Exploring the Relationship Between Nicotine and Learning Among Veterans with Severe Mental Illness

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Introduction

- Individuals with schizophrenia spectrum disorders (SSDs) exhibit impaired reinforcement learning and deficits in social cognition (Acheson, Twamley & Young, 2013). Additionally, neurocognitive problems in attention, memory, and executive functioning have been observed to occur in approximately 70% of persons with schizophrenia (Palmer, Healter, Kuck, & Braff, 1997), which can impact learning.
- Nicotine has learning-enhancing effects (Acheson et al., 2013) and smoking prevalence is elevated in among persons with SSDs (de Leon & Diaz, 2005). Specifically, the alpha7 nicotinic acetylcholine receptor (nAChR) has been identified as a pro-cognitive target to augment reward-based learning in patients with schizophrenia (Acheson et al., 2013).
- Social Skills Training (SST) and Cognitive and Behavioral Social Skills Training (CBSST) have shown to be effective forms of treatment for this population. Consumer of these interventions develop their social and cognitive abilities through skill-based curricula and positive feedback, resulting in skill acquisition and enhanced quality of life (Benton & Schroeder, 1990; Dixon et al., 2010; Granholm et al., 2013).
- To these authors' knowledge, no study to date has explored the relationship between nicotine use and reward-based learning associated with SST and CBSST among this population. Since this has not been examined in this population/setting, feasibility (i.e., enrollment, dropout, number of assessments completed) was also evaluated.
- Results derived from this study may facilitate the development of the VASDHS' CORE program by highlighting observed differences in learning between nicotine versus non-nicotine users, potentially leading to the modification and delivery of current group curriculum to bridge these differences and improve quality of life.

Hypotheses

- Veterans with SSDs who use nicotine will demonstrate better learning in SST and CBSST compared to non nicotine-users.
- Nicotine-users will demonstrate better quality of life and self-efficacy post-treatment than non-users.
- The study will demonstrate feasibility.

Study Aims

Improve the clinical operations of the VA San Diego Healthcare's (VASDHS) Center of Recovery Education (CORE) by observing potential differences in learning among Veterans (nicotine and non-nicotine users) enrolled in SST and/or CBSST groups, and the impact participating in these groups has on their quality of life.

Methods

Participants & Procedures

The relationship between reward learning and nicotine was explored in a sample of **(*N*=15*)** Veterans. Participants were members of the CORE who carry diagnoses of SSDs and related disorders with psychotic features.

Veterans were enrolled in a weekly, 60-minute SST or CBSST groups for a range of 8-12 weeks. Veterans completed measures at the first and last session of their respective groups. All Veterans who identified as nicotine users were provided the opportunity to request a referral for smoking cessation services through the VASDHS' tobacco use cessation clinic.

Quantitative Measures

General

- A basic demographics questionnaire was developed and administered.
- Current and historical nicotine use/cravings, were assessed by the Heavy Smoking Index (HSI; Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989), the Fagerström Test for Nicotine Dependence for Smokeless tobacco (FTND-ST; Ebbert, Patten, & Schroeder, 2006) and questions adapted from the brief Questionnaire of Smoking Urges (QSU-brief; Tiffany & Drobes, 1991).
- The Quality of Life Scale (QOLS; Burckhardt & Anderson, 2003) was used as an assessment for psychosocial functioning (Hayes et al.1995; Liberman et al.,1998).
- The General Self-Efficacy Scale (GSE; Schwarzer & Jerusalem, 1995) was used, as SST has been shown to reinforce the self-efficacy and willingness to use skills (Kurtz & Mueser, 2008; Pratt, Mueser, Smith, & Lu, 2005).

Social Skills Training

- Standard clinical measures to assess SST-specific learning (pre/post), which are routinely collected as part of the VA Office of Mental Health and Suicide Prevention's (OMHSP) National Evidence-Based Psychotherapy Training Program (EBP Training Program), were administered. These measures include, The World Health Organization's Quality of Life survey (WHO-QOL) and the Social Skills Training Veteran survey: Satisfaction, Self-efficacy & Competence in Social Skills (SSCS).

Cognitive and Behavioral Social Skills Training

- Cognitive Skills Module Test (CMT; Granholm, Holden & Mcquaid, 2016), was administered pre/post to evaluate the learning of the cognitive skills in CBSST.

Analytic Procedures

- To examine the differences in pre/post scores between nicotine use status (user vs. non-user), a series of repeated-measures ANOVAs were conducted. A Mann-Whitney U test was performed for the self-reported post-SST treatment ratings of improvement in social skills.

Below is an overview of the participants' characteristics.

	SST (*n*=9)	CBSST (*n*=6)
Age	*M* = 49.89, *SD* = 15.17	*M* = 43.50, *SD* = 13.02
Gender	88.9% Male 11.1% Female	83.3% Male 16.7% Female
Race/ Ethnicity	62.5% Caucasian 37.5% Hispanic/Latino	33.2% Black or African American 16.7% American Indian/Alaskan Native 16.7% Multi-racial 16.7% Caucasian 16.7% Hispanic/Latino
Diagnosis	44.4% Schizoaffective disorder 22.2% Schizophrenia 22.2% MDD with psychotic features 11.2% Delusional disorder	50% Schizoaffective disorder 50% Schizophrenia
Nicotine Use	66.7% non-users 33.3% active users 60% of non-users were former users HSI** average for nicotine users: *M* = 3.67, *SD* = 3.21 Craving Score for nicotine users: *M* = 6.67, *SD* = 5.03	66.7% non-users 33.3% active users No former users HSI** average for nicotine users: *M* = 2.5, *SD* = 0.71 Craving Score for nicotine users: *M* = 10.5, *SD* = 3.53

** One Veteran was enrolled in both SST and CBSST groups*
*** The Heavy Smoking Index*

Results

- There were no statistically significant differences in overall patient responses between the nicotine users and non-nicotine users.
- Pre/post scores from the GSE and QOLS were examined by nicotine use status (user vs non-user). Results did not yield statistically significant differences.

**Estimated marginal means are available via handout from author.*

	SST		CBSST	
GSE	$F(1, 2) = .41$	$p = .59$	$F(1, 2) = 1.75$	$p = .32$
QLS	$F(1, 2) = .21$	$p = .69$	$F(1, 2) = 2.10$	$p = .28$

Social Skills Training

- Pre/post scores from the sections of the SSCS that assess SST-specific learning and the QOL were examined by nicotine use status (user vs. non-user). Results did not yield statistically significant differences. A series of Mann-Whitney U tests measuring improvement in SST skills from the SSCS did not yield statistically significant differences pre/post between nicotine users and non-users.

**Estimated marginal means are available via handout from author.*

WHO-QOL	Loneliness	$F(1, 2) = 2.50$	$p = .67$
	Support from others	$F(1, 2) = .14$	$p = .74$
	Relationships satisfaction	$F(1, 2) = .17$	$p = .72$
SSCS	Relationship skills confidence	$F(1, 2) = 2.58$	$p = .25$
	Community involvement comptenece	$F(1, 1) = 8.33$	$p = .21$
	Treatment engagement comptenece	$F(1, 2) = .25$	$p = .67$
	Improvement in listening to others	$U = .50$	$p = .32$
	Improvement in making requests	$U = .50$	$p = .32$
	Improvement in expressing positive feelings	$U = 1.00$	$p = .56$
	Improvement in expressing unpleasant feelings	$U = 1.00$	$p = 1.00$

Cognitive and Behavioral Social Skills Training

- Pre/post scores from the CMT were examined by nicotine use status (user vs non-user). Results did not yield significant differences, $F(1, 2) = .14$, $p = .74$.

Feasibility

- Average group size for the CORE clinic is an *n*=6, thus we can conclude that we had good feasibility with an *n*=9 (CBSST) and *n*=6 (SST) for the groups.
- A total of 14 Veterans were approached to be in the study and 13 agreed to participate. There was a retention rate of 55.5% for SST and 66.67% for CBSST. There was a rate of 35.7% nicotine users across both groups.

Discussion

- Across all measures, general and group-specific, no significant differences were found between nicotine-users and non-users, likely due to the small sample size.
- We had good recruitment and high retention rates for both groups. It is feasible to explore these hypotheses/aims among this population at CORE.
- The incidence of nicotine-users was lower than expected at the CORE clinic. This may be, in part, related to VASDHS' efforts to implement smoking cessation services and a smoke-free campus.

Limitations

- Small sample size impacted the study's power and ability to generalize results.
- This study was incremental to current standard clinical care received by CORE Veterans and did not exclude Veterans with prior SST and CBSST exposure.
- The study did not use random assignment and extraneous variables were not controlled.
- There was a low rate of identified nicotine users within both groups.

Conclusions/Future Directions

Conclusions

- Overall there was no statistically significant differences between the nicotine users and non-nicotine users across all general and group-specific measures.
- Despite limitations, this study demonstrated good feasibility.
- Outcomes of this study helped quantify the number of active nicotine-users in SST and CBSST groups of the CORE Program, which facilitated the provision of referrals to the VASDHS' Smoking Cessation Clinic.
- The incidence of nicotine-users was lower than expected at the CORE clinic. A total of 60% of SST non-nicotine users were former smokers, there were no former smokers in CBSST. This may be, in part, related to VASDHS' efforts to implement smoking cessation services and a smoke-free campus.

Future Directions

- Other mental health clinics, which larger censuses, that also serve Veterans with SSDs may be able to recruit a larger sample, as well as more active nicotine users with SSDs.
- Future studies should use randomization.
- Data derived from future studies with larger sample sizes may be able to detect significant differences between nicotine and non-nicotine users. These results may improve the delivery of current group curriculum to bridge these differences, enhance skill acquisition, and improve Veterans' quality of life.

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