

# Virtual reality job interview training and 6-month employment outcomes for individuals with substance use disorders seeking employment

Matthew J. Smith<sup>a,b,\*</sup>, Morris D. Bell<sup>c</sup>, Michael A. Wright<sup>a</sup>, Laura B. Humm<sup>d</sup>, Dale Olsen<sup>d</sup> and Michael F. Fleming<sup>a,e</sup>

<sup>a</sup>*Northwestern University Feinberg School of Medicine, Department of Psychiatry and Behavioral Sciences, Chicago, IL, USA*

<sup>b</sup>*Northwestern University Feinberg School of Medicine, Warren Wright Adolescent Center, Chicago, IL, USA*

<sup>c</sup>*Yale School of Medicine, Department of Psychiatry, Department of Veteran Affairs, West Haven, CT, USA*

<sup>d</sup>*SIMmersion LLC., Columbia, MD, USA*

<sup>e</sup>*Northwestern University Feinberg School of Medicine, Department of Family Medicine, Chicago, IL, USA*

Revised/Accepted August 2015

## Abstract.

**BACKGROUND:** Individuals with substance use disorders (SUDs) have low employment rates and job interviewing is a critical barrier to employment for them. Virtual reality training is efficacious at improving interview skills and vocational outcomes for several clinical populations.

**OBJECTIVE:** This study evaluated the acceptability and efficacy of virtual reality job interview training (VR-JIT) at improving interview skills and vocational outcomes among individuals with SUDs via a small randomized controlled trial ( $n = 14$  VR-JIT trainees,  $n = 11$  treatment-as-usual (TAU) controls).

**METHODS:** Trainees completed up to 10 hours of virtual interviews, while controls received services as usual. Primary outcome measures included two pre-test and two post-test video-recorded role-play interviews and vocational outcomes at six-month follow-up.

**RESULTS:** Trainees reported that the intervention was easy-to-use and helped prepared them for future interviews. While co-varying for pre-test role-play performance, trainees had higher post-test role-play scores than controls at the trend level ( $p < 0.10$ ). At 6-month follow-up, trainees were more likely than controls to attain a competitive position (78.6% vs. 44.4%,  $p < 0.05$ , respectively). Trainees had greater odds of attaining a competitive position by 6 month follow-up compared to controls (OR: 5.67,  $p < 0.05$ ). VR-JIT participation was associated with fewer weeks searching for a position ( $r = -0.36$ ,  $p < 0.05$ ).

**CONCLUSION:** There is preliminary evidence that VR-JIT is acceptable to trainees with SUDs. Moreover, VR-JIT led to better vocational outcomes with trainees having greater odds of attaining a competitive position by 6-month follow-up. Future studies could evaluate the effectiveness of VR-JIT within community-based services.

Keywords: Substance use disorders, virtual reality training, job interview skills, vocational outcomes

\*Address for correspondence: Dr. Matthew J. Smith, Northwestern University Feinberg School of Medicine, Department of Psychiatry and Behavioral Sciences, 710 N. Lake Shore

Drive, Abbott Hall, 13th Floor, Chicago, IL 60611, USA. Tel.: +1 312 503 2542; Fax: +1 312 503 0527; E-mail: matthewsmith@northwestern.edu.

## 1. Introduction

Individuals diagnosed with an alcohol or other substance use disorders (SUDs) have low levels of competitive employment (15–30%) (McCoy, Comerford, & Metsch, 2007; Platt, 1995; Richardson, Wood, Li, & Kerr, 2010; Sigurdsson, DeFulio, Long, & Silverman, 2011). In turn, research has evaluated barriers to employment for people with SUDs in an effort to identify targets for intervention development (Richardson et al., 2010; Richardson, Wood, Montaner, & Kerr, 2012; Sigurdsson, Ring, O'Reilly, & Silverman, 2012). Findings from this research suggest that individuals with SUDs face barriers to employment that include the lack of on-the-job 'hard' skills (e.g., computer skills) (Sigurdsson et al., 2012) and impairments in 'soft' social skills that impact on-the-job behavior (e.g., interacting with customers and coworkers) as well as pre-job behavior (e.g., job interviewing) (Ginexi, 2003; Lidz, Sorrentino, Robison, & Bunce, 2004). Some addiction treatment programs target both hard and soft skills in an effort to help these individuals attain volunteer positions or competitive jobs as both of these outcomes are critical to recovery (Pagano et al., 2009; Room, 1998; White, 2009; Zemore, Kaskutas, & Ammon, 2004) and contribute to a better quality of life (Donovan, Mattson, Cisler, Longabaugh, & Zweben, 2005; Foster, Peters, & Marshall, 2000; Laudet, 2011; Laudet, Becker, & White, 2009).

Individuals with SUDs face similar barriers to employment (e.g., lack of skills, fear of benefit loss) as individuals with severe mental illness (SMI) (Cook, 2006). However, few studies have evaluated whether individuals with SUDs may be responsive to evidence-based supported employment (SE) that helps individuals with SMI overcome those barriers (Drake & Bond, 2011). This trend may be changing as some studies have begun to evaluate the effectiveness of SE in populations with co-occurring SMI and SUDs (Frounfelker, Wilkniss, Bond, Devitt, & Drake, 2011; Rosenheck & Mares, 2007). Despite a paucity of research examining job interview skills among individuals with SUDs, it would be reasonable to suggest that this clinical population recognizes the job interview as a gateway to competitive volunteer work or employment as they face similar barriers to employment as individuals with SMI (and has limited access to standardized vocational services).

Recently, a series of randomized controlled trials (RCTs) evaluated the efficacy of Virtual Reality Job Interview Training (VR-JIT), an intervention that

helps trainees prepare for job interviews. VR-JIT has demonstrated acceptability and efficacy at improving interview skills in multiple clinical cohorts, including: individuals with mood disorders, veterans with post-traumatic stress disorder (PTSD), individuals with schizophrenia, and young adults with autism spectrum disorder (Smith, Humm, et al., 2015; Smith, Fleming, Wright, Roberts, et al., 2015; Smith, Ginger, Wright, Wright, Taylor, et al., 2014; Smith, Ginger, Wright, Wright, Humm, et al., 2014). Moreover, VR-JIT trainees were found to have better vocational outcomes (e.g., attain job offers; get offers faster) than their comparison groups; and more completed virtual interview trials were associated with an increased likelihood of receiving a job offer and reduced time searching for jobs (Smith, Fleming, Wright, Jordan, et al., 2015; Smith, Fleming, Wright, Losh, et al., 2015; Smith, Fleming, Wright, Roberts, et al., 2015).

Based on prior evaluations of VR-JIT, our primary hypotheses were that 1) trainees would have greater improvement in job interview skills as evaluated through pre-post standardized role-plays and 2) trainees would have better vocational outcomes (i.e., attaining a job or competitive volunteer position) compared to controls at 6-month follow-up. Our secondary hypotheses were that participation in the VR-JIT group (and amount of VR-JIT) would be associated with weeks-to-outcome and role-play performance, and that trainees would find VR-JIT easy-to-use and helpful. We generated these directional hypotheses based on our prior work (Smith, Fleming, Wright, Jordan, et al., 2015; Smith, Fleming, Wright, Losh, et al., 2015; Smith, Fleming, Wright, Roberts, et al., 2015).

## 2. Methods

### 2.1. Participants

Participants included 25 individuals with a primary Alcohol or other SUD recruited through Northwestern University. Inclusion criteria included: 18–65 years old, minimum of a 6th grade reading level using the Wide Range Achievement Test-IV (WRAT-IV) (Wilkinson & Robertson, 2006), willingness to be video-recorded, unemployed or underemployed, actively seeking employment, lifetime history of abusing alcohol or drugs, and actively receiving outpatient treatment verified by their case manager (e.g., substance use counseling, individual

psychotherapy, vocational rehabilitation). The study exclusion criteria included: having a medical illness that significantly comprised cognition (e.g., traumatic brain injury), uncorrected vision or hearing problem. Northwestern University's Institutional Review Board approved the study protocol and all participants provided informed consent. Once enrolled, participants were randomized into the training ( $n=14$ ) or treatment-as-usual control ( $n=11$ ) groups. Data from 2 trainees who met inclusion criteria and had completed prior studies were included in the present analyses to optimize statistical power (Smith, Humm, et al., 2015; Smith, Ginger, Wright, Wright, Humm, et al., 2014). Participants were re-contacted after 6 months and asked to complete a follow-up survey. Of the original 25 participants, 23 (92%) completed the follow-up survey and 2 (8%) were lost to contact.

## 2.2. Intervention

Virtual Reality Job Interview Training (VR-JIT) is a computer-based intervention developed by SIMmersion LLC (<http://www.simmersion.com>) to enhance interviewing skills for individuals with a range of disabilities. Trainees review interviewing didactics and repeatedly practice job interviews with Molly Porter (a virtual human resources representative) using speech recognition. The training was developed based on 8 learning goals: 1) sounding like a hard worker, 2) sounding easy to work with, 3) behaving professionally, 4) negotiation skills (asking for Thursdays off), 5) sharing things in a positive way, 6) sounding honest, 7) sounding interested in the position and 8) establishing overall rapport with the interviewer. Please visit <http://www.jobinterviewtraining.net> to view images of Molly and the VR-JIT interface.

VR-JIT was designed to improve interview skills using behavioral learning principles (Cooper, 1982; Cooper, Heron, & Heward, 2007) and Issenberg et al's principles for designing effective simulations (Issenberg, 2006). These principals are noted to help develop sustainable changes in behavior (Roelfsema, van Ooyen, & Watanabe, 2010; Vinogradov, Fisher, & de Villers-Sidani, 2012). Virtual job interview performances were scored on a scale of 0–100 and ranged in difficulty from easy to medium to hard. Participants were required to score 90 or better within 3 trials on a given difficulty level before advancing to the next level. If a score of 90 was not attained then participants were automatically advanced after

5 trials. Upon completion, trainees received feedback on each response that they could review and use as a learning tool. See Smith et al. (2014b) for additional details on design and delivery (e.g., fidelity training) of VR-JIT.

## 2.3. Study procedures

Pre-test measures included: demographic, clinical, cognitive, and vocational assessments and two standardized role-plays. Participants were randomized following completion of the pre-test assessments. Trainees completed up to 10 hours of VR-JIT (~20 trials) over the span of 5 visits (within 5–10 business days). Controls received services-as-usual during this same time frame. After 10 days, both groups completed two post-test standardized role-plays, and trainees completed the Treatment Experience Questionnaire (TEQ).

Approximately 6 months after completing the above efficacy trial, research staff contacted participants to complete a brief follow-up survey over the phone or via email. Two controls were unreachable by phone, mail, and email, and were lost to contact. Overall, 14 VR-JIT and 9 controls completed follow-up.

## 2.4. Study measures

### 2.4.1. Participant characteristics

We assessed demographic characteristics and vocational history via self-report and a Bachelor's or Ph.D.-level research staff assessed addiction severity and mental health using the Addiction Severity Index (ASI) (McLellan, Luborsky, Woody, & O'Brien, 1980). The ASI measures the problem severity for the 30 days prior to the interview in several domains of functioning: medical status, family/social status, employment and support, psychiatric status (e.g., mood), legal, drug use, and alcohol use. Alcohol and drug use data include: main substance used, months abstinent, days of addiction outpatient treatment, days of use over past 30 days, and years of use. The history of addiction and treatment were validated for the two participants from prior studies using the Mini-International Neuropsychiatric Interview (MINI) to determine DSM-IV Axis I diagnoses (Sheehan et al., 1998).

### 2.4.2. Cognition

We measured neurocognition using the Repeatable Battery for the Assessment of Neuropsychological

Status (RBANS; (Randolph, Tierney, Mohr, & Chase, 1998). The RBNAS total score reflects performance across immediate memory, visuospatial capacity, language, attention, and delayed memory.

#### 2.4.3. VR-JIT acceptability

Trainee attendance and the total number of minutes (600 minutes possible) across the five sessions that they engaged in virtual interviews were recorded. Trainees completed the TEQ to assess if they thought VR-JIT was easy to use, enjoyable, helpful, instilled confidence, and prepared them for interviews (Bell & Weinstein, 2011).

#### 2.4.4. VR-JIT efficacy

The scoring criteria for the job interview role-plays (~20 minutes each) included nine communication skills that are critical for performing a successful interview and based on the job interview literature (Huffcutt, 2011); 1) conveying oneself as a hard worker, 2) sounding easy to work with, 3) conveying that one behaves professionally, 4) negotiation skills (requesting Thursdays off), 5) sharing things in a positive way, 6) sounding honest, 7) sounding interested in the position, 8) comfort level, and 9) establishing rapport.

Participants filled out a job application and completed two pre-test and two post-test role-plays. Each participant chose four job scenarios for the role-plays (e.g., Maintenance, Librarian). Participants were instructed to negotiate for a work schedule where they could take Thursdays off for personal reasons. Standardized role-play actors (SRAs) were trained to pose as human resources representatives. They interviewed participants by asking 13 standardized questions and 3–4 random questions (70+ questions available). Role-plays were video-recorded for scoring purposes.

Videos were rated in a random order by one blinded rater who had more than 10 years of experience in human resources and who had served as a rater for our prior studies (Smith, Humm, et al., 2015; Smith, Ginger, Wright, Wright, Humm, et al., 2014; Smith, Ginger, Wright, Wright, Taylor, et al., 2014). The rater trained with 10 practice videos before independently rating the study videos. See Smith et al. (2014b, 2015a) for additional information about these methods. Total scores for each of the two baseline and follow-up role-plays were computed across nine domains (range of 1–5 with higher scores reflecting better performance), and averaged to compute a single score. Despite SRA prompting, 25% of the role

plays did not include a negotiation for Thursdays off. An item-level imputation for this score replaced missing ratings (Myers, 2000). No other ratings were missing.

#### 2.4.5. VR-JIT process measures

We recorded trainees' VR-JIT performance scores, number of completed trials, and time spent engaged in virtual interviews. The software scored each virtual interview from 0–100 using an algorithm that targeted their responses in eight domains: negotiation skills (asking for Thursdays off), conveying that you're a hard worker, sounding easy to work with, sharing things in a positive way, sounding honest, sounding interested in the position, behaving professionally, and establishing interviewer rapport.

#### 2.4.6. Six-month follow-up measures

The follow-up survey asked participants to reflect on the past 6 months and report 1) total number of weeks they spent searching for a job or volunteer position, 2) number of job or volunteer interviews completed, and 3) number of job or volunteer offers accepted. The 6-month survey also assessed whether trainees believed that VR-JIT prepared them for real interviews, helped them attain employment, and revisiting the training would help them prepare for future interviews. The 5 items were rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

### 2.5. Data analysis

#### 2.5.1. Primary outcomes for efficacy study

Between-group differences for demographics, vocational history, cognition, and clinical history were assessed with a Mann-Whitney independent samples test or chi-square analysis. We analyzed VR-JIT acceptability using descriptive statistics for session attendance, the number of minutes engaged with VR-JIT, and TEQ responses. We evaluated whether role-play performance for trainees significantly differed at post-test as compared to controls when co-varying for pre-test via an analysis of covariance (ANCOVA).

We evaluated whether trainees improved their VR-JIT performance scores across trials as a process measure by computing linear regression 'learning' slopes for each trainee based on the regression of their performance scores on the log of trial number. We plotted the group-level performance average for each successive VR-JIT trial and generated the R-Square

from the regression of average performance on the log of trial number.

### 2.5.2. Primary outcomes at six month follow-up

We conducted a logistic regression with attaining a job or competitive volunteer position (1 = yes, 0 = no) as the dependent variable to evaluate whether or not trainees had higher odds of this outcome than controls. Neurocognition and the number of months since prior employment were included as covariates based on their a priori relationship to vocational outcomes in populations with severe mental illness (Burke-Miller et al., 2006; Catty et al., 2008; Gold, Goldberg, McNary, Dixon, & Lehman, 2002). Odds ratios (OR) were generated and presented with 95% Confidence Intervals. Nagelkerke R-Squared provided the model's proportion of explained variance.

### 2.5.3. Secondary outcomes

We conducted point serial correlations to evaluate whether group status (training vs. control) was associated with fewer weeks-to-outcome at 6-month follow-up. We conducted Pearson correlations to evaluate whether VR-JIT process measures (i.e.,

number of completed trials, learning slope) were correlated with role-play performance and weeks-to-outcome.

## 3. Results

### 3.1. Pre-test between-group characteristics

In Table 1, trainees and controls did not differ with respect to age, gender, race, parental education, vocational history, cognition, days of outpatient treatment (past month), months of current abstinence, and years of cocaine and heroin use (all  $p > 0.10$ ,  $df = 1$  for nominal variables). Despite random assignment, the control group had a longer history (in years) of using cannabis ( $p < 0.01$ ) and alcohol (trend level,  $p = 0.07$ ).

### 3.2. VR-JIT acceptability

In Table 2, trainees attended mean = 548.6 (sd = 90.7) minutes of VR-JIT and completed mean = 17.2 (sd = 3.0) trials. Trainees reported that VR-JIT was easy to use, enjoyable, helpful, increased

Table 1  
Baseline participant characteristics

	Control Group (n = 11)	Training Group (n = 14)	p-value
Demographics			
Mean age (SD)	52.2 (6.1)	51.9 (6.0)	0.65
Gender (% male)	54.5%	64.3%	0.62
Parental education, mean years (SD)	11.1 (4.1)	12.4 (2.3)	0.78
Race			
% Caucasian	18.2%	28.6%	
% African-American	72.7%	71.4%	0.46
% Latino	9.1%	0.0%	
Vocational history			
Months since prior employment, mean (SD)	53.8 (59.1)	75.5 (86.4)	0.77
Prior full-time employment (%)	100%	100%	–
Prior participation in vocational training program	45.5%	21.4%	0.20
Neurocognitive function, mean (SD)	82.9 (11.9)	85.7 (13.7)	0.89
Substance Use History			
Days of outpatient treatment (past 30 days) <sup>a</sup>	14.1 (6.2)	14.7 (9.7)	0.98
Months of current abstinence <sup>a</sup>	43.0 (47.9)	87.8 (97.5)	0.43
Primary substance of abuse <sup>a</sup>			
Alcohol	18.2%	28.6%	
Polydrug <sup>b</sup> (and alcohol)	72.7%	35.7%	
Polydrug <sup>b</sup> (no alcohol)	0.0%	28.6%	0.13
Cocaine	7.1%	7.1%	
Heroin	0.0%	0.0%	
Years of Use <sup>a</sup>			
Alcohol, mean (SD)	27.09 (12.8)	16.08 (12.6)	0.07
Cannabis, mean (SD)	17.00 (10.1)	10.11 (3.0)	0.007
Cocaine, mean (SD)	9.55 (9.6)	8.33 (6.7)	0.93
Heroin, mean (SD)	7.36 (13.1)	7.42 (7.2)	0.79

<sup>a</sup>Data missing from two trainees; <sup>b</sup>Heroin, cocaine, and cannabis are the noted drugs used.

their self-confidence in job-interview skills, and improved their readiness for interviewing.

### 3.3. VR-JIT process measures

The process measures indicated that VR-JIT performance scores appeared to improve linearly across the number of completed trials (Fig. 1). The slope (mean = 2.6, sd = 2.0) suggests that performance improves 2.6 points for every 1 point increase in the natural log of the trial number (R-Squared = 0.64).

### 3.4. Primary outcomes for efficacy study

In Fig. 2, ANCOVA revealed a trend-level group effect that VR-JIT trainees, as compared to controls, had higher post-test role-play performance scores (M = 38.2, SD = 1.9 vs. M = 37.2, SD = 1.9, respectively) when covarying for pre-test scores (F(1,22) = 1.8,  $p = 0.097$ ).

Table 2  
Mean characteristics of VR-JIT acceptability (SD)

Attendance Measures	
Completed Trials (out of 20)	17.2 (3.0)
Elapsed Simulation Time (min)	548.6 (90.7)
TEQ Items	
Ease of use	5.9 (1.3)
Enjoyable	6.1 (1.1)
Helpful	6.4 (1.2)
Instilled confidence	6.2 (1.2)
Prepared for interviews	6.4 (0.8)

Note. Scale for TEQ, 1 = Extremely Unhelpful to 7 = Extremely Helpful; Abbreviations: VR-JIT, virtual reality job interview training; TEQ, training experience questionnaire.



Fig. 1. VR-JIT Learning Curve in Individuals with Substance Use Disorders. This figure plots the average score for each successive VR-JIT simulated interview trial. Trials 1–3 at easy, trials 4–6 at medium, and trials 7–17 at hard. Model fit,  $R^2 = 0.64$

### 3.5. Primary outcomes at 6-month follow-up

In Table 3, we report that a similar proportion of controls and trainees completed interviews for a job or volunteer position ( $p > 0.10$ ,  $df = 1$ ). More trainees attained jobs or volunteer positions than controls ( $p = 0.047$ ,  $df = 1$ ). Trainees, as compared to controls, completed fewer interviews ( $p = 0.04$ ) and looked for a position for fewer weeks (trend,  $p = 0.07$ ).

In Table 4, we report the odds of attaining a position (job or volunteer) were 5.67 times higher for trainees compared to controls (OR = 5.67,  $df = 1$ ,  $p = 0.043$ ; 95% CI = 1.07, 30.04). Neurocognition and months since prior employment were non-significant predictors ( $p > 0.10$ ). Overall, the model explained 18.7% of the variance in position attainment (Nagelkerke R-Squared = 0.187).

### 3.6. Secondary outcomes

Participation in VR-JIT (i.e., group status) was correlated with fewer weeks searching for a job ( $r = -0.36$ ,  $p < 0.05$ ). A larger VR-JIT performance slope correlated with greater improvement in role-play performance ( $r = 0.57$ ,  $p < 0.05$ ). The completion of a greater number of VR-JIT trials correlated with improved role-play performance at a trend level ( $r = 0.40$ ,  $p = 0.08$ ). Correlations between number of trials and learning slope with weeks-to-outcome were non-significant (both  $p > 0.10$ ).

At 6-month follow-up, all trainees agreed or strongly agreed that VR-JIT prepared them for real-life interviews and that the training was helpful to them. Over 85% of trainees agreed or strongly agreed that they would use VR-JIT again to enhance their skills.

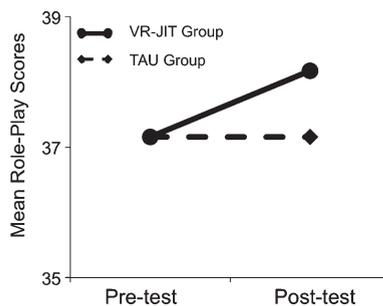


Fig. 2. Differences in post-test role-play Interview performance for each group while covarying for pre-test role-play performance.

Table 3  
Six month follow-up between-group differences

	N	Control Group (n = 9)	Training Group (n = 14)	p-value
Mean total weeks looking for a job (SD)		16.7 (9.6)	9.3 (10.1)	0.07
Mean total job or volunteer interviews completed (SD)		6.0 (4.4)	2.6 (1.9)	0.04
% who completed job or volunteer interviews	9	100%	13	0.67
% who attained job or volunteer position <sup>a</sup>	4	44.4%	11	0.047
% who attained a job	3	33.3%	8	0.13
% who attained a volunteer position	1	11.1%	8	0.14

<sup>a</sup>Five participants attained a job and volunteer position.

Table 4  
VR-JIT as a predictor of attaining a competitive position

	Step 1 OR (C.I. 95%)	Step 2 OR (C.I. 95%)
Step 1 <sup>a</sup>		
Neurocognition	1.00 (0.94–1.05)	0.98 (0.92–1.05)
Months since prior employment	1.00 (0.99–1.01)	1.00 (0.99–1.01)
Step 2 <sup>b</sup>		
VR-JIT (yes or no)	–	5.67 (1.07–30.04)*
Nagelkerke R <sup>2</sup>	0.01	0.187

<sup>a</sup>Step 1 Omnibus Test of Model Coefficients, Chi-Square=0.09, df = 2,  $p = 0.95$ ; <sup>b</sup>Step 2 Omnibus Test of Model Coefficients, Chi-Square=3.26 df = 3,  $p = 0.035$ . Abbreviations: VR-JIT, virtual reality job interview training.

#### 4. Discussion

We evaluated both the acceptability and efficacy of VR-JIT in a small RCT of individuals with substance use disorders (SUDs) who self-reported that they were actively looking for employment. The trainees found VR-JIT to be acceptable based on their reports on its ease-of-use, it being enjoyable to use, and its helpfulness in preparing for future interviews. Moreover, VR-JIT appears to demonstrate efficacy at improving role-play performance and trainees learned from the intervention as their virtual interview scores increased across greater levels of difficulty. The 6-month follow-up data suggests trainees had greater odds of attaining a job or competitive volunteer position. Of note, the analyses controlled for known predictors of vocational outcomes (i.e., cognition, time since prior employment) (Burke-Miller et al., 2006; Catty et al., 2008; Gold et al., 2002). Also, using VR-JIT was associated with a shorter duration of searching for a job or volunteer position, and trainees reported that VR-JIT prepared them for real-life interviews.

Although trainees improved their interviewing skills, this effect was at the trend level. The general direction of this finding was consistent with our recent evaluation of VR-JIT in several other clinical populations (Smith, Humm, et al., 2015; Smith, Ginger,

Wright, Wright, Humm, et al., 2014; Smith, Ginger, Wright, Wright, Taylor, et al., 2014). Moreover, we observed that trainees had greater odds of attaining a position and spent fewer weeks searching for positions as compared to controls. These findings also replicate our 6-month follow-up data among veterans with PTSD, and individuals with either a mood disorder or schizophrenia, and young adults with autism spectrum disorders (Smith, Fleming, Wright, Jordan, et al., 2015; Smith, Fleming, Wright, Losh, et al., 2015; Smith, Fleming, Wright, Roberts, et al., 2015). Moreover, improving access to employment and competitive volunteer work for individuals with SUDs is notable as positive vocational outcomes are associated with a higher quality of life (Donovan et al., 2005; Foster et al., 2000; Laudet, 2011; Laudet et al., 2009).

The current findings suggest that there are several directions for future research. First, the findings need to be replicated in a larger sample to validate that the training is efficacious for adults with SUDs. Second, most participants have limited access to standardized vocational services. Thus, VR-JIT could be evaluated as a complement to vocational services that are currently available. Third, the current study focused on midlife adults, while future studies could evaluate whether VR-JIT is effective for younger individuals in recovery from SUDs. Lastly, most participants

were last employed 5–10 years previously. Perhaps future studies could evaluate whether VR-JIT may be more helpful to individuals who were more recently employed.

Based on the pilot nature of the current study, we would like to offer a few implications as hypotheses to be tested in dissemination and implementation studies. For instance, VR-JIT is likely to be scalable to both small- and large-scale vocational rehabilitation programs due to its ability to be self-sustaining. More specifically, the use of a training manual and the self-directed nature of VR-JIT suggests that vocational counselors may not be needed to guide their clients through job interview training. As such, vocational counselors could shift their efforts from conducting job interview training to soliciting additional community-based jobs for their caseload, train clients in employable skills, or conduct other job development duties. Thus, future studies can evaluate the scalability of VR-JIT, and whether its implementation has downstream effects on vocational rehabilitation programming. Also, future research could conduct a budget impact or cost effectiveness analysis to evaluate the impact of VR-JIT on programming budgets.

There were some limitations that much be considered when interpreting the findings. The extent of services received by the treatment-as-usual group (e.g., contact hours, skills taught, performance feedback) were not monitored due to the limited resources of this pilot study. Future studies would need to carefully monitor these important variables. The study has limited statistical power given the sample size. The 6-month outcome data does not include types of jobs attained or pay received, and the duration of the position. All study participants were actively seeking work or a volunteer position. Thus, the results do not generalize to individuals not actively searching for these engagements. However, job-seekers are the individuals who are likely to use the training so the findings are generalizable to them. The participants were paid for completing the study, which may have biased the results.

## 5. Conclusions

VR-JIT may be a helpful tool for individuals with SUDs as training was associated increasing the odds that trainees obtained a job or competitive volunteer work and a trend towards improved interview skills. VR-JIT also helped trainees attain these positions faster as compared to controls. In the future,

a definitive study is still needed to evaluate VR-JIT effectiveness within a community setting. Based on the ability to download and use VR-JIT in a rapid fashion, this intervention could be widely disseminated to clinics and treatment centers that have limited access to vocational services.

## Acknowledgments

Support for this work was provided by the Department of Psychiatry and Behavioral Sciences. The authors would like to acknowledge Dr. Zoran Martynovich for advising on statistical issues, the research staff at Northwestern University's Clinical Research Program for data collection, and our participants for volunteering their time.

## Conflict of interest

Dr. Olsen and Ms. Humm are employed by and own shares in SIMmersion LLC. They contributed to the manuscript, but were not involved in analyzing the data. Dr. Bell was a paid consultant by SIMmersion LLC to assist with the development of VR-JIT. Dr. Bell and his family do not have a financial stake in the company. The remaining authors report no conflicts of interest.

## Funding source

The development of VR-JIT was supported by a grant from the National Institute of Mental Health awarded to Dr. Dale Olsen (R44 MH080496). The evaluation of VR-JIT in the current cohort of participants was supported by the Department of Psychiatry and Behavioral Sciences at Northwestern University.

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