1). Two studies assessed treatment motivation as an outcome (Cogswell & Negley, 2011; Williams et al., 2002). Finally, harm-reduction behaviors (Caudwell et al., 2018) and treatment engagement were the least frequently studied outcomes, each was included in a single study (Cogswell & Negley, 2011).

Components of SDT investigated. Basic psychological needs were the most frequently leveraged SDT component among the 10 intervention studies. Specifically, these studies focused on need satisfaction. All targeted autonomy (i.e., perceived autonomy or autonomy support), and a majority targeted perceived competence (seven articles; [70%] see Table 1). Relatedness was the least frequently included psychological need and was incorporated in a single intervention (Gustafson et al., 2014). Motivation source was also frequently utilized as it was included in 9 of the interventions ([90%], see Table 1).

Relevant findings. Interventions utilizing SDT components were frequently effective in eliciting change in the targeted outcomes, especially those targeting abstinence and substance use (see Table 1). Increased rates of abstinence and decreases in use were attributed to increases in perceived competence (7 articles [70%]), perceived autonomy (5 articles [50%]), and changes in motivation source (5 articles [50%]). Studies that investigated the role of motivation source found that shifts toward more autonomous forms of motivation led to greater abstinence and reduced use. One study found that delivering smoking counseling in an autonomy-supportive manner had indirect, but not direct, effects on patient abstinence through changes in treatment motivation (Williams et al., 2002).

Although SDT-guided interventions were frequently effective at facilitating change in the targeted outcomes, two interventions failed to find statistically significant effects of intervention components on relevant outcomes. One was an online randomized controlled trial (RCT; Caudwell et al., 2018) that tested the effect of autonomy-support and implementation intentions on pre-drinking behaviors and alcohol-related harm (Caudwell et al., 2018). At baseline, participants were provided information about the harmful health outcomes associated with pre-drinking behaviors (Caudwell et al., 2018). This information was supplemented with four weekly follow-up SMS messages. Participants in the intervention condition received SMS messages aimed at providing autonomy support or fostering implementation intentions, whereas participants in the control condition received SMS messages reminding them of the baseline health information (Caudwell et al., 2018). Results showed that while all participants reduced their pre-drinking behaviors, differences between the intervention and control conditions were nonsignificant (Caudwell et al., 2018). Manipulation checks showed no significant differences between the autonomy support and control groups, suggesting the intervention failed to induce changes in autonomy-support (Caudwell et al., 2018). The other study assessed the effect of an autonomy-supportive treatment environment on treatment motivation among individuals entering an outpatient treatment program utilizing a pre-posttest design (Cogswell & Negley, 2011). The autonomy-supportive environmental intervention involved altering the provider-participant interaction (Cogswell & Negley, 2011). Providers focused on extending empathy to participants, providing a rationale for treatment procedures, emphasizing participants' choice, or a combination of these

foci (i.e., empathy and rationale; Cogswell & Negley, 2011). The intervention was conducted over the course of four months; starting with the control condition in the first month, followed by each of the three autonomy-supportive conditions in each subsequent month (Cogswell & Negley, 2011). Treatment motivation was assessed at the start and end of the control condition and each subsequent intervention condition. Findings showed no significant effects of any manipulation on participants' motivation toward treatment (Cogswell & Negley, 2011). This study lacked random assignment, resulting in some participants receiving components of multiple treatment arms (Cogswell & Negley, 2011). Additionally, about 20% of the initial sample was excluded from the analysis because they were prematurely discharged from treatment due to incarceration or repeatedly failing drug tests, and many participants included in the analysis indicated they engaged in socially desirable responding to the relevant outcome measures (Cogswell & Negley, 2011). Therefore, the lack of significant findings in these studies may be due to aspects of study design and quality, rather than ineffectiveness of the SDT components leveraged.

Predicting treatment outcomes and engagement

Substances of primary focus. Among the 11 articles utilizing SDT to predict treatment outcomes and engagement, three focused exclusively on alcohol (27%), three focused on substance use broadly and thus measured multiple substances (27%), and two did not report on substance use measures (18%) (see Table 1). The remaining three articles focused on tobacco (Patten et al., 2016), cannabis (Blevins et al., 2016), or opioids (Zeldman et al., 2004).

Outcomes measured. Three outcomes were assessed: treatment readiness, client engagement (i.e., cognitive interest and attitudes, resource utilization, participation, etc.), and client-related treatment outcomes (i.e., progress, sobriety, drop-out, retention, etc.). The most frequently studied outcome was client engagement, measured in seven of the articles (64%). Client-related treatment outcomes were studied in five articles (45%), followed by treatment readiness, assessed in three articles (27%).

Components of SDT investigated. Similar to intervention studies, motivation source and basic psychological needs were the SDT constructs most frequently utilized to investigate treatment engagement and associated outcomes. Among the 11 articles that utilized the SDT framework in this way, motivation source (10 articles [91%]; see Table 1) was the most frequently studied component, followed by psychological needs (6 articles [55%]; see Table 1). Three articles assessed both motivation source and need satisfaction as they relate to treatment engagement and associated outcomes (see Table 1). Of the studies that examined need satisfaction, all assessed autonomy, four assessed competence (67%), and three assessed relatedness (33%). Finally, two articles focused on causality orientations (Blevins et al., 2016; Simoneau & Bergeron, 2003).

Relevant findings. Findings across studies universally supported that SDT is a useful framework for predicting treatment readiness, client engagement, and client-related outcomes. Changes in these outcomes were primarily attributed to differences in motivation source, suggesting that more autonomous motivation predicted greater readiness, better engagement, and better client-related outcomes relative to more controlled motivation. It is important to note that while autonomous motivation predicted better outcomes relative to controlled motivation, several articles reported an interaction between these sources of motivation such that levels of autonomous motivation moderated the effects of controlled motivation on client engagement and outcomes such that high controlled motivation was positively related to client engagement and outcomes only when autonomous motivation was also high (Ryan et al., 1995). When autonomous motivation was low, high controlled motivation predicted the worst treatment outcomes (Zeldman et al., 2004).

With respect to causality orientations, autonomous orientation was related to more positive outcomes (i.e., greater reductions in use) following treatment (Blevins et al., 2016). However, this relation only applied to individual differences in these orientations, and not changes in orientations over the course of treatment (Blevins et al., 2016). When assessed over the course of treatment, causality orientations either remained stable or failed to predict treatment outcomes when changes were observed (Blevins et al., 2016).

Several studies examined the influence that need satisfaction had on treatment outcomes. These findings showed that competence and autonomy were positive predictors of treatment readiness and client-related outcomes whereas relatedness-focused aspects of treatment positively influenced engagement.

Discussion

The objective of this scoping review was to summarize the literature applying SDT to substance use in non-treatment and treatment settings. Results illustrate that SDT has been applied to investigate interrelated, but distinct, areas of research regarding the role of motivation in substance use behaviors. In non-treatment settings, SDT has been applied to explain the maintenance of substance use behaviors, and how substance use-related problems and disorders can develop. In treatment settings, SDT is used to identify and leverage motivational constructs that have the potential to bring about behavior change as it relates to substance use behaviors. The findings of the present review suggest SDT can provide important insight into both areas of research.

Main findings

Research in non-treatment settings focused mostly on alcohol use, whereas studies within the treatment setting examined a wider range of substances (e.g., tobacco, opioids).

One reason for this difference may be the populations from which these studies sampled. Most of the research in non-treatment settings recruited college student samples, where alcohol is often the primary substance of use (Schulenberg et al., 2021). In contrast, treatment and intervention studies frequently sampled participants from substance use clinics, or the general population through public health campaigns. Treatment clinics typically address multiple forms of substance use dependence without specializing in a single substance. As a result, the individuals sampled from such settings reflect a population that is likely more heterogeneous in their substance use patterns than those sampled from non-treatment settings.

Results also highlight differences in how SDT constructs are studied across these settings. In non-treatment settings, there was greater focus on causality orientations and motivation source than on psychological need satisfaction. Given that psychological needs are a core aspect of SDT, their omission is somewhat surprising. In contrast, psychological need satisfaction was consistently targeted in treatment settings, with less focus on causality orientations. That psychological need satisfaction received greater attention than causality orientations in treatment environments likely reflects the distinct, yet interrelated, research questions of interest for each respective setting. Treatment studies generally targeted components of SDT that are amenable to change (e.g., need satisfaction, the treatment environment; Deci & Ryan, 2000). For example, several treatment studies sought to influence autonomy by modifying the treatment environment to be more autonomy-supportive (Caudwell et al., 2018; Cogswell & Negley, 2011; Solloway et al., 2006; Zeldman et al., 2004). The other treatment studies targeting need satisfaction did so by teaching skills or behaviors that would build autonomy and competence (9 studies; See Table 1). By comparison, causality orientations are considered less malleable to change (Deci & Ryan, 1985; Hagger & Hamilton, 2021) and therefore may be particularly relevant to understanding why substance use is maintained and/or for identifying those at greatest risk of developing substance use-related problems (e.g., dependence).

Despite the focus on psychological need satisfaction in treatment settings, only three studies assessed relatedness (see Table 1). One explanation for this gap in the literature may be that relatedness, relative to the other needs, is less malleable in the treatment environment. For example, relatedness is likely influenced by other forms of social support that are beyond the reach of the setting including friends, family members, or significant others.

Another important finding from this review is that the literature currently implies that within non-treatment settings, motivation source may be a more reliable predictor of alcohol consumption than causality orientations. Greater autonomous motivation to limit one's alcohol consumption, pre-drink, or drink responsibly was consistently associated with higher engagement in those behaviors (Caudwell & Hagger, 2015; Hagger et al., 2012; Hagger et al., 2014), whereas higher controlled motivations were inversely associated with the same behaviors (Caudwell & Hagger, 2015; Hagger et al., 2014). In contrast, the association between causality orientations and substance use was not robust in non-treatment settings, with multiple studies failing to find a significant association (Hove et al., 2010; Knee & Neighbors, 2002). Importantly, control causality orientation was reliably found to be positively associated with substance use-related problems (Hove et al., 2010; Neighbors et al., 2004). Thus, causality orientations may predict substance use-related problems due to their effects on behavioral self-regulation, rather than through increased substance use. In other words, individuals who perceive less personal control over their own actions may be less likely to regulate their behavior and more likely to experience negative outcomes as a result. This suggests that causality orientation may be useful to measure as a potential risk factor for experiencing substance use-related problems, whereas motivation source may be a more appropriate predictor of substance use behaviors in non-treatment settings. However, it is important to note that all but three (Carey et al., 2019; Neighbors et al., 2006; Salazar et al., 2018) of the non-treatment studies utilized cross-sectional or longitudinal survey methods with extended time (weeks or months) between assessments. Consequently, additional examination of these associations within a shorter timeframe (i.e., using an ecological momentary assessment design) would increase confidence in these findings. Further, within non-treatment settings, there is a need for experimental methods to test the causal relationships between SDT constructs and substance use outcomes.

Findings within treatment contexts provide further support for the influence of causality orientations on treatment outcomes *via* behavioral regulation. Specifically, one's causality orientation prior to or at the start of treatment was related to treatment and intervention outcomes, however, changes in causality orientations over the course of treatment were unrelated to changes in these outcomes (Blevins et al., 2016, Neighbors et al., 2006, Simoneau & Bergeron, 2003). Such findings suggest causality orientations indirectly predict treatment outcomes through their effect on behavioral regulation. Alternatively, these findings may suggest that causality orientations serve to moderate the effect of needs on the relationship between goals or behavioral regulation on substance use behaviors. This would be consistent with the broader SDT framework wherein psychological needs are considered mediators while causality orientation is considered a moderator (Hagger & Hamilton, 2021; Deci & Ryan, 1985). Notably, only a single study in the review formally tested causality orientations as a moderator of the effectiveness of an intervention (Neighbors et al., 2006), suggesting this may be a useful area for future research. As with non-treatment contexts, behavioral orientation may serve as a potential risk factor for determining success or failure in treatment. Therefore, though they may not be viable treatment or intervention targets themselves, it may be useful to measure causality orientations prior to the start of treatment or intervention.

Findings from the present review suggest that interventions focusing on shifting one's motivational source hold promise, as such changes frequently predict changes in treatment outcomes (Kennedy & Gregoire, 2009; Klag et al., 2010; Ryan et al., 1995; Simoneau & Bergeron, 2003; Wild

et al., 2006; Wild et al., 2016; Zeldman et al., 2004). Increases in autonomous motivation are consistently positively associated with changes in treatment outcomes (Kennedy & Gregoire, 2009; Klag et al., 2010; Ryan et al., 1995; Simoneau & Bergeron, 2003; Wild et al., 2006; Wild et al., 2016; Zeldman et al., 2004). Additionally, several studies showed that in certain contexts and populations (i.e., when autonomous motivation is also high) controlled motivation can also have a positive impact on these outcomes (Ryan et al., 1995; Zeldman et al., 2004).

Opportunities for future research

While the studies included in this review suggest that motivation source and causality orientations influence alcohol use outcomes in non-treatment settings, additional research is needed to determine whether these findings extend to other common substances such as cannabis and e-cigarettes. One cannot assume that findings for alcohol use apply to other substances for multiple reasons. First, substances have different physiological effects (e.g., depressant vs. stimulant). Therefore, psychological factors that predict the use of one substance will not necessarily predict the use of other substances. Second, alcohol use is frequently characterized as a social activity (Creswell, 2021; Fairbairn & Sayette, 2014), but this is not necessarily the case for other substances. Alcohol can be consumed in public spaces such as restaurants and bars whereas cannabis use is often restricted to private residences. These different contexts may affect one's motivation to use these substances.

Findings from this review highlight three additional areas for future research on the role of basic psychological needs in substance use treatment. First, all studies that investigated psychological need satisfaction did so in relation to the specific treatment being assessed, while no studies investigated general need satisfaction. Thus, it is unclear how general feelings of competence, autonomy, and relatedness may influence treatment and treatment outcomes.

Second, future research on psychological needs should incorporate relatedness in the treatment context. This is important to address as relatedness may play a significant role in treatment. Many practices rely on social networks and support as a key aspect of treatment (Bond et al., 2003; Kennedy et al., 2016). For example, the social networks and support components of Alcoholics Anonymous (AA) significantly predict 90-day abstinence (Bond et al., 2003). These treatment components may influence abstinence in part through their effects on relatedness, but we are aware of no published work testing this possibility. Furthermore, relatedness may influence treatment outcomes indirectly *via* treatment engagement. Multiple studies (McTavish et al., 2012; Muroff et al., 2017) imply that treatment engagement is affected more by relatedness than competence or autonomy. Given the impact client engagement has on treatment outcomes (Ryan et al., 1995; Wild et al., 2006; Zeldman et al., 2004), interventions that promote relatedness may be an effective means of improving these outcomes, especially treatment initiation and adherence (McTavish et al., 2012; Muroff et al., 2017).

Third, within the context of substance use, there is a dearth of research examining need frustration. Rather, the studies that focused on psychological needs, solely focused on need satisfaction. This is noteworthy because it stands in contrast to SDT-guided research in other domains (e.g., physical activity, education) which show that need frustration and satisfaction are distinct constructs (Longo et al., 2016; Warburton et al., 2020). This work implies that need frustration may explain additional variance in substance use-related outcomes not accounted for by need satisfaction.

Finally, future research would benefit from greater precision regarding how the primary constructs of SDT are being studied or applied to the context of substance use, misuse, and treatment. For example, within SDT psychological needs should be considered a potential mediator of observed effects on treatment outcomes or substance use behaviors, whereas causality orientations should be considered a potential moderator of such relationships (Hagger & Hamilton, 2021; Deci & Ryan, 1985). However, only a single study included in this review reported formally testing causality orientations as a moderator of the effectiveness of an intervention (Neighbors et al., 2006). Future work should incorporate formal tests of psychological needs as mediators and causality orientations as moderators to further improve our understanding of how SDT can be applied to substance use, misuse, and treatment.

Limitations

It is important to note the limitations of the present scoping review. First, only articles written in English were included, and thus works reporting on SDT and substance misuse in other languages are not reflected in the current review. Another limitation is that all but four (Lim & Ha, 2019; Muroff et al., 2017; Richards et al., 2020, 2021b) of the samples studied were primarily White non-Hispanic, making it difficult to know the extent to which findings hold for individuals from other groups. Another limitation is the intentionally broad scope of the review, resulting in considerable heterogeneity regarding study designs and samples. This prevented the development of a standardized approach to assessing study quality. Furthermore, the breadth of studies included limited our ability to draw conclusions regarding more complex relationships between aspects of SDT and substance use- and treatment-related outcomes. Despite these limitations, our hope is that this study will guide future research applying SDT to substance misuse and its treatment, and can provide the groundwork necessary for deeper exploration of these relationships.

Conclusions

SDT has been applied in a variety of ways in efforts to understand substance use. SDT has been utilized to predict relevant outcomes, design prevention and treatment programs, and assess treatment efficacy. While the literature

largely suggests that these applications have been successful, this review highlights several gaps in the literature that, if filled, have the potential to advance our understanding of substance use and inform future intervention and treatment efforts.

Note

1. The PRISMA checklist for the present review is included in the supplementary materials.

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References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Bureau, J. S., Howard, J. L., Chong, J. X., & Guay, F. (2022). Pathways to student motivation: A meta-analysis of antecedents of autonomous and controlled motivations. *Review of Educational Research*, *92*(1), 46–72. https://doi.org/10.3102/00346543211042426

Blevins, C. E., Banes, K. E., Walker, D. D., Stephens, R. S., & Roffman, R. A. (2016). The relationship between general causality orientation and treatment outcome among marijuana-dependent adults. *Addictive Behaviors*, *53*, 196–200. https://doi.org/10.1016/j.addbeh.2015.10.021

Bond, J., Kaskutas, L. A., & Weisner, C. (2003). The persistent influence of social networks and alcoholics anonymous on abstinence. *Journal of Studies on Alcohol*, *64*(4), 579–588. https://doi.org/10.15288/jsa.2003.64.579

Buckman, J. F., Yusko, D. A., White, H. R., & Pandina, R. J. (2009). Risk profile of male college athletes who use performance-enhancing substances. *Journal of Studies on Alcohol and Drugs*, *70*(6), 919–923. https://doi.org/10.15288/jsad.2009.70.919

Cafferky, B. M., Mendez, M., Anderson, J. R., & Stith, S. M. (2018). Substance use and intimate partner violence: A meta-analytic review. *Psychology of Violence*, *8*(1), 110–131. https://doi.org/10.1037/vio0000074

Carey, T. M., Maillet, M. A., & Grouzet, F. M. E. (2019). Self-regulation of student drinking behavior: Strength-energy and self-determination theory perspectives. *Motivation Science*, *5*(3), 202–219. https://doi.org/10.1037/mot0000111

Caudwell, K. M., Keech, J. J., Hamilton, K., Mullan, B. A., & Hagger, M. S. (2019). Reducing alcohol consumption during pre-drinking sessions: Testing an integrated behaviour-change model. *Psychology & Health*, *34*(1), 106–127. https://doi.org/10.1080/08870446.2018.1518527

Caudwell, K. M., Mullan, B. A., & Hagger, M. S. (2018). Testing an online, theory-based intervention to reduce pre-drinking alcohol consumption and alcohol-related harm in undergraduates: A randomized controlled trial. *International Journal of Behavioral Medicine*, *25*(5), 592–604. https://doi.org/10.1007/s12529-018-9736-x

Caudwell, K. M., & Hagger, M. S. (2015). Predicting alcohol pre-drinking in Australian undergraduate students using an integrated theoretical model. *Applied Psychology. Health and Well-Being*, *7*(2), 188–213. https://doi.org/10.1111/aphw.12044

Chan, I. S., & Ginsburg, G. S. (2011). Personalized medicine: Progress and promise. *Annual Review of Genomics and Human Genetics*, *12*(1), 217–244. https://doi.org/10.1146/annurev-genom-082410-101446

Chawla, N., Neighbors, C., Logan, D., Lewis, M. A., & Fossos, N. (2009). Perceived approval of friends and parents as mediators of the relationship between self-determination and drinking. *Journal of Studies on Alcohol and Drugs*, *70*(1), 92–100. https://doi.org/10.15288/jsad.2009.70.92

Cogswell, J., & Negley, S. K. (2011). The effect of autonomy-supportive therapeutic recreation programming on integrated motivation for treatment among persons who abuse substances. *Therapeutic Recreation Journal*, *45*(1), 47–61.

Cooper, M. L., Kuntsche, E., Levitt, A., Barber, L. L., & Wolf, S. (2016). Motivational models of substance use: A review of theory and research on motives for using alcohol, marijuana, and tobacco. In K. J. Sher (Ed.), *The Oxford handbook of substance use and substance use disorders*, Vol. 1. (pp. 375–421). Oxford University Press.

Cox, W. M., & Klinger, E. (1988). A motivational model of alcohol use. *Journal of Abnormal Psychology*, *97*(2), 168–180. https://doi.org/10.1037/0021-843X.97.2.168

Creswell, K. G. (2021). Drinking together and drinking alone: A social-contextual framework for examining risk for alcohol use disorder. *Current Directions in Psychological Science*, *30*(1), 19–25. https://doi.org/10.1177/0963721420969406

Cui, M., Allen, J. W., Fincham, F. D., May, R. W., & Love, H. (2019). Helicopter parenting, self-regulatory processes, and alcohol use among female college students. *Journal of Adult Development*, *26*(2), 97–104. https://doi.org/10.1007/s10804-018-9301-5

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality*, *19*(2), 109–134. https://doi.org/10.1016/0092-6566(85)90023-6

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology/Psychologie Canadienne*, *49*(1), 14–23. https://doi.org/10.1037/0708-5591.49.1.14

Deci, E. L., & Ryan, R. M. (2012). Motivation, personality, and development within embedded social contexts: An overview of self-determination theory. In R. M. Ryan (Ed.), *The Oxford handbook of human motivation* (pp. 85–107). Oxford University Press.

Dunn, C., Deroo, L., & Rivara, F. P. (2001). The use of brief interventions adapted from motivational interviewing across behavioral domains: A systematic review. *Addiction (Abingdon, England)*, *96*(12), 1725–1742. https://doi.org/10.1046/j.1360-0443.2001.961217253.x

Fairbairn, C. E., & Sayette, M. A. (2014). A social-attributional analysis of alcohol response. *Psychological Bulletin*, *140*(5), 1361–1382. https://doi.org/10.1037/a0037563

French, M. T., Maclean, J. C., Sindelar, J. L., & Fang, H. (2011). The morning after: Alcohol misuse and employment problems. *Applied Economics*, *43*(21), 2705–2720. https://doi.org/10.1080/00036840903357421

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior*, *26*(4), 331–362. https://doi.org/10.1002/job.322

Gaudreau, P., Carraro, N., & Miranda, D. (2012). From goal motivation to goal progress: The mediating role of coping in the Self-Concordance Model. *Anxiety, Stress, and Coping*, *25*(5), 507–528. https://doi.org/10.1080/10615806.2011.628015

Grolnick, W. S., & Ryan, R. M. (1989). Parent styles associated with children's self-regulation and competence in school. *Journal of Educational Psychology*, *81*(2), 143–154. https://doi.org/10.1037/0022-0663.81.2.143

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), 566–572. 10.1001/jamapsychiatry.2013.4642

Hagger, M. S., Lonsdale, A. J., Hein, V., Koka, A., Lintunen, T., Pasi, H., Lindwall, M., Rudolfsson, L., & Chatzisarantis, N. L. D. (2012). Predicting alcohol consumption and binge drinking in company employees: An application of planned behaviour and self-determination theories. *British Journal of Health Psychology*, *17*(2), 379–407. https://doi.org/10.1111/j.2044-8287.2011.02043.x

Hagger, M. S., & Hamilton, K. (2021). General causality orientations in self-determination theory: Meta-analysis and test of a process model. *European Journal of Personality*, *35*(5), 710–735. https://doi.org/10.1177/0890207020962330

Hagger, M. S., Hardcastle, S. J., Chater, A., Mallett, C., Pal, S., & Chatzisarantis, N. L. D. (2014). Autonomous and controlled motivational regulations for multiple health-related behaviors: Between-and within-participants analyses. *Health Psychology and Behavioral Medicine*, *2*(1), 565–601. https://doi.org/10.1080/21642850.2014.912945

Hove, M. C., Parkhill, M. R., Neighbors, C., McConchie, J. M., & Fossos, N. (2010). Alcohol consumption and intimate partner violence perpetration among college students: The role of self-determination. *Journal of Studies on Alcohol and Drugs*, *71*(1), 78–85. https://doi.org/10.15288/jsad.2010.71.78

Jerković, D., Rihtarić, M. L., & Kranželić, V. (2017). The moderating role of causality orientations in the relationship between personality traits and cannabis consumption. *Hrvatska Revija Za Rehabilitacijska Istraživanja*, *53*(Suppl), 219–230.

Kennedy, K., & Gregoire, T. K. (2009). Theories of motivation in addiction treatment: Testing the relationship of the transtheoretical model of change and self-determination theory. *Journal of Social Work Practice in the Addictions*, *9*(2), 163–183. https://doi.org/10.1080/15332560902852052

Kennedy, D. P., Hunter, S. B., Osilla, K. C., Maksabedian, E., Golinelli, D., & Tucker, J. S. (2016). A computer-assisted motivational social network intervention to reduce alcohol, drug and HIV risk behaviors among housing first residents. *Addiction Science & Clinical Practice*, *11*(1), 4. https://doi.org/10.1186/s13722-016-0052-y

Klag, S. M.-L., Creed, P., & O'Callaghan, F. (2010). Early motivation, well-being, and treatment engagement of chronic substance users undergoing treatment in a therapeutic community setting. *Substance Use & Misuse*, *45*(7–8), 1112–1130. https://doi.org/10.3109/10826080903499562

Knee, C. R., & Neighbors, C. (2002). Self-determination, perception of peer pressure, and drinking among college students. *Journal of Applied Social Psychology*, *32*(3), 522–543. https://doi.org/10.1111/j.1559-1816.2002.tb00228.x

Lim, J. H., & Ha, Y. (2019). Effectiveness of a workplace smoking cessation program based on self-determination theory using individual counseling and tailored text messaging: A pilot study. *Asian Nursing Research*, *13*(1), 53–60. https://doi.org/10.1016/j.anr.2019.01.004

Longo, Y., Gunz, A., Curtis, G. J., & Farsides, T. (2016). Measuring need satisfaction and frustration in educational and work contexts: The Need Satisfaction and Frustration Scale (NSFS). *Journal of Happiness Studies*, *17*(1), 295–317. https://doi.org/10.1007/s10902-014-9595-3

McTavish, F. M., Chih, M.-Y., Shah, D., & Gustafson, D. H. (2012). How patients recovering from alcoholism use a smartphone intervention. *Journal of Dual Diagnosis*, *8*(4), 294–304. https://doi.org/10.1080/15504263.2012.723312

Milyavskaya, M., & Koestner, R. (2011). Psychological needs, motivation, and well-being: A test of self-determination theory across multiple domains. *Personality and Individual Differences*, *50*(3), 387–391. https://doi.org/10.1016/j.paid.2010.10.029

Moller, A. C., Deci, E. L., & Ryan, R. M. (2006). Choice and ego-depletion: The moderating role of autonomy. *Personality & Social Psychology Bulletin*, *32*(8), 1024–1036. https://doi.org/10.1177/0146167206288008

Morse, D. S., Cerulli, C., Bedell, P., Wilson, J. L., Thomas, K., Mittal, M., Lamberti, J. S., Williams, G., Silverstein, J., Mukherjee, A., Walck, D., & Chin, N. (2014). Meeting health and psychological needs of women in drug treatment court. *Journal of Substance Abuse Treatment*, *46*(2), 150–157. https://doi.org/10.1016/j.jsat.2013.08.017

Munn, Z., Peters, M. D., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, *18*(1), 143. https://doi.org/10.1186/s12874-018-0611-x

Muroff, J., Robinson, W., Chassler, D., López, L. M., Gaitan, E., Lundgren, L., Guauque, C., Dargon-Hart, S., Stewart, E., Dejesus, D., Johnson, K., Pe-Romashko, K., & Gustafson, D. H. (2017). Use of a smartphone recovery tool for Latinos with co-occurring alcohol and other drug disorders and mental disorders. *Journal of Dual Diagnosis*, *13*(4), 280–290. 10.1080/15504263.2017.1348649

Nation, M., Crusto, C., Wandersman, A., Kumpfer, K. L., Seybolt, D., Morrissey-Kane, E., & Davino, K. (2003). What works in prevention: Principles of effective prevention programs. *American Psychologist*, *58*(6–7), 449–456. https://doi.org/10.1037/0003-066X.58.6-7.449

Neighbors, C., Larimer, M. E., Geisner, I. M., & Knee, C. R. (2004). Feeling controlled and drinking motives among college students: Contingent self-esteem as a mediator. *Self and Identity*, *3*(3), 207–224. https://doi.org/10.1080/13576500444000029

Neighbors, C., Walker, D. D., & Larimer, M. E. (2003). Expectancies and evaluations of alcohol effects among college students: Self-determination as a moderator. *Journal of Studies on Alcohol*, *64*(2), 292–300. https://doi.org/10.15288/jsa.2003.64.292

Neighbors, C., Lewis, M. A., Bergstrom, R. L., & Larimer, M. E. (2006). Being controlled by normative influences: Self-determination as a moderator of a normative feedback alcohol intervention. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, *25*(5), 571–579. 10.1037/0278-6133.25.5.571

Patten, C. A., Clinic, M., Goggin, K., Harris, K. J., Richter, K., Williams, K., Decker, P. A., Clinic, M., Bradley-Ewing, A., & Catley, D. (2016). Relationship of autonomy social support to quitting motivation in diverse smokers. *Addiction Research & Theory*, *24*(6), 477–482. 10.3109/16066359.2016.1170815

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., & Brière, N. M. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. *Motivation and Emotion*, *25*(4), 279–306. https://doi.org/10.1023/A:1014805132406

Pollock, D., Tricco, A. C., Peters, M. D. J., Mclnerney, P. A., Khalil, H., Godfrey, C. M., Alexander, L. A., & Munn, Z. (2022). Methodological quality, guidance, and tools in scoping reviews: A scoping review protocol. *JBI Evidence Synthesis*, *20*(4), 1098–1105. https://doi.org/10.11124/JBIES-20-00570

Prendergast, M. L., Podus, D., Chang, E., & Urada, D. (2002). The effectiveness of drug abuse treatment: A meta-analysis of comparison group studies. *Drug and Alcohol Dependence*, *67*(1), 53–72. https://doi.org/10.1016/S0376-8716(02)00014-5

Richards, D. K., Pearson, M. R., & Field, C. A. (2020). Profiles of motivations for responsible drinking among college students: A self-determination theory perspective. *Addictive Behaviors*, *111*, 106550. https://doi.org/10.1016/j.addbeh.2020.106550

Richards, D. K., Pearson, M. R., & Field, C. A. (2021a). Further validation of the treatment self-regulation questionnaire for assessing motivations for responsible drinking: A test of self-determination theory. *Experimental and Clinical Psychopharmacology*, *29*(6), 679–688. 10.1037/pha0000405

Richards, D. K., Pearson, M. R., & Witkiewitz, K. (2021b). Understanding alcohol harm reduction behaviors from the perspective of self-determination theory: A research agenda. *Addiction Research & Theory*, *29*(5), 392–397. https://doi.org/10.1080/16066359.2020.1863378

Rollnick, S., & Miller, W. R. (1995). What is motivational interviewing? *Behavioural and Cognitive Psychotherapy*, *23*(4), 325–334. https://doi.org/10.1017/S135246580001643X

Ryan, R. M., Plant, R. W., & O'Malley, S. (1995). Initial motivations for alcohol treatment: Relations with patient characteristics, treatment involvement, and dropout. *Addictive Behaviors*, *20*(3), 279–297. https://doi.org/10.1016/0306-4603(94)00072-7

Salazar, A. M., Noell, B., Cole, J. J., Haggerty, K. P., & Roe, S. (2018). Incorporating self-determination into substance abuse prevention programming for youth transitioning from foster care to adulthood. *Child & Family Social Work*, *23*(2), 281–288. https://doi.org/10.1111/cfs.12416

Schulenberg, J. E., Patrick, M. E., Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Miech, R. A. (2021). Monitoring the future national survey results on drug use, 1975–2020. Volume II, College Students & Adults Ages 19–60. Institute for Social Research.

Simoneau, H., & Bergeron, J. (2003). Factors affecting motivation during the first six weeks of treatment. *Addictive Behaviors*, *28*(7), 1219–1241. https://doi.org/10.1016/S0306-4603(02)00257-5

Solloway, V., Solloway, K., & Joseph, A. (2006). A hypnotherapy for smoking intervention investigates the effects of autonomy support

on motivation, perceived competence and smoking abstinence. *European Journal of Clinical Hypnosis*, *7*(2), 26–40.

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., … Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, *169*(7), 467–473. https://doi.org/10.7326/M18-0850

US Department of Health and Human Services (HHS). (2016). *Facing addiction in America: The Surgeon General's report on alcohol, drugs, and health*. HHS.

Vallerand, R. J., Pelletier, L. G., & Koestner, R. (2008). Reflections on self-determination theory. *Canadian Psychology/Psychologie Canadienne*, *49*(3), 257–262. https://doi.org/10.1037/a0012804

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2004). Motivating learning, performance, and persistence: The synergistic effects of intrinsic goal contents and autonomy-supportive contexts. *Journal of Personality and Social Psychology*, *87*(2), 246–260. https://doi.org/10.1037/0022-3514.87.2.246

Walsh, C., MacMillan, H. L., & Jamieson, E. (2003). The relationship between parental substance abuse and child maltreatment: Findings from the Ontario Health Supplement. *Child Abuse & Neglect*, *27*(12), 1409–1425. https://doi.org/10.1016/j.chiabu.2003.07.002

Warburton, V. E., Wang, J. C., Bartholomew, K. J., Tuff, R. L., & Bishop, K. C. (2020). Need satisfaction and need frustration as distinct and potentially co-occurring constructs: Need profiles examined in physical education and sport. *Motivation and Emotion*, *44*(1), 54–66. https://doi.org/10.1007/s11031-019-09798-2

Wild, T. C., Cunningham, J. A., & Ryan, R. M. (2006). Social pressure, coercion, and client engagement at treatment entry: A self-determination theory perspective. *Addictive Behaviors*, *31*(10), 1858–1872. https://doi.org/10.1016/j.addbeh.2006.01.002

Wild, T. C., Yuan, Y., Rush, B. R., & Urbanoski, K. A. (2016). Client engagement in legally-mandated addiction treatment: A prospective study using self-determination theory. *Journal of Substance Abuse Treatment*, *69*, 35–43. https://doi.org/10.1016/j.jsat.2016.06.006

Williams, G. C., & Deci, E. L. (1996). Internalization of biopsychosocial values by medical students: A test of self-determination theory. *Journal of Personality and Social Psychology*, *70*(4), 767–779. https://doi.org/10.1037/0022-3514.70.4.767

Williams, G. G., Gagné, M., Ryan, R. M., & Deci, E. L. (2002). Facilitating autonomous motivation for smoking cessation. *Health Psychology*, *21*(1), 40–50. https://doi.org/10.1037/0278-6133.21.1.40

Williams, G. C., McGregor, H. A., Sharp, D., Levesque, C., Kouides, R. W., Ryan, R. M., & Deci, E. L. (2006a). Testing a self-determination theory intervention for motivating tobacco cessation: Supporting autonomy and competence in a clinical trial. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, *25*(1), 91–101. https://doi.org/10.1037/0278-6133.25.1.91

Williams, G. C., McGregor, H., Sharp, D., Kouldes, R. W., Lévesque, C. S., Ryan, R. M., & Deci, E. L. (2006b). A self-determination multiple risk intervention trial to improve smokers' health. *Journal of General Internal Medicine*, *21*(12), 1288–1294. https://doi.org/10.1111/j.1525-1497.2006.00621.x

Williams, G. C., Niemiec, C. P., Patrick, H., Ryan, R. M., & Deci, E. L. (2009). The importance of supporting autonomy and perceived competence in facilitating long-term tobacco abstinence. *Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine*, *37*(3), 315–324. https://doi.org/10.1007/s12160-009-9090-y

Williams, G. C., Niemiec, C. P., Patrick, H., Ryan, R. M., & Deci, E. L. (2016). Outcomes of the Smoker's Health Project: A pragmatic comparative effectiveness trial of tobacco dependence interventions based on self-determination theory. *Health Education Research*, *31*(6), 749–759. https://doi.org/10.1093/her/cyw046

Zeldman, A., Ryan, R. M., & Fiscella, K. (2004). Motivation, autonomy support, and entity beliefs: Their role in methadone maintenance treatment. *Journal of Social and Clinical Psychology*, *23*(5), 675–696. https://doi.org/10.1521/jscp.23.5.675.50744