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ASSESSMENT, DEVELOPMENT, AND VALIDATION

Psychometric Evaluation of the Hope-Action Inventory in Individuals with Substance Use Issues

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ABSTRACT
This study evaluated the psychometric properties of the Hope-Action Inventory (HAI) scores with a problematic substance use population ($N=783$). The hierarchical seven-factor structure of the HAI fit the data well. Further, the HAI scores had satisfactory internal consistency reliability and good convergent evidence for validity.

Unemployment is a serious concern for many individuals with substance use issues (Substance Abuse & Mental Health Services Administration, 2018). It is estimated that 70 percent of individuals entering substance use treatment are unemployed (e.g., Kim et al., 2019). Therefore, it is not surprising that gaining employment and achieving career goals have also been found to be influential factors in the overall process of successful recovery (Richard & Epp, 2016). However, individuals experiencing issues with substance use often face a variety of barriers to gaining employment, some of which are relatively unique to this population. These barriers include but are not limited to poor self-confidence, difficulty applying vocational problem-solving skills, feeling incapable of meeting work-related demands, lack of motivation to work, a high degree of physical health problems related to substance use, and limited work experience or gaps in work experience due to fluctuations in the severity of their substance use (Harris et al., 2014). Research examining the importance of assessing and strengthening career competencies among individuals with substance use issues is quite limited. Most research primarily focuses on rudimentary career competencies related to gaining employment (e.g., resume writing, job search strategies, interview skills; Magura & Marshall, 2020) and ignores broader career development issues such as navigating a career path or paths, managing workplace demands and issues, making important career decisions in context of other life roles and demands, adjusting to shifts in work-related roles, and finding hope and fulfillment in one's vocational life (Niles et al., 2014). Consequently, it seems advantageous to assess the strength of various hope-centered career competencies (Niles et al., 2014), which directly or indirectly relate to many of the employment barriers experienced by this population, and use that information in service of interventions for individuals with substance use issues.

A strong connection has been established between the presence of hopefulness and success in both substance use recovery and career development (Hirschi et al., 2015). Hope-action theory provides a novel view of career competencies that centers on hopefulness interrelated with specific higher-order career competencies rather than just applied employment skills (Niles et al., 2010). By developing a better understanding of an individual's degree of Action-Oriented Career Hope, as operationalized by their strengths or weaknesses in the specific career competencies deemed most essential by hope-action theory, professionals can better support those in substance use recovery through the process of turning hope into action when searching for employment

and making career decisions (Niles et al., 2014). In turn, hope-centered action then further improves substance use outcomes. This is important given the strong connection between success in substance use recovery and the presence of hopefulness (Gutierrez et al., 2020).

Hope-Action Theory

Hope-action theory, earlier known as the hope-centered model of career development, was designed to address relatively unique 21st century career challenges (e.g., lifelong job security no longer the norm, normality of multiple career changes in one's lifespan, working past retirement age eligibility, shifting cultural views of the importance of work in individual's lives; Niles et al., 2019). The theory provides direction for understanding one's work context and ways of managing career flow effectively. It uses "career flow" to refer to navigating the common vocational difficulties that all workers encounter (e.g., employment obtainment, work demands, job/career transitions; Niles et al., 2011). In this theory, the underlying construct, Action-Oriented Career Hope involves "envisioning a meaningful goal and believing that positive outcomes are likely to occur should specific actions be taken" (Niles et al., 2010, p. 102). Those with higher levels of Action-Oriented Career Hope are better able to explore their options, act, and overcome adversity over a lifetime of employment and career development to maximize career outcomes (Niles et al., 2014). Based on its underlying theoretical framework, hope-action theory also provides numerous specific theory-driven interventions and strategies to promote the development of each career competency to maximize "career flow" (Amundson et al., 2016).

Hope-action theory centers upon seven specific competencies that impact an individual's ability to successfully navigate career flow: Hope, Self-Reflection, Self-Clarity, Visioning, Goal Setting and Planning, Implementing, and Adapting (Niles et al., 2011; Niles et al., 2019). Together, these competencies comprise the "hope-centered career competencies," which reflect Action-Oriented Career Hope. The Hope-Action Inventory (HAI) is derived from hope-action theory and measures the strength of these seven career competencies. As such, the HAI differs notably from existing measures of career competencies, as it does not assess the typical basic skills (e.g., resume writing) required in job attainment. In order to maximize recovery and life success for individuals with substance use issues, it is important to be able to assess evidence-based, higher-order career competencies, such as those examined by the HAI, and target areas for intervention.

Previous Research on the Hope-Action Inventory

The HAI was initially designed for use in direct service with community agencies. Thus, most evidence of its utility and performance were presented in the form of agency-specific, general technical reports (e.g., Amundson et al., 2013, Amundson et al., 2016) and conference presentations at practitioner conferences (e.g., Schreiber et al., 2013; Schindler et al., 2014; Yoon, 2017). Studies that have previously evaluated the practical utility of the HAI or one of its two predecessors (i.e., Career Flow Index and Hope-Centered Career Inventory) and have included samples of university students (e.g., Amundson et al., 2013; Yoon et al., 2015), unemployed job seekers (Amundson et al., 2016; Clarke et al., 2018), individuals in transition from one career to another (Niles et al., 2010), and refugees (Yoon et al., 2019). Existing evidence for the use of the HAI in practice has been highly favorable. For example, higher HAI scores have been repeatedly found to be predictive of individuals' active engagement in their career development across various metrics (e.g., developing new job search perspectives, improved career planning, greater decision-making confidence; Amundson et al., 2013; Smith et al., 2014; Yoon et al., 2015; Yoon et al., 2019; Yoon et al., 2020).

The measure has also previously undergone psychometric evaluations (Niles et al., 2010; Yoon et al., 2015; Yoon et al., 2019; Yoon et al., 2020) and has been utilized as a research tool (Amundson et al., 2018; Clarke et al., 2018; Niles et al., 2010; Niles et al., 2014; Smith et al., 2014) in journal articles. Studies that have evaluated the psychometric properties of the HAI

scores, or those of its predecessors, have reported good model fit, adequate internal consistency reliability, and supportive evidence for construct validity in the samples used (i.e., university students, unemployed job seekers, and unemployed job seekers diagnosed with autism spectrum disorder [ASD]; Niles et al., 2010; Santilli et al., 2021; Schindler et al., 2014; Schreiber et al., 2013; Yoon, 2017; Yoon et al., 2015; Yoon et al., 2020).

The theorized seven-factor hierarchical model has shown moderate to excellent fit with unemployed job seekers and university students; factor loadings ranged from .37 to .89 on the higher-order factor (Niles et al., 2010; Santilli et al., 2021; Schreiber et al., 2013; Yoon, 2017; Yoon et al., 2015). Scores on the HAI and its earlier versions showed good to excellent reliability across various samples studied with a coefficient alpha of about .92 across studies for the total scale and mostly adequate to good reliability for subscale scores (Hope = .74 to .85, Self-Reflection = .59 to .78, Self-Clarity = .65 to .83, Visioning = .75 to .86, Goal Setting and Planning = .71 to .81, Implementing = .64 to .85, Adapting = .65 to .82; Niles et al., 2010; Santilli et al., 2021; Schreiber et al., 2013; Yoon, 2017; Yoon et al., 2015).

Evidence for convergent score validity is provided with a variety of measures, including the Adult Hope Scale (Snyder et al., 1991), Assessment of Human Agency scale (Yoon, 2011), the Optimism subscale of Life Orientation Test-Revised (Carver, 2013), the Vocational Identity scale (Holland et al., 1980), and the Self-Concept Clarity Scale (Campbell et al., 1996). In undergraduate students, previous research (Niles et al., 2010; Yoon et al., 2015) provided convergent/ discriminant evidence for validity by examining the correlations between scores on the Career Flow Index or the Hope-Centered Career Inventory (the two precursors to the HAI) and the Adult Hope Scale ($r = .74$), the Assessment of Human Agency Scale ($r = .82$), and the Vocational Identity scale ($r = .45$). Similar supportive score validity evidence was also examined with the German version of the Hope-Centered Career Inventory showing a lower, but moderate, convergent coefficient with the Adult Hope Scale ($r = .56$) that was still notably higher than discriminant coefficients with the Self-Concept Clarity Scale ($r = .32$), Life-Orientation Test-Revised total scores ($r = .27$) and its Optimism ($r = .33$) and Pessimism ($r = -.13$) subscale scores (Schindler et al., 2014). Scores on the Italian version of the Hope-Centered Career Inventory had a moderate convergent coefficient with the Adult Hope Scale ($r = .54$) and a relatively low discriminant coefficient with the Satisfaction with Life Scale ($r = .22$; Diener et al., 1985).

All previous research on the HAI and its previous versions were conducted with non-clinical populations, with one recent exception (i.e., unemployed job seekers with ASD; Yoon et al., 2020). Importantly, validity evidence related to a scale cannot be separated from the sample from which the information is obtained (Zumbo & Hubley, 2016). The HAI has not yet been evaluated psychometrically for use with individuals with problematic substance use issues, despite the strong potential value of this scale in applied and community settings with this population. Before one can have confidence in using the HAI with individuals with problematic substance use issues, it is critical to first evaluate the reliability of scores and validity of inferences made from the HAI with this group.

Purpose of the Present Study

The purpose of this study was to examine the psychometric properties of scores on the HAI, a measure of Action-Oriented Career Hope, for use with individuals who have past or present history of significant substance use issues. Specifically, this study aimed to (a) confirm the previously theorized and reported seven-factor hierarchical structure of the HAI scores, (b) report the internal consistency reliabilities of HAI total and subscale scores, and (c) using Hubley's (2021) convergent/discriminant continuum concept, examine the pattern of convergent validity coefficients for the HAI total score focusing on measures of hope, hopelessness, and pessimism, with individuals who have a past or present history of substance use issues.

Based on the theoretical structure of the HAI and previous research, we hypothesized that (a) a seven-factor hierarchical model would show adequate fit to the data from a sample of individuals
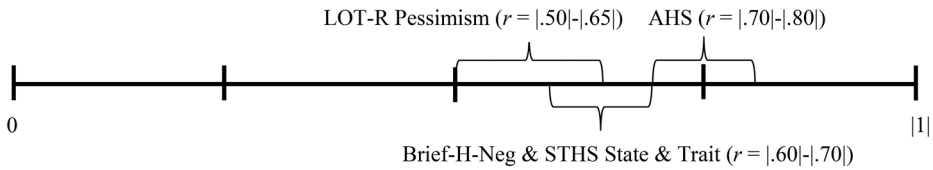
Figure 1. Expected range of validity coefficients along the validity continuum.
Note. All predicted values have been placed along a continuum of absolute values. We expected the LOT-R Pessimism subscale, Brief-H-Neg, and STHS to be negatively correlated with the HAI as these scales focus on the constructs of pessimism and hopelessness, respectively. LOT-R = Life Orientation Test-Revised. AHS = Adult Hope Scale. Brief-H-Neg = Brief-Hope-Negative scale. STHS = State-Trait Hopelessness Scale.

with substance use issues (hypothesis 1), (b) the HAI total and subscale scores would show at least minimally adequate internal consistency reliability (ordinal omega greater than .70) (hypothesis 2), and (c) the pattern of convergent coefficients would be consistent with the expected continuum and thus be supportive of validity for the HAI total score (hypothesis 3; see Figure 1). Specifically, we expected a moderately high positive correlation with the Adult Hope Scale (AHS) total score because the AHS and HAI both measure a positive hopefulness construct and contain no reverse-keyed items (Tay & Jebb, 2018). We expected somewhat lower moderate to moderately high negative correlations with the State-Trait Hopelessness Scale (STHS) scale (state and trait) scores as hopelessness is not necessarily just the reverse of hope (Huen et al., 2015), these measures cover fewer components of hope than the HAI, assess self-efficacy and barriers that are not measured in the HAI, and have both positively (e.g., Today, I believe that things will improve) and negatively (e.g., Today, I see my future as gloomy) keyed items that can introduce method variance or construct confusion (Tay & Jebb, 2018; Zeng et al., 2020). Similarly, we expected lower moderate to moderately high negative correlations with the Brief-Hope-Negative scale scores as this two-item measure focuses on negative thinking, which differs from the HAI (Rönkkö & Cho, 2022). Finally, we expected a noticeably lower moderate and negative correlation with the Pessimism subscale scores of the Life Orientation Test-Revised as pessimism is a related, but different construct than hope or even hopelessness and, unlike the HAI, this subscale contains both positive and reverse-keyed items that can introduce method variance.

Method

This study gained ethical approval from the University of British Columbia (#): H18-03324.

Participant Recruitment and Selection

Participants were recruited through (a) Amazon's Mechanical Turk (MTurk) and (b) seven local community substance use treatment centers. Centers ranged from urban residential housing serving approximately 15 individuals to large rural facilities housing over 100 individuals. MTurk participants had to meet the following inclusion criteria: be located in Canada or the United States, have a HIT approval rate no less than 90%, and receive a score of 2 or greater on the CAGE-AID or endorse an additional screening question: "Have you ever attended treatment or detox for substance use?" MTurk requires workers to be 18 years or older. MTurk workers were reimbursed $0.05 USD for completing the screening questions. Those who met the inclusion criteria were sent an invitation to participate in the study through MTurk. Community recruitment strategies included recruitment flyers to participate posted at the facilities and on community bulletin boards at locations known to host support group meetings, paper copies of the study materials available in the facilities for self-administration, and pre-arranged time set aside to provide in-person survey administration to interested individuals at local substance use organizations. The community and MTurk samples included general problematic substance users that met the same inclusion criteria. Those included from MTurk screened positive for problematic substance use and would be thus recommended for a formal assessment and likely treatment.

Sampling from two sources allowed for greater sampling variability and better breadth in accessing the population of interest (i.e., individuals with a history of problematic substance use). In doing so, we believe that we have better represented the range, severity, and various manifestations of problematic substance use than sampling from either setting alone. In addition, sampling online allowed for greater geographical diversity with the sample including both individuals across and within both Canada and the United States, which is important for developing generalizable results not restricted to a particular locale.

A total of 2,788 participants were initially screened through MTurk. Of those who completed the screening survey, 44.9% ($n = 1,253$) met inclusion for the main survey. These participants completed the questionnaires in an online survey via Qualtrics. For the survey, data were initially collected from 1,131 participants; however, some MTurk workers completed the survey more than once ($n = 66$, 5.84%) and were subsequently removed. After removing duplicate responses, those participants who did not receive a score of 2 or greater on the second administration of the CAGE-AID or endorse the additional screening question included in the full survey ($n = 248$, 21.93%), participants who did not correctly answer the attention check questions ($n = 115$, 10.17%), and participants who skipped the HAI, the third measure in the survey ($n = 42$, 3.71%), a total of 716 participants obtained from MTurk were included in the final analyses (participants may have been removed from the final data set for more than one of the listed reasons resulting in overlap between reasons for removal). These individuals received $0.75 USD for their participation. A total of 67 participants were obtained from substance use treatment organizations; these participants completed the questionnaires in-person via paper. Community participants were entered into a draw for one of four $25.00 gift cards to local restaurants. Different honorariums were offered to the MTurk and community participants because of differing reimbursement norms and expectations based on the MTurk platform and prior local research, respectively.

In total, 783 participants were included in the study. The sample size exceeded the recommended number of 5 to 10 participants per parameter with 71 parameters in the model (DeVellis, 2017). The majority of participants were recruited through MTurk (91.44%). About 86.21% ($n = 675$) were from the United States and 13.79% ($n = 108$) were from Canada. The average age of participants was 35.86 years old ($SD = 10.60$, range = 19–72). There was a reasonably comparable proportion of females ($n = 400$, 51.09%) and males ($n = 382$, 48.79%) in this study with one participant identifying as another gender. Participants' average score on the CAGE-AID was 3.02 ($SD = 0.85$, range = 0–4). One community participant and seven MTurk participants did not receive a score of 2 or greater on the CAGE-AID; however, they did report currently attending treatment or detox and therefore were included in the study. Additional demographics are available in Table 1, including a breakdown of those recruited from MTurk and those from community substance use treatment organizations.

Measures

The survey materials included a demographic questionnaire, the CAGE-AID, HAI, Adult Hope Scale, The State-Trait Hopelessness Scale, Brief-Hope-Negative Scale, and the Pessimism subscale of the Life Orientation Test-Revised. There were also two attention check questions placed within the survey to ensure participants were reading each question (i.e., "If you are reading this please select mostly false" and "If you are reading this please select I agree a little").

CAGE-AID

The CAGE-Adapted to Include Drugs (CAGE-AID; Brown & Rounds, 1995) is a 4-item questionnaire that simultaneously screens for both alcohol and drug use problems. Item responses are scored 0 for "No" or 1 for "Yes." A score of 2 or greater denotes clinically significant substance use. The CAGE-AID scores had acceptable internal consistency (α = .77–.84; Couwenbergh

Table 1. Community and MTurk Sample Demographics.

Variables		Community (n=67) n (%), M (SD)	MTurk (n=716) n (%), M (SD)	Combined (N=783) n (%), M (SD)
Gender	Male	38 (56.72%)	344 (48.04%)	382 (48.79%)
	Female	29 (43.28%)	371 (51.82%)	400 (51.09%)
	Other		1 (0.14%)	1 (0.12%)
Age (years)		35.84 (13.90)	35.86 (10.27)	35.86 (10.60)
Relationship	Single/never legally married	50 (74.63%)	358 (50.00%)	408 (52.11%)
	Legally married	1 (1.49%)	240 (33.52%)	241 (30.78%)
	Separated, but still legally married	3 (4.48%)	9 (1.26%)	12 (1.53%)
	Common-law	6 (8.96%)	25 (3.49%)	31 (3.96%)
	Divorced	4 (5.97%)	77 (10.75%)	81 (10.34%)
	Widowed	1 (1.49%)	7 (0.98%)	8 (1.02%)
Education	Some high school or less	16 (23.88%)	4 (0.56%)	20 (2.55%)
	Graduated high school	22 (32.84%)	151 (21.09%)	173 (22.09%)
	Attending college	6 (8.96%)	110 (15.36%)	116 (14.81%)
	Associate degree or diploma/ certificate, completed	9 (13.43%)	77 (10.75%)	86 (10.98%)
	Bachelor's degree completed/ master's program, attending	6 (8.96%)	252 (35.20%)	258 (32.95%)
	Master's degree completed/doctoral program, attending	0 (0.00%)	98 (13.69%)	98 (12.52%)
	Doctoral degree or equivalent, completed	0 (0.00%)	18 (2.51%)	18 (2.30%)
	Completed an apprenticeable trade	4 (5.97%)	6 (0.84%)	10 (1.28%)
Work Experience	Years of any work experience	17.42 (13.70)	15.61 (10.24)	15.76 (10.58)
	Years full-time work experience	11.35 (10.00)	12.56 (9.51)	12.46 (9.55)
Employment Status	Unemployed, not looking for work	21 (31.34%)	58 (8.10%)	79 (10.09%)
	Unemployed, looking for work	30 (44.78%)	50 (6.98%)	80 (10.22%)
	Part-Time	4 (5.97%)	119 (16.62%)	123 (15.71%)
	Full-Time	12 (17.91%)	489 (68.30%)	501 (63.98%)
Ethnicity	European	46 (68.66%)	564 (78.77%)	610 (77.91%)
	Aboriginal	5 (7.46%)	4 (0.56%)	9 (1.15%)
	African		43 (6.00%)	43 (5.49%)
	Arab/West Asian	2 (2.99%)	3 (0.42%)	5 (0.64%)
	Chinese	2 (2.99%)	7 (0.98%)	9 (1.15%)
	Filipino	1 (1.49%)	12 (1.68%)	13 (1.66%)
	Japanese		4 (0.56%)	4 (0.51%)
	Korean		6 (0.84%)	6 (0.77%)
	Latin American	1 (1.49%)	35 (4.89%)	36 (4.60%)
	South Asian		8 (1.11%)	8 (1.02%)
	South East Asian	1 (1.49%)	5 (0.70%)	6 (0.76%)
	Other	9 (13.43%)	25 (3.49%)	34 (4.34%)
Number of substances used		10.25 (4.29)	6.55 (4.29)	6.87 (4.41)
Attended Treatment or Detox		63 (94.03%)	174 (24.3%)	237 (30.27%)
CAGE-AID Total Score		3.76 (0.50)	2.95 (0.84)	3.02 (0.85)
	Endorsed 4 CAGE-AID items	52 (77.61%)	221 (30.87%)	273 (34.87%)
	Endorsed 3 CAGE-AID items	12 (17.91%)	252 (35.2%)	264 (33.72%)
	Endorsed 2 CAGE-AID items	2 (2.99%)	236 (32.96%)	238 (30.4%)

Note. Of the participants recruited in the community, two did not report their relationship status, and four did not report their highest level of education. The CAGE-AID number of items endorsed does not equal 100% as participants were included in the study if they endorsed two or more CAGE-AID items or had attended treatment of detox. There was one community participant and seven MTurk participants who did not endorse two or more items on the CAGE-AID but did report attending treatment or detox.

et al., 2009) and moderate test-retest reliability (κ = .62; Dyson et al., 1998). Across various studies, the CAGE-AID scores had good sensitivity (.70) for identifying individuals who engage in diagnosable substance use and great specificity (.85) for identifying non-cases. To further increase the sensitivity of our screening (i.e., not miss those incorrectly classified as non-cases by the CAGE-AID), we also included the following additional screening question: "Have you ever attended treatment or detox for substance use?"

Hope-Action Inventory

The HAI (Yoon, 2017, Yoon et al., 2019) is a 28-item scale based on hope-action theory that was developed to assess adults' degree of Action-Oriented Career Hope. The scale utilizes a 4-point Likert-type response scale (1 = *definitely false* to 4 = *definitely true*). It is composed of seven subscales, with four items per subscale, each corresponding to one of the seven specific career competencies: Hope, Self-Reflection, Self-Clarity, Visioning, Goal Setting and Planning, Implementing, or Adapting. Consistent with the underlying theory, the subscales of the HAI are expected to be correlated and load onto a higher-order factor (Action-Oriented Career Hope; e.g., Yoon, 2017; Yoon et al., 2019). A high score on a subscale indicates that the individual has a significant degree of that particular career competency. A high total score on the collection of career competencies indicates the individual has strong career competencies and Action-Oriented Career Hope for effective career flow.

Adult Hope Scale

The Adult Hope Scale (AHS; Snyder et al., 1991) is a 12-item self-report scale that measures two hope constructs: agency thinking (i.e., goal-directed determination) and pathways thinking (i.e., the ability to make plans to achieve said goals). The scale is composed of four agency items, four pathways items, and four filler items and utilizes an 8-point Likert-type response scale (1 = *definitely false* to 8 = *definitely true*). Cronbach's alphas in past research ranged from .74 to .84, .71 to .76, and .63 to .80 for the total scale, agency subscale, and pathways subscale scores, respectively. The AHS displayed good construct validity using measures of optimism, self-esteem, hopelessness and depression, and has repeatedly shown good test-retest score reliability across various time intervals (Snyder et al., 1991).

State-Trait Hopelessness Scale

The State-Trait Hopelessness Scale (STHS; Dunn et al., 2014) is a 23-item self-report scale developed based upon a view of hopelessness being either circumscribed (i.e., a state) or generalized (i.e., a trait). The scale utilizes a 4-point Likert-type response scale (1 = *strongly disagree* to 4 = *strongly agree*). There are two scales: State Hopelessness Scale (SHS) with 10 items and Trait Hopelessness Scale (THS) with 13 items. Scale scores are computed by summing and dividing by the total number of items in that scale. Scale scores range from 1 to 4 with a higher score indicating a higher level of hopelessness. Exploratory factor analysis confirmed the two-factor structure of the scales (Dunn et al., 2014). High internal consistency reliability was found for both the SHS (α = .87) and the THS (α = .91) scores, which correlated moderately with the Beck Hopelessness Scale (Beck et al., 1974; r = .58 and .60, respectively; Dunn et al., 2014), providing evidence of construct validity.

Brief-Hope-Negative Scale

The Brief-Hope-Negative Scale (Brief-H-Neg; Everson et al., 1996) is a 2-item self-report measure of hopelessness with regard to the future and the possibility of reaching future goals. The scale utilizes a 5-point Likert-type response scale (0 = *strongly agree* to 4 = *strongly disagree*). Scores are interpreted as low (i.e., 0 to 2), moderate (i.e., 3 to 5), or high (i.e., 6 to 8) hopelessness. Scores on the two items were found to be moderately correlated in a sample of men (r = .53; Everson et al., 1996). Despite its brevity, Fraser et al. (2014) found the Brief-H-Neg scores had good internal consistency (α = .80), showed adequate two-week interval test-retest reliability in past research (ICC = .67;), and correlated strongly (r = .93) with the Beck Hopelessness Scale (Beck et al., 1974).

Pessimism Subscale of the Life Orientation Test-Revised

The Life Orientation Test-Revised (LOT-R; Carver, 2013) is a 10-item self-report scale that is used to measure dispositional optimism. The scale is composed of three optimistically and three pessimistically phrased items with an additional four filler items. The scale utilizes a 5-point Likert-type response scale (4 = *I agree a lot* to 0 = *I disagree a lot*). Only the Pessimism subscale score was used in this study. Scores on the Pessimism subscale displayed good internal consistency (α = .77) in past research (Schou-Bredal et al., 2017). The LOT-R has been used with a sample of opiate-dependent patients (Hirsch et al., 2010) and scores were found to have good test-retest reliability over a minimum two weeks interval (ICC = .72), adequate internal consistency at baseline (α = .69) and two-week follow-up (α = .72), and strong convergent evidence as indicated by negative correlations with hopelessness ($r = -.65$) and depression ($r = -.60$).

Data Cleaning, Imputation, and Analysis

A preliminary review of the items was completed. Little's missing completely at random (MCAR) test suggested that missing data on the HAI were missing completely at random, $X^2(134) = 109.18$, $p = .94$. Any items with missing values were replaced using person mean substitution due to the extremely low percentage of missing data. It provides a parsimonious yet still highly effective solution to missing data in this circumstance and does not require assumptions about the data, which would be required for more complex imputation strategies. For example, most of the popular complex imputation strategies assume that the data are normally distributed. In our study, the data were non-normally distributed violating this assumption. Person mean substitution differs from the widely criticized item-mean substitution method because the mean scale score of the observed items is imputed at the person level rather than the item mean of the observed cases being imputed at the item level (Huisman, 2000). When less than 20% of item responses are missing, past research has shown that person mean substitution provides a very good representation of the original data, is appropriate for Likert-type data, provides reasonably accurate estimate of the variances, and provides good estimates of reliability (Mazza et al., 2015). Data were missing at the item level from the HAI scale items for only six community participants (0.8% of all participants, resulting in a missing data rate of 0.03% for the HAI). There was no data missing at the item level of the HAI scale items within the MTurk sample.

Inter-item and item-total correlations for the HAI were computed using polychoric correlations as it provides a better estimate of the linear relationship between ordinal variables (Zumbo et al., 2007). Means, standard deviations, and inter-subscale correlations for the seven-factor scores of the HAI and the HAI total score were computed. Ordinal omega (with Cronbach's alpha reported only for comparison purposes with other research) was utilized to estimate internal consistency reliability because ordinal omega is a more accurate estimate when a model is multidimensional, the data are ordinal, and polychoric correlations are utilized (Kalkbrenner, 2023).

Given the large sample size, the underlying bivariate normal distribution was examined through visualizing the data (histograms and QQ-plots). The data were found to be non-normally distributed, as was previously found in Niles et al. (2010), so the robust diagonally weighted least squares (robust DWLS) method for hierarchical confirmatory factor analysis (HCFA) was used to account for the violation of normality and the ordinal nature of the data (Li, 2016).

The statistical software R (version 3.6.2) was used to conduct HCFA with an oblique rotation to determine the extent to which the theoretically proposed seven-factor hierarchical structure model of the HAI fit the data from the present sample. Five fit indices were utilized: chi-square, root-mean-square error of approximation (*RMSEA*), standardized root mean square residual (*SRMR*), comparative fit index (*CFI*), and Tucker-Lewis index (*TLI*). For the *RMSEA*, it is suggested that <.01, <.05, and <.08 indicate excellent, good, and moderate fit, respectively (MacCallum et al., 1996). The suggested *SRMR* cutoff value is <.08 (Hu & Bentler, 1999). When assessing *CFI* or *TLI* fit indices, values greater than .95 indicate good fit. Evidence for convergent and discriminant validity was assessed using Pearson correlation coefficients between different scales.

Results

Hierarchical Confirmatory Factor Analysis

The hypothesized hierarchical structure (one higher-order factor and seven lower-order factors) fit the data well: $X^2(343) = 1732.38$, $p < 0.001$, $TLI = .98$, $CFI = .98$, $RMSEA = .07$, 95% CI [.07, .08], $SRMR = .07$). As shown in Figure 2, the standardized item factor loadings on the seven subscales ranged from .40 to .93 and the standardized factor loadings from the seven subscales onto the higher-order factor ranged from .58–.94. All but one of the standardized factor loadings onto the higher-order factor exceeded .70, which is considered the cutoff for satisfactory fit (Kline, 2016).

Correlations, Descriptive Statistics, and Internal Consistency

Means, standard deviations, ordinal omegas, subscale-total correlations and inter-subscale correlations are presented in Table 2. All seven HAI subscale scores showed significant, positive, moderate correlations with each other and strong, significant, positive correlations with the HAI total score. The ordinal omega (ω_o) was excellent (0.95; 95% CI [0.95, 0.96]) for the HAI total score and the individual subscale internal consistency reliability coefficients ranged from good to excellent. The inter-item correlations ranged from -0.02 to 0.82 ($M = 0.41$). Item-total correlations >0.20 are considered satisfactory (Kline, 2015). All item-total correlations were strong (range $= 0.64–0.86$, $M = 0.79$).

Pattern of Convergent Evidence for Validity

The HAI total scores showed a moderately strong positive correlation with the AHS total score ($r = .76$, $p < .001$) and moderate negative correlations of decreasing magnitude with the State Hopelessness Scale ($r = -.64$, $p < .001$), Trait Hopelessness Scale ($r = -.60$, $p < .001$), Brief-H-Neg scale ($r = -.51$, $p < .001$), and LOT-R Pessimism subscale ($r = -.44$, $p < .001$). We calculated the significance of the difference between this validity coefficient ($r = -.44$) and the next lowest convergent validity coefficient ($r = -.51$) and found they were significantly different at $p < .001$, indicating that this is very likely to be a real difference rather than an artifact of sampling variability.

Discussion

Individuals with past or present substance use issues tend to experience an inordinate amount of employment and career development-related difficulties (Coduti & Schoen, 2014). Given the importance of improving various employment and career development outcomes for individuals with substance use issues (Richard & Epp, 2016) as well as the potential role of hope in both substance use recovery and career development outcomes (Hirschi et al., 2015), we sought to examine the psychometric properties of the scores of a hope-based career competence measure, the Hope-Action Inventory (HAI), with a sample of individuals with current or a past history of significant substance use issues. The validity of inferences made from scores on a measure is not independent of the sample and context (Zumbo & Hubley, 2016). Thus, it is important to evaluate and provide evidence supporting the reliability of scores and validity of inferences made from the HAI with individuals with problematic substance use issues before using it in applied and community settings with this population.

   All three of our hypotheses were supported. We confirmed the theoretically-proposed hierarchical factor structure fit the sample data well (hypothesis one). The ordinal omega values found in the present study all exceeded .80, indicating that scores from the HAI total scale and subscale scores were reliable in terms of internal consistency (hypothesis two). Finally, supportive convergent evidence for validity was provided given that obtained validity coefficients with measures of hope, hopelessness, and pessimism were generally consistent with expectations (hypothesis three). We will discuss each of these findings in turn.
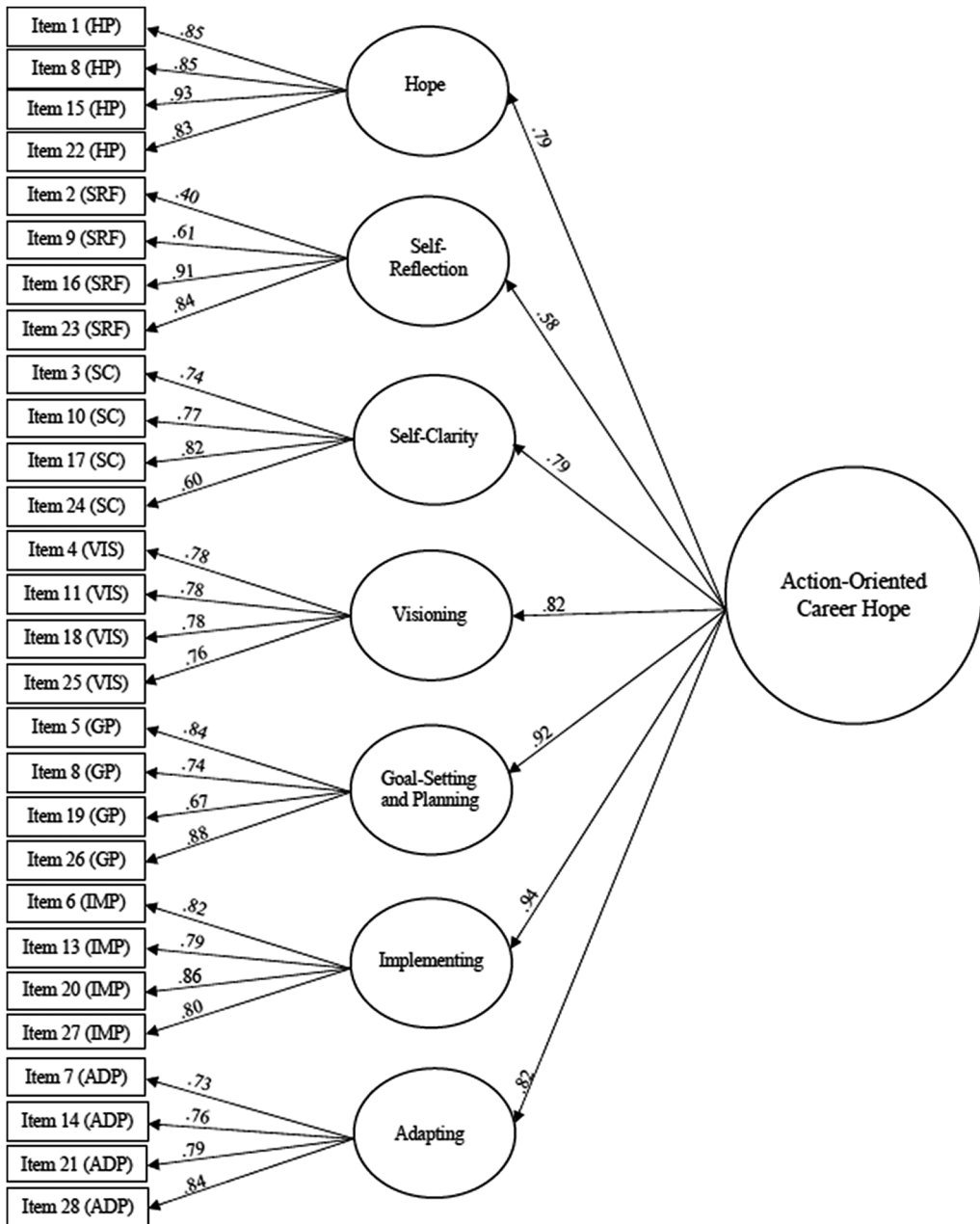
Figure 2. Hierarchical confirmatory factor analysis for HAI.

Factor Structure

The factor loadings onto the higher-order factor ranged from .58–.94. These factor loadings are comparable and actually slightly higher than what been found in previous studies with university students and unemployed job seekers (Niles et al., 2010; Schreiber et al., 2013; Yoon, 2017). Our results replicate the previous findings that the Self-Reflection subscale was the weakest loading subscale and the Implementing subscale was the strongest loading subscale (Schreiber et al., 2013; Yoon, 2017). Therefore, it not only seems that the theoretically proposed factor structure of the HAI fits well in this sample of individuals with substance use issues, but that

Table 2. Means, Standard Deviations, Ordinal Omegas, and Inter-Correlations among HAI Subscales (N = 783).

Measure	1	2	3	4	5	6	7	8	Combined		MTurk		Community	
									M	SD	M	SD	M	SD
1. HAI Total	.95								3.13	0.48	3.12	0.47	3.19	0.45
2. Hope	.78	.92							2.97	0.76	2.94	0.76	3.18	0.75
3. Self-Reflection	.56	.22	.81						3.37	0.52	3.35	0.51	3.59	0.40
4. Self-Clarity	.74	.53	.37	.81					3.20	0.59	3.20	0.59	3.19	0.49
5. Visioning	.78	.56	.47	.47	.85				3.12	0.64	3.12	0.64	3.05	0.70
6. Goal Setting and Planning	.82	.56	.34	.51	.60	.85			2.94	0.69	2.94	0.68	2.18	0.64
7. Implementing	.84	.62	.29	.58	.54	.77	.89		3.02	0.64	3.02	0.64	3.00	0.61
8. Adapting	.76	.54	.43	.51	.51	.51	.61	.86	3.26	0.54	3.24	0.53	3.50	0.56

Note. All inter-correlations were statistically significant at $p < .001$. HAI = Hope-Action Inventory. Ordinal omega (ω_o) values appear along the diagonal. All HAI scores range from 1–4 with higher scores indicating a significant degree of that particular Hope-Centered Career Competency.

[a] Cronbach's alpha (α) values: HAI Total = .88, Hope = .90, Self-Reflection = .90, Self-Clarity = .92, Visioning = .91, Goal Setting and Planning = .90, Implementing = .90, Adapting = .90.

the factors load similarly on the higher-order construct (Action-Oriented Career Hope) to how they loaded with all other populations studied thus far.

The range of the item loadings (.40–.93) onto the seven lower-order factors in the present study was larger than was found in previous studies (i.e., .40–.84, Schreiber et al., 2013; and .54–.85, Yoon, 2017). Furthermore, the vast majority of the item loadings were strong, with 85.7% ($n = 24$) of the lower-order factor loadings being above the recommended .70 and only four below that value (Kline, 2016). Interestingly, this pattern of factor loadings is stronger than found in past research. Schreiber et al. (2013) study with the German version of the HCCI reported 15 item loadings below .70 and Yoon (2017) reported 10 item loadings below .70. This implies that the individual career competencies actually correlate more strongly with the higher order construct measured by the HAI (Action-Oriented Career Hope) in individuals with substance use issues than they do for populations for which the measure was originally designed and by which norms were developed. In the present study, there were also a few items that performed less well, including item 2 (item loading = .40) and item 9 (item loading = .60) on the Self-Reflection subscale, item 24 (item loading = .58) on the Self-Clarity subscale, and item 19 (item loading = .67) on the Goal Setting and Planning subscale. These findings replicate past research in different populations that found items 2 and 24 have weaker fit in terms of factor loadings (Schreiber et al., 2013; Yoon, 2017). Therefore, items 2 and 24 should be more carefully evaluated and perhaps altered, replaced, or removed in any future revisions of the measure.

These findings suggest that, while the higher-order construct of Action-Oriented Career Hope seems to function comparably in individuals with substance use issues, the individual career competencies, while still highly relevant, may function somewhat differently. However, this could be due to sampling error associated with the particular participants selected for this study. Therefore, these findings require replication in future studies with individuals with past or present substance use issues. If replicated, these particular observations could be used by the theory developers or subsequent addiction researchers to advance the theory by addressing how specific hope-action career competencies (and items) may be differentially relevant or function differently across various groups through measurement invariance and on what basis.

Internal Consistency

The ordinal omega (ω_o = .95) and Cronbach's alpha (α = .88) values found in the present study suggested the HAI total scale and subscale scores showed strong reliability. Additionally, the ordinal omega and Cronbach's alpha values showed similar trends and values as those found in previous studies that consistently reported a Cronbach's alpha greater than .90 for the total scale (Niles et al., 2010; Schreiber et al., 2013; Yoon, 2017; Yoon et al., 2015). This suggests that scores from the measure not only function reliably in individuals with substance use issues, but its precision of measurement is comparable to that with the standardization sample (university students), and the subsequent samples of healthcare workers, unemployed job seekers, and unemployed job seekers with ASD.

Pattern of Convergent Evidence for Validity

As found in previous studies with different populations (Niles et al., 2010; Schindler et al., 2014), the total score of the HAI was most strongly and positively correlated with the total score of the AHS (a measure of hope). Moreover, as expected, the HAI total score was moderately and negatively correlated with the STHS (state and trait) scores and Brief-H-Neg total score (measures of hopelessness). Although the Brief-H-Neg scores correlated lower than expected, because they are all in the moderate range, this offers validity support for the inferences made from the HAI when used with individuals with substance use issues.

As we expected, the LOT-R Pessimism subscale scores had a moderate negative correlation with the HAI total score ($r = -.44$) that was notably lower than the correlations found with scores on the hope and hopelessness measures. The obtained validity coefficient was less strong than we expected (i.e., $r = |.50|$ to $|.65|$) for a convergent but distinct construct, but much stronger than what was previously reported in a German sample using an earlier version of the HAI ($r = -.13$; Schindler et al., 2014). Still, we argue it provides adequate convergent evidence for a distinct but related construct, particularly given the obtained validity coefficients for the other more related convergent measures.

Strengths of the Study

A key strength of the current study is the relatively large sample size ($N = 783$), larger than all but one of all the previous studies of the HAI or its predecessors. A sample of this size is important when conducting confirmatory factor analysis using a complex multilevel model for achieving adequate statistical power, obtaining solution propriety, and minimizing bias in the parameter estimates and standard errors (Knekta et al., 2018). A second strength is that the CFA and reliability analyses used in this study accounted for the ordinal nature of the data, which was not done in previous studies with the HAI or its predecessors (Niles et al., 2010; Schindler et al., 2014; Schreiber et al., 2013; Yoon, 2017; Yoon et al., 2015). For example, many researchers with the HAI and other Likert-type scales based psychological measures continue to use Cronbach's alpha, which is not the most appropriate index for estimating internal consistency with ordinal data (Kalkbrenner, 2023). A third strength is that evidence of construct validity was assessed with the construct of hopelessness and two measures of hope (i.e., STHS, Brief-H-Neg) that had not been used in previous construct validation studies with the HAI or its predecessors, in addition to measures that have been used in previous studies (i.e., AHS, Pessimism subscale of LOT-R).

Limitations and Future Research

There are also a few notable limitations to consider. First, neither the MTurk participants nor community participants were required to have an official diagnosis of Substance Use Disorder (SUD). It would be beneficial in future research to examine the psychometric properties of the HAI scores with a sample of individuals who have verifiable diagnoses of SUD to further establish the clinical utility psychometric performance of the HAI for this group.

Second, the community and MTurk samples were combined in the present study. Small psychometric differences are expected to be present between the sub-samples on the HAI. However, the benefit of multi-method recruitment from two very different sites also results in more diverse and hopefully more representative sampling, with the biases of one site partially overcome by inclusion of the second site. Future research should be conducted on various subgroups of individuals who engage in substance misuse (e.g., across treatment settings, treated versus untreated) to further assess the psychometric performance, including measurement invariance, of the HAI across subgroups within this broader population.

Third, the sample collected for this study is not a random sample of individuals with substance use issues. The results of the study may disproportionately reflect individuals who choose to participate in this type of research for specific reasons such as finding the topic personally meaningful or those who needed the honorarium. Where this might be most notable is the comparable number of female (51.1%) and male participants in the present study, which does not reflect the gender distribution of substance use/misuse in Canada or the United States, where men outnumber women (Statistics Canada, 2013; SAMHSA, 2012). We speculate that this possibly occurred in the present study because MTurk workers, who comprised the majority of the sample, are more likely to be female (Buhrmester et al., 2011). In addition, the present sample, on average, was older ($M = 35.86$, $SD = 10.60$) than the average problematic substance user in North America (i.e., 15 to 25 years old; Statistics Canada, 2013; SAMHSA, 2012).

Furthermore, the majority of the sample identified as being of European background (77.9%), potentially limiting the generalizability of the results to other racial or ethnic groups. These points should be considered when assessing the generalizability of our results to the broader population of Canadian and American individuals who experience substance use issues and provide fruitful avenues for future research.

Implications for Counseling Practice

Strengthening one's desire to reenter the workforce, securing a vocational plan and implementing this plan are examples of career development goals that can significantly contribute to positive outcomes for an individual with a past or present history of substance use issues (Magura & Marshall, 2020). Based on the results of this study, counselors have some psychometric support for using the HAI to assess career-related hope and competencies in individuals with substance use issues and use this information to guide psychoeducation and interventions and measure the effectiveness of counseling and client outcomes.

Utilizing the HAI as an intake measure can provide useful and valid information for mental health professionals on where a new client is at with regard to career-related hope and preexisting levels of specific career competencies. The HAI can thus help mental health professionals determine what types of services may be useful and/or appropriate for a new client. They can then utilize hope-action theory interventions developed specifically for each competency (Amundson et al., 2016; Amundson et al., 2018) to target areas in need of substantial development and reinforce areas of strength. For example, if a client had a relatively lower score on the Self-Clarity subscale, they would very likely highly benefit from reflecting on their interests, values, and skills accompanied by keeping a journal of times when they experience satisfaction in their life and work (Niles et al., 2010). In another example, if a client also had a relatively lower score on the Visioning subscale, they would especially benefit from exploring possible employment opportunities to gain a better sense of their options, reflect on workplace preferences, and participate in informational interviewing to develop a vision of what different employment opportunities would encompass (for examples, see Niles et al., 2010). The HAI is also a useful tool for assessing the effectiveness of career hope interventions through pre/post-intervention assessment methods and the results of this study support its use with individuals with a history of problematic substance use. Utilizing validated measures to determine the effectiveness of treatment approaches and interventions can provide objective information for mental health professionals on client strengths and weaknesses as well as the effectiveness of counseling, rather than relying solely on unstructured clinical judgment.

Furthermore, the HAI produces a client-friendly narrative report, which could be a useful tool for psychoeducation, essential insights and offers evidence-based self-directed career development exercises within a hope-action theory framework targeted specifically to the individual's hope-action career competencies profile. Along this line, this research study supports the use of the HAI as a career-related outcome measure in guidance, counseling, and vocational rehabilitation practice when used with individuals with substance use issues. The HAI has a wide range of utility for mental health professionals and this study provides support for its use with problematic substance users.

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Notes on Contributors

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