Drug and Alcohol Dependence Reports 2 (2022) 100014

Contents lists available at ScienceDirect

Drug and Alcohol Dependence Reports

journal homepage: www.elsevier.com/locate/dadr

Psychometric evaluation of the treatment entry questionnaire to assess extrinsic motivation for inpatient addiction treatment

Alyna Walji[a,b], Isabella Romano[c,a], Emily Levitt[b,a], Sarah Sousa[a,c], Brian Rush[e,f,a,d], James MacKillop[b,a], Karen Urbanoski[g,h,e], Mary Jean Costello[a,c,*]

[a] Homewood Research Institute, Guelph, ON, Canada
[b] Peter Boris Centre for Addiction Research, McMaster University & St. Joseph's Healthcare Hamilton, Hamilton, ON, Canada
[c] School of Public Health Sciences, University of Waterloo, Waterloo, ON, Canada
[d] Department of Psychiatry and Behavioural Neurosciences, McMaster University, Hamilton, ON, Canada
[e] Centre for Addiction and Mental Health, Toronto, ON, Canada
[f] Dalla Lana School of Public Health, University of Toronto, Toronto, ON, Canada
[g] Canadian Institute for Substance Use Research, University of Victoria, BC, Canada
[h] School of Public Health and Social Policy, University of Victoria, BC, Canada

ARTICLE INFO

Keywords:
Motivation
Substance use disorders
Addiction
Treatment
Scale validation
Measurement invariance

ABSTRACT

Introduction: Valid multi-faceted measurement of motivation for substance use disorder (SUD) treatment is needed to help inform treatment approaches and predict outcomes. This study examined evidence of validity for the Treatment Entry Questionnaire (TEQ-9).

Methods: Data represented individuals entering inpatient SUD treatment (n = 1455). We used confirmatory factor analysis (CFA) to assess the three-factor structure of the TEQ-9 [identified (i.e., values/personally chooses treatment), introjected (i.e., internally controlled by guilt/shame) and external motivations (i.e., external pressure/demands)], and examined measurement invariance across gender, age, and ethno-racial identity. Correlation with readiness and confidence assessed convergent validity, while correlations with substance use problem severity and previous substance use treatment assessed meaningful group differences.

Results: A three-factor structure was confirmed with all items loading significantly onto their respective factors (ps < 0.001). Each subscale demonstrated high internal consistency (Identified α = 0.90; Introjected α = 0.79; External α = 0.85). Each subscale demonstrated measurement invariance up to the scalar level across all sub-groups. Readiness, confidence, and substance use problem severity correlated as expected across various substances with the identified (rs = 0.098 — 0.262, ps < 0.05), and external (rs = -0.096 — -0.178, ps < 0.05) subscales. Additionally, the mean Identified subscale score was significantly higher among those who previously engaged in SUD treatment (p < 0.001). Findings for the Introjected subscale were more ambiguous.

Conclusions: Findings provide evidence for factorial validity, measurement invariance, convergent validity and group differences of the TEQ-9 in a large clinically mixed inpatient SUD treatment population, providing further support of its clinical and research utility.

1. Introduction

Motivation to enter treatment is an important factor in the treatment of alcohol and other substance use disorders (SUDs; Kelly and Greene, 2013; Kizilkurt and Gıynaş, 2020; Kushnir et al., 2016; Ryan et al., 1995). Indeed, increased levels of motivation have been linked to greater treatment retention and greater engagement in treatment (Joe et al., 1998; Ryan et al., 1995; Wild et al., 2016). Evidence-informed treatment modalities such as motivational enhancement therapy and motivational interviewing are routinely used in SUD treatment to increase motivation and facilitate desirable treatment outcomes (Smedslund et al., 2011). Thus, measures that accurately assess motivation are essential, especially in the context of measurement-based care whereby client data are routinely collected to inform treatment planning, increase treatment engagement, and monitor treatment progress and outcome (Scott and Lewis, 2015).

Motivation is often assessed by measuring an individual's readiness for change; for example, following the Transtheoretical Model (Kushnir et al., 2016; Prochaska and DiClemente, 1983;) using tools such as the Stages of Change Readiness and Treatment Eagerness Scale

* **Corresponding** author at: Homewood Research Institute, 150 Delhi Street, Riverslea Building, Guelph, Ontario, Canada N1E 6K9.
E-mail address: jcostello@hriresearch.com (M.J. Costello).

https://doi.org/10.1016/j.dadr.2021.100014
Received 27 August 2021; Received in revised form 29 November 2021; Accepted 1 December 2021

(SOCRATES; Miller and Tonigan, 1996). However, beyond quantifying one's level of motivation, there has been increased focus on measuring *why* and *how* individuals become motivated to change their behavior (Deci and Ryan, 2000; Kushnir et al., 2016; Vallerand et al., 2008).

Self-Determination Theory (SDT) is a theoretical approach for understanding motivations to engage in activities, such as behavioural health treatments (Deci and Ryan, 1985, 2008). SDT posits that behavioural change will be more sustainable to the extent that they are self-determined (i.e., meet people's fundamental psychological needs for autonomy, relatedness, and competence) (Deci and Ryan, 1985, 2008). SDT proposes that motivation to engage in behavioural change varies along a continuum ranging from amotivation (whereby an individual is completely non-autonomous and has no sense of control), to extrinsic motivation (whereby an individual exhibits varying degrees of external motivation and sense of control), to intrinsic motivation (whereby an individual is completely self-motivated and driven by their own interest, enjoyment and satisfaction). The theory further speculates these types of motivation can shift over time and in relation to one another, depending on whether newly enacted activities or behaviours are seen to support people's needs for autonomy, relatedness, and competence. Relevant to behavioural health treatments, social conditions or health care contexts that enhance these psychological needs promote self-determination and behavioural persistence (Deci and Ryan, 1985, 2008).

To date, SDT has been applied to domains such as education (Guay et al., 2008), work (Deci et al., 2017), sport (Ntoumanis, 2001), and health (Ng et al., 2012). Moreover, a meta-analysis by Ng et al. (2012) suggested that SDT is a viable conceptual framework of motivation for behavioural change within a variety of health contexts including smoking cessation, diabetes care, weight control, physical activity, and medication adherence. While measures exist to assess separate constructs within SDT (e.g., satisfaction of psychological needs, supportive health care climates), few are able to assess the full continuum of self-determination with respect to behavioural within a single tool (Ng et al., 2012). Given individuals often endorse more than one type of motivation (Vallerand et al., 2008), multi-dimensional measures are required to distinctively yet comprehensively assess these types of motivation.

However, in some cases it may not be relevant to measure the full continuum of self-determination. For example, if we consider individuals who are voluntarily entering treatment for SUD, it may not be relevant to measure amotivation or intrinsic motivation. Instead, it may be more relevant to unpack the varying degrees of extrinsic motivation, including those identified as external regulation (i.e., the motivation to engage in activity as a result of pressure or demands from external agents, such as interpersonal relationships, the legal system or an employer), introjected regulation (i.e., a form of motivation internally controlled by feelings of guilt, shame and anxiety), and, identified regulation (e.g., an individual identifies with the value of an activity and personally chooses to commit to it)(Deci and Ryan, 1985, 2008). Notably, in this case, the fourth dimension of extrinsic motivation (i.e., integrated regulation) also is likely not relevant given the more internal nature of the motivation source.

To measure self-determined motivations within treatment settings, most studies included in the Ng et al. (2012) meta-analysis relied on the Treatment Self-Regulation Questionnaire (TRSQ), derived from the Treatment Motivation Questionnaire (TMQ; Ryan et al., 1995;). Wild and Wild (2006) developed the 30-item Treatment Entry Questionnaire (TEQ), an extension of the TMQ, to more clearly discriminate between identified motivation (i.e., sees value and personally chooses), introjected motivation (i.e., internally controlled by feelings of guilt, shame and anxiety), and external motivation (i.e., pressure or demands from external agents), specifically for individuals entering SUD treatment. Subsequently, shortened 12-item (Wild et al., 2006), and 9-item (TEQ-9; Urbanoski and Wild, 2012) versions of the TEQ were developed and evaluated, demonstrating high internal consistency and support for the three-factor structure among outpatient and residential SUD treatment populations. In addition, evidence for the three-factor structure was found for a Dutch version of the TEQ with 27- and 18-items in an outpatient psychiatric population (Jochems et al., 2014).

Previous psychometric evaluation among inpatient and outpatient samples has explored correlations between the TEQ subscales and legally mandated treatment, pressures to seek treatment, perceived coercion and substance use problem severity providing evidence for concurrent validity (Urbanoski and Wild, 2012; Wild et al., 2016). The subscales are likewise correlated with measures of readiness to quit and self-efficacy (i.e., confidence to change one's behavior) among SUD and other behavioural addictions populations (Kennedy and Gregoire, 2009; Kushnir et al., 2016). However, no studies have examined measurement invariance of the TEQ-9; a psychometric property that indicates whether the construct under study (i.e., extrinsic motivation) is being measured consistently across different groups such as age, gender, and ethno-racial identity, and is a logical prerequisite to conducting cross-group comparisons in research (Vandenberg and Lance, 2000). Collectively, the studies to date have provided evidence for the psychometric validity of the TEQ, although the overall literature is small and there are notable gaps.

While the TEQ has shown promise as a robust measure of self-determined motivations for SUD treatment, additional evidence of validity for the TEQ-9 is required in order to confidently use this measure in clinical practice and research (e.g. treatment planning, predicting treatment outcomes, etc.). As such, in the current study we sought replicate and expand on previous work to assess the validity of the TEQ-9 by addressing the following objectives: (1) to measure the factorial validity of the TEQ-9 within a clinically mixed SUD treatment population (2) to assess measurement invariance across gender, age, and ethno-racial identity; (3) to assess convergent validity of the TEQ-9 subscales with related constructs of readiness to quit and confidence to stay abstinent; and, (4) to assess whether scores on the TEQ-9 subscales are discernable across meaningful sub-populations (i.e., group differences).

2. Material and methods

2.1. Participants and procedures

Data analyses were performed on a sample of individuals who entered treatment for SUDs between April 26, 2018 and December 31, 2019 at a large inpatient SUD treatment program located at Homewood Health center in Guelph, Ontario. Data were collected electronically as part of routine clinical assessment, using psychometrically evaluated scales that measured a variety of clinically relevant domains including substance use, motivation to seek treatment, readiness to quit and confidence to stay abstinent. At the time of study, the program offered a 35–42 day treatment program for adults aged 19+ with a variety of SUDs and a 56-day integrated treatment program stream for adults with convergent post-traumatic stress. Treatment was largely group-based and primarily adopted an abstinence-based treatment approach (e.g., 12-Step facilitation) featuring recovery-oriented education and skills training facilitated by a multidisciplinary team of health professionals. Treatment costs were covered through a variety of sources, including public (e.g., provincial funding), semi-private (e.g., health insurance), or private (e.g., out-of-pocket) funding. No individuals were involuntarily admitted to treatment. Data were accessed retrospectively via research protocol that received ethics approval from the Regional center for Excellence, Research Ethics Board in Guelph, Ontario, Canada (protocol #19–8).

In total, 1496 individuals were admitted to the treatment program. Forty-one participants (2.6%) had missing TEQ-9 responses for reasons including administrative error, or choosing not to answer, and were excluded from the analyses. Most of the remaining 1455 participants self-reported as male (68.5%), employed (71.2%), heterosexual (85.3%), white (86.3%); not married or partnered (58.6%), and had attended at least some college or university (64.5%). Participants' mean age was 41.1 years (SD=11.5; range: 19 to 75).

2.2. Measures

Treatment Entry Questionnaire: 9-item (TEQ-9). The TEQ-9 is a measure of extrinsic motivation for SUD treatment (Urbanoski and Wild, 2012). The scale consists of one four-item, one three-item, and one two-item subscale which measure identified regulation, introjected regulation, and external regulation, respectively. Items are rated using a seven-point Likert scale ranging from 1 (*strongly disagree)* to 7 *(strongly agree)*. A summary score is calculated for each subscale, with scores ranging from 4 to 28 for Identified, 3–21 for Introjected, and 2–14 for External. Higher scores indicate higher levels of motivation within each subscale; as such, high scores on multiple subscales are not mutually exclusive. See Supplementary Material A for specific items within their corresponding subscales.

Substance Use Problem Severity. To assess severity of substance use over the past 90-days, we used the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) SUDs Checklist (American Psychiatric Association, 2013; Hasin et al., 2013). The checklist assesses eleven diagnostic criteria related to SUDs as described in the DSM-5 including, for example: "Did [substance] regularly result in problems fulfilling your roles at work, school, or home?", and "Did you continue to use [substance] despite knowing it contributed to a physical or psychological problem?", "Did you experience withdrawal from [substance]?". The checklist was administered separately for each substance used over the past 90 days, including: alcohol, cannabis, cocaine, other stimulants, heroin, other opioids, hallucinogens, sedatives, prescription sleep aids, and other non-listed substances. Response options for each criterion were dichotomous (yes=1, no=0), and a total sum score (ranging from 0 to 11) was calculated to represent a continuous measure of problem severity for each substance. For the purpose of these analyses, we combined substances into the following categories: alcohol, non-prescription cannabis, stimulants (cocaine and other stimulants), opioids (heroin and other opioids), and other drugs (hallucinogens, inhalants, sedatives, prescriptions sleep aids, and other non-listed substances). Where participants indicated the use of multiple substances within a substance category, we used the highest sum severity value across each of the substances. Comparisons between patient self-reports of SUD symptoms and diagnostics dispositions from clinical interview in this sample have revealed high correspondence (Levitt et al., 2021).

Readiness to quit. Using a modified version of the single-item Readiness Ruler ("How ready are you to quit your use of [substance]?"; Chung et al., 2011; Maisto et al., 2011), participants were asked to rate their readiness to quit each substance they indicated using in the past 90 days, with a 10-point Likert scale from 1 (*Not at all ready)* to 10 *(Extremely ready)*. We combined substances into the same aforementioned categories (alcohol, non-prescription cannabis, stimulants, opioids and other drugs). Where participants indicated the use of multiple substances within a category, we calculated an average readiness to quit score across each of the substances used which we included in the analyses.

Confidence to stay abstinent. Using a modified version of a single-item developed by Hoeppner et al. (2011) ("How confident are you that you will be able to stay abstinent from [substance] over the next 3 months (or 90 days)?), participants were asked to rate their confidence to stay abstinent from each substance they indicated using in the past 90 days. Responses were provided using a 10-point Likert scale ranging from 1 (*Not at all confident)* to 10 *(Extremely confident),* and individual substances were categorized into alcohol, non-prescription cannabis, stimulants, opioids, and other drugs. We calculated an average confidence score wherever participants indicated multiple substances within a category, which we used in the analyses.

Previous substance use treatment history. To assess previous engagement in substance use treatment, participants were asked, "Have you ever in your lifetime received treatment or services for problems related to drug or alcohol use [please do not include attended AA/NA groups or other self-help activities]?" The possible response options were *yes* or *no*.

Socio-demographic and program-level characteristics. Several socio-demographic variables were collected as part of routine clinical screening practices including gender, ethno-racial identity, and sexual orientation. We obtained additional demographic characteristics such as age (derived from date of birth) marital status and employment status from hospital administrative databases. For the measurement invariance analyses which compares only two groups, gender was limited to male and female (we excluded participants whose gender identification was "other" fom the measurement invariance analyses), we split age into two categories using the median age of 41 years, and we collapsed ethno-racial identity into white and racialized (including First Nations, Inuit or Métis; Asian; African, Caribbean or Black; Middle Eastern; Latin American; and Multiple or Mixed).

2.3. Analyses

To measure factorial validity, we conducted a confirmatory factor analysis (CFA) specifying a three-factor model using a maximum likelihood estimator. We evaluated model fit using two absolute [Standardized Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA)] and two relative [Tucker Lewis index (TLI), Confirmatory Factor Index (CFI)] fit indices. We established the following cutoff criteria a priori to determine good model fit: SRMR < 0.08 (Hu and Bentler, 1999), RMSEA < 0.08 (MacCallum et al., 1996), TLI > 0.95 (Hu and Bentler, 1999), and CFI > 0.90 (Ullman et al., 2001). We accepted the model if: 1) at least one of the absolute fit indices and one of the relative fit indices met the cutoff criteria, and 2) factor loadings proved strong and significant. We also reported the χ^2 statistic as an index of absolute fit, but we did not use it to determine goodness of fit as it is overly sensitive to large sample sizes. After confirming the factor structure, we then used Cronbach's alpha (α) to assess the internal consistency for each of the identified factors. Next, we investigated measurement invariance of the TEQ-9 across gender (female vs. male), age (< 41 vs. ≥ 41 – using the median split), and ethno-racial identity (racialized vs. white), using a multiple-group CFA model framework with increasingly stringent equality constraints (Muthén and Muthén, 2017; Vandenberg and Lance, 2000). In the first step, we specified a model without equality constraints to measure configural invariance – uniform factor structure between groups. A second model measured metric invariance – equal factor loadings between groups – with equality constraints imposed on factor loadings. Third, we used a model with equality constraints imposed on factor loadings and intercepts to measure scalar invariance, which indicates equality at the level of item means or intercepts between groups. To establish invariance at each level, adequate model fit was first required. Configural invariance, established via good model fit, is a prerequisite for testing invariance at the increasingly restricted levels (Cheung and Rensvold, 2002). Next, to establish metric and scalar invariance, we evaluated differences in fit between the less constrained and more constrained models. To establish equality invariance, we determined a priori that at least two of the following cut-points for changes in model fit indices must be met: $\Delta CFI \leq 0.010$ (Cheung and Rensvold, 2002), $\Delta TLI \leq 0.020$ (Vandenberg and Lance, 2000), $\Delta RMSEA \leq 0.015$ (Chen, 2007). To assess convergent validity, we measured Pearson's correlation coefficient (r) for each of the identified factors with readiness to quit and confidence to stay abstinent, two related but inherently different constructs. We interpreted the correlations as follows: $r < 0.30$, small; $0.30 \leq r < 0.50$, moderate, $r > 0.50$, large (Cohen, 1988), along with their statistical significance at $p < 0.05$. As such, we expected the correlations to be significant but small in each case and that both readiness and confidence would be positively associated with identified regulation and negatively associated with both introjected external regulation. To assess whether scores on each subscale were discernable across meaningful sub-populations, we measured the associations between the score on each subscale with

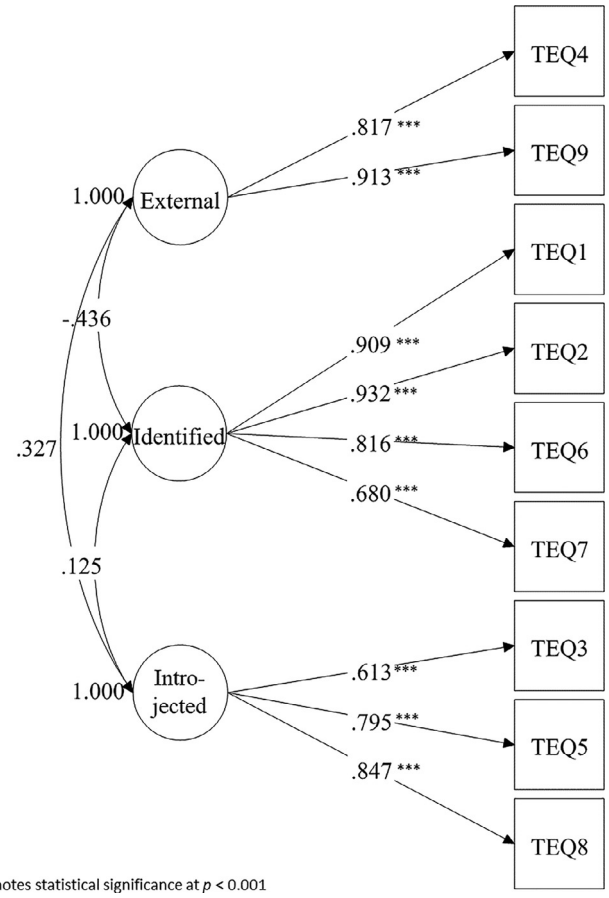

Fig. 1. Confirmatory factor analysis of the three-factor structure for the 9-item Treatment Entry Questionnaire (Standardized solution; $N = 1455$).

substance use problem severity and previous substance use treatment history, using r and t-tests, respectively. We expected problem severity to be positively associated with identified and introjected regulation, but not associated with external regulation and previous treatment history would be positively associated with identified regulation. CFA and measurement invariance analyses were conducted in MPlus version 8.4 (Muthén and Muthén, 2017). All other analyses were conducted in SAS version 9.4 (SAS 9.4, 2016).

3. Results

3.1. Factorial validity and internal consistency

The CFA results confirmed a three-factor structure of the TEQ-9. Criteria was met for one of the absolute fit indices (SRMR = 0.05; RMSEA = 0.083) and both of the relative fit indices (TLI = 0.967, CFI = 0.967), demonstrating good model fit of the three-factor structure. Fig. 1 demonstrates that each of the nine items had large and significant loadings on their respective factors with estimates ranging from 0.613 to 0.913 (all $ps < 0.0001$). Each of the three subscales exhibited excellent internal consistency (Identified $\alpha = 0.90$; Introjected $\alpha = 0.79$; External $\alpha = 0.85$). Overall, mean scores and standard deviations for each of the TEQ-9 subscales were as follows: Identified, 25.9 (SD=4.9); Introjected, 12.7 (SD=5.3); External 5.2 (SD=3.4). The distribution of mean scores within our sample were negatively skewed for the Identified subscale, positively skewed for the External subscale, and multimodal for the Introjected subscale with peaks at the upper end, lower end, and middle of the scale scores.

3.2. Measurement invariance

Measurement invariance results are displayed in Table 1.

3.2.1. Gender (Male vs. female)

Fit of the three-factor TEQ-9 model was good for both female (SRMR = 0.067; RMSEA = 0.098 [95% CI, 0.082–0.115]; CFI = 0.960; TLI = 0.940) and male (SRMR = 0.048; RMSEA = 0.069 [95% CI, 0.069–0.092]; CFI = 0.967; TLI = 0.950) samples independently. Good fit of the configural model suggested equivalent factor structures among males and females (SRMR = 0.055; RMSEA = 0.086 [95% CI, 0.077–0.096]; CFI = 0.965; TLI = 0.947). Equality constraints imposed at the metric level did not substantially worsen model fit (ΔCFI = −0.002; ΔTLI = 0.003; ΔRMSEA = −0.003), thus indicating factorial invariance of the TEQ. We proceeded to test constraints placed on item intercepts and found further evidence of invariance at the scalar level (ΔCFI = 0.000; ΔTLI = 0.005; ΔRMSEA = −0.004).

3.2.2. Age (Median split technique: < 41 vs. >=41)

The three-factor TEQ-9 model demonstrated good fit for the both the sample below the median age (SRMR = 0.052; RMSEA = 0.078 [95% CI, 0.065–0.091]; CFI = 0.970; TLI =0.956) and median age and above (SRMR = 0.059; RMSEA = 0.097 [95% CI, 0.084–0.110]; CFI = 0.957; TLI = 0.935). The configural invariance model fit the data well, suggesting the same factor structure between age groups (SRMR = 0.055; RMSEA = 0.088 [95% CI, 0.079–0.097]; CFI = 0.963; TLI = 0.945). Model fit did not significantly decrease at the metric model (ΔCFI = −0.002; ΔTLI = 0.003; ΔRMSEA = −0.002), demonstrating that items loaded onto their respective factors consistently among age groups. Invariance was also established at the scalar level (ΔCFI = −0.002; ΔTLI = 0.004; ΔRMSEA = −0.004), demonstrating no significant difference in item intercepts between age groups.

3.2.3. Ethno-racial identity (White vs. racialized)

The three-factor structure of the TEQ-9 fit well for the racialized (SRMR = 0.076; RMSEA = 0.102 [95% CI, 0.074–0.130]; CFI = 0.945; TLI = 0.917) and white (SRMR = 0.052; RMSEA = 0.083 [95% CI, 0.073–0.093]; CFI = 0.968; TLI = 0.952) groups separately. Good model fit was demonstrated at the configural level (SRMR = 0.055; RMSEA = 0.085 [95% CI, 0.076–0.095]; CFI = 0.966; TLI = 0.949) indicating a three-factor structure among both white and racialized samples. Evidence supported invariance at the metric level (ΔCFI = 0.00; ΔTLI = 0.005; ΔRMSEA = −0.004), suggesting no difference in item factor loadings between groups. Lastly, model fit improved when constraints were imposed on item intercepts, and thus invariance was also established at the scalar level (ΔCFI = 0.001; ΔTLI = 0.005; ΔRMSEA = −0.004).

3.3. Convergent validity

Table 2 presents the Pearson correlations between readiness to quit substance use and confidence to stay abstinent with each factor, assessing convergent validity. Readiness to quit had small but significant positive correlations with identified regulation for each of the substances measured (rs = 0.118 – 0.262, all $ps < 0.05$), and small but highly significant negative correlations with external regulation for alcohol ($r = −0.119$, $p < 0.001$) and stimulants ($r = −0.178$, $p < 0.001$). Confidence to stay abstinent had small but significant correlations with identified regulation for all substances (rs = 0.107 – 0.162, all $ps < 0.05$) except cannabis, and small but significant correlations with the external regulation for alcohol ($r = −0.097$, $p < 0.001$) and stimulants ($r = −0.096$, $p < 0.05$). No significant correlations were found between introjected regulation and readiness or confidence.

3.4. Group differences

The Pearson correlations between substance use severity and each factor are also presented in Table 2, measuring group differences. Alco-

Table 1
Model fit statistics and measurement invariance testing for the Treatment Entry Questionnaire: 9-item across characteristics.

Parameter	$\chi 2$ (df)	CFI	TLI	SRMR	RMSEA (90% CI)	$\Delta\chi^2$ (df)	ΔCFI	ΔTLI	ΔRMSEA
Gender (*Female* vs. *Male*)									
Configural	305.88 (48)	.965	.947	.055	.086 (0.077, 0.096)	–	–	-	–
Metric	323.89 (54)	.963	.950	.064	.083 (0.075, 0.092)	18.01(6)	−0.002	.003	−0.003
Scalar	331.22 (60)	.963	.955	.065	.079 (0.071, 0.087)	7.33(6)	.000	.005	−0.004
Age *(Median Split Technique: < 41 vs. >= 41)*									
Configural	319.04 (48)	.963	.945	.055	.088 (0.079, 0.097)	–	–	–	–
Metric	343.48 (54)	.961	.948	.064	.086 (0.077, 0.095)	24.44(6)	−0.002	.003	−0.002
Scalar	354.63 (60)	.960	.952	.066	.082 (0.074, 0.091)	11.15(6)	−0.002	.004	−0.004
Ethno-racial Identity *(Racialized* vs. *White)*									
Configural	299.59 (48)	.966	.949	.055	.085 (0.076, 0.095)	–	–	-	–
Metric	306.36 (54)	.966	.954	.058	.081 (0.072, 0.090)	6.95(6)	.000	.005	−0.004
Scalar	313.21 (60)	.965	.959	.059	.077 (0.068, 0.085)	6.68(6)	.001	.005	−0.004

Note: CFI = comparative fit index, TLI = Tucker Lewis index, SRMR = square root mean residual, RMSEA = root mean standard error of approximation.

Table 2
Pearson correlation coefficients (r) between the 9-item Treatment Entry Questionnaire (TEQ-9) subscales and related constructs.

		Score	TEQ-9 Subscale Scores		
	N = 1455 %(n)	Mean(SD)	Identified r	Introjected R	External r
Readiness to quit[1]					
Alcohol	88.04 (1281)	8.78 (2.07)	**0.258*****	0.008	**−0.119*****
Cannabis	49.21 (716)	6.91 (3.30)	**0.118****	0.011	−0.035
Stimulants	43.44 (632)	9.49 (1.19)	**0.252*****	−0.017	**−0.178*****
Opioids	20.55 (299)	9.45 (1.37)	**0.262*****	0.031	−0.112
Other drugs[2]	27.28 (397)	7.03 (3.50)	**0.122***	0.020	−0.089
Confidence to stay abstinent[1]					
Alcohol	88.04 (1281)	8.52 (1.97)	**0.162*****	−0.035	**−0.097*****
Cannabis	49.21 (716)	7.38 (3.16)	0.062	−0.019	0.013
Stimulants	43.44 (632)	8.87 (1.71)	**0.144*****	−0.082	**−0.096***
Opioids	20.54 (299)	8.76 (2.04)	**0.154****	0.092	0.010
Other drugs[2]	27.28 (397)	6.90 (3.48)	**0.107***	−0.006	−0.098
Substance use severity[1]					
Alcohol	88.45 (1287)	6.62 (3.78)	**0.098*****	**0.085****	0.008
Cannabis	49.35 (718)	2.96 (3.34)	0.019	**0.076***	−0.026
Stimulants	43.50 (633)	7.59 (3.71)	**0.114****	**0.107****	−0.077
Opioids	20.62 (300)	6.40 (4.10)	0.040	−0.039	−0.024
Other drugs[2]	27.28 (397)	3.07 (3.49)	0.057	**0.146****	−0.061
			Mean (SD)	Mean(SD)	Mean(SD)
Previous SU[3] **treatment**			***t* = −3.61*****	*t* = −0.15	*t* = 1.56
Yes	58.01 (844)	–	**26.23 (3.77)**	12.68 (5.45)	5.14 (3.30)
No	41.65 (606)	–	**25.44 (4.45)**	12.64 (5.22)	5.42 (3.45)

[1] Groups are not necessarily mutually exclusive.
[2] Includes sedatives, sleep aids, hallucinogens, inhalants and other drugs.
[3] Substance Use.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

hol use severity was significantly and positively correlated with identified regulation ($r = 0.098$, $p < 0.001$), as was stimulant use severity ($r = 0.114$, $p < 0.01$). Introjected regulation had small but significant positive associations with severity for all substances (rs = 0.076 – 0.146, all $ps < 0.05$) except opioids. There were no significant associations between substance use severity and external regulation. Additionally, participants who had participated in previous substance use treatment had higher mean scores on the Identified subscale than those who had not ($p < 0.001$; Table 1), but no significant differences were detected for the Introjected and External subscales.

4. Discussion

As measurement-based care becomes increasingly common, it is essential brief tools that measure clinically meaningful domains, such as treatment motivation, are developed and psychometrically evaluated. The purpose of this study was to replicate and extend the psychometric validation of the TEQ-9 (Urbanoski and Wild, 2012), investigating its factorial validity, measurement invariance at the scalar level, convergent validity and examine group differences in a large inpatient SUD treatment population.

With respect to factorial validity, our findings are consistent with those of Urbanoski & Wild (2012) in demonstrating support for the hypothesized three-factor structure of the TEQ-9, as well as strong internal consistency among items within each of the three sub-scales. Furthermore, this is the first study to investigate and demonstrate measurement invariance across gender, age, and ethno-racial identity for the TEQ-9, thus providing evidence the scale performs equally well among these various sub-groups. This is in line previous validation work of the TRSQ, another multidimensional SDT measure of motivation, which posit SDT

constructs are universal across populations, including culture and ethnicity (Richards et al., 2020), and responds to the call for establishing measurement invariance of SDT-based measures.

To assess convergent validity, we considered readiness to quit and confidence to stay abstinent to be theoretically related constructs given their known link to motivation (Kennedy and Gregoire, 2009; Kushnir et al., 2016). As expected, we found positive, albeit small, associations between identified regulation and both readiness to quit and confidence to stay abstinent for all substances (with exception to cannabis for confidence). Meanwhile, external regulation was negatively correlated with readiness to quit and confidence to stay abstinent for alcohol and cocaine. In other words, those who exhibit greater internal motivation to enter treatment (as represented by identified regulation) also report higher levels of readiness and confidence, while those who felt more externally pressured to enter treatment (as represented by external regulation) reported lower levels readiness and confidence. Notably, the associations in both cases are small in magnitude, but expected given these are related but distinct constructs. More specifically, while the TEQ-9 measures extrinsic motivation in terms of reasons or rationale for seeking treatment, readiness and confidence are operationalized through behavior change. This is in accordance with Kennedy & Gregoire (2009) who discuss how efficacy (i.e., confidence) represents success in a change effort, rather than motivation. As such, there is a degree of separation between each of these related but distinct constructs. Additionally, the substance specific nature of our findings suggest there might be more nuanced relations at work, and thus warrant further exploration in future research. The lack of association between confidence to stay abstinent from cannabis with identified regulation is of note, given the recent legalization of cannabis in Canada.

We also found evidence that scores on the TEQ-9 subscales differed in meaningful ways among specific subgroups. More specifically, we used substance use treatment history as a proxy indicator for substance use severity, and found that having previously engaged in substance use treatment was positively correlated with identified regulation. This is consistent with work by Kizilkurt & Giynas (2020), who found that previous engagement in inpatient treatment may be associated with higher levels of motivation. Additionally, problem severity related to alcohol and stimulant use were positively correlated with identified regulation. Given that identified motivation is positively correlated with substance use problem severity (Ryan et al., 1995; Urbanoski and Wild, 2012; Wild et al., 2006), these between-group differences provide support for validity of the TEQ-9 such that the subscale scores differed across sub-groups as expected. Interestingly, in our sample, problem severity for all substances (except opioids) was the only factor significantly related to introjected regulation, whereby introjected regulation was positively correlated to substance use problem severity. This suggests that those who have higher substance use problem severity have higher levels of entering treatment due to feelings of guilt and shame. Previous evidence for the Introjected subscale has been mixed. Wild and Wild (2006) found positive correlations between introjected regulation and drug use severity, but null associations with alcohol use severity in an outpatient sample. Using a DSM-IV based measure of SUD, Urbanoski and Wild (2012) also found that introjected motivation was higher among those who met the criteria for SUD (relative to no disorder) in both inpatient and outpatient treatment settings. Together, the ambiguous pattern of associations for the Introjected subscale that have also been observed previously (Ng et al., 2012; Urbanoski and Wild, 2012), as well as the null association with only opioid use severity, both warrant further investigation of the Introjected subscale (Vallerand et al., 2008).

4.1. Strengths and limitations

Our findings should be interpreted in light of some strengths and limitations. Data were collected as part of routine clinical screening practices in a large, inpatient SUD treatment program. As such, data were collected for almost all individuals who entered the program and is a strength of the study. However, our sample was mostly male, white, heterosexual, educated and employed. Thus, the generalizability to other samples is uncertain and we recommend that further study be undertaken in more diverse populations to account for variances in culture, values and beliefs that could affect the interpretation of the TEQ-9 scores within different groups. Additionally, although our battery of assessments was quite comprehensive and included various psychosocial domains such as readiness to quit and confidence to stay abstinent, it was limited in that the battery did not include independent measures of perceived coercion or social pressures, which are important considerations when studying motivations to enter treatment (Urbanoski and Wild, 2012; Wild, 2006). Finally, as per unified validity theory, psychometric validity is not established after only one study, rather validity is a continuous process of gathering evidence across multiple studies towards the use of a tool for a particular purpose (Bandalos, 2018). As such, while our findings do provide evidence for the validity of the TEQ-9, we cannot state that the TEQ-9 is a valid tool generally across all populations and for all uses. Thus, we encourage further study of the TEQ-9, including its conceptual groundings and psychometric properties, particularly among samples where motivation to seek treatment may be particularly susceptible to external pressures (e.g., individuals mandated to seek treatment by the criminal justice system, child protection system, employers or professional associations).

4.2. Implications

Our findings have important implications for researchers and practitioners. The presence of measurement invariance across gender, age and ethno-racial identity indicates meaningful and valid comparisons can be made across these groups with confidence (Vandenberg and Lance, 2000). Additionally, our findings provide evidence for the validity of the TEQ-9 and demonstrate that the measure may be used as a robust predictor when investigating treatment retention and post-treatment outcomes. For example, an important area for future research would be establishing the predictive validity of the TEQ-9, and exploring whether identified motivation predicts more positive treatment outcomes compared to introjected or external motivations. Moreover, these findings will be important for future research as motivations to enter treatment are further explored – for example, in relation to constructs such as treatment engagement, treatment environments, and therapeutic alliance. A priority should be to explore how pre-treatment motivation extends through the continuum of care for SUDs, such as engagement in continuing care or after care (Arbour et al., 2011). Our work also furthers the theoretical advancements of SDT within the SUD context, which has been identified as a needed area of future research (Vallerand et al., 2008). Notably however, the TEQ-9 does not assess the full self-determination continuum of motivation, including the constructs of amotivation and integrated regulation. Although the TEQ-9 is particularly relevant for use among populations who are entering treatment for SUD, it may not be relevant in all cases or with all populations. As such, further attention to developing other multi-dimensional measures of motivation among the full self-determination continuum may be warranted.

For clinicians, additional validity evidence of the TEQ-9 can allow for the more confident identification of patient motivational profiles. Clinicians can use this knowledge to design treatment plans accordingly (Kizilkurt and Gıynaş, 2020), with aim to improve treatment outcomes (Dugosh et al., 2014). For example, knowing that a client has high controlled forms of motivation (external or introjected regulations) might prompt a clinician to use motivational interviewing techniques, which have been shown to increase levels of autonomous motivation (Frielink et al., 2015). Lastly, this evidence can provide support for the inclusion of the TEQ-9 within measurement-based care and routine outcomes monitoring practices, which would allow for researchers and clinicians to engage with the data as suggested above.

5. Conclusion

In conclusion, the present study provides evidence for the validity of TEQ-9 in a large clinically mixed SUD inpatient population for measuring extrinsic treatment motivation from an SDT perspective. The findings provide evidence for factorial validity such that we confirmed the three-factor structure of the TEQ-9, as well as provided evidence that the TEQ-9 is psychometrically invariant across gender, age and ethno-racial identity. Measurement invariance of the TEQ-9 supports the validity of comparisons in motivation between groups. We also provide evidence for the convergent validity of the TEQ-9, and demonstrate that the scale scores differ as expected between groups. Further investigation in diverse populations and in the context of measurement-based care or other novel clinical approaches are warranted.

6. Role of funding source

This research did not receive any direct grant from funding agencies in the public, commercial, or not-for-profit sectors. This work was supported by Homewood Research Institute, an independent charitable organization funded through a variety of sources including Homewood Health, community stakeholders, corporations, private foundations. JM's contributions were partially supported by the Peter Boris Chair for Addictions Research.

Declaration of Competing Interest

Homewood Health provides unrestricted charitable donations to Homewood Research Institute. JM is a principal in BEAM Diagnostics, Inc. No other potential conflicts of interest to report.

Author Disclosures

No other disclosures to report.

Acknowledgements

We wish to thank the clinicians and staff at Homewood Health Center for their invaluable efforts in supporting the ongoing data collection procedures that made this work possible. We are also very grateful to the patients who agreed to the use of their clinical data for research purposes.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.dadr.2021.100014.

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