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A novel intervention increases task persistence in smokers with schizophrenia: A proof of concept study

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Task persistence, the act of persisting in a difficult or effortful task, is a particularly important target for intervention in smokers with schizophrenia. Not only does task persistence predict smoking cessation in smokers with schizophrenia (Steinberg et al., 2012), but it is also lower in smokers with, as compared to those without, schizophrenia (Steinberg et al., 2010) and may therefore be an important contributor to the lower cessation rates in this population.

In an effort to improve cessation outcomes for smokers with schizophrenia, we modified a novel cognitive behavioral therapy intervention targeting thoughts likely to adversely influence task persistence in smokers with schizophrenia and examined its ability to increase task persistence. In this proof-of-concept study, patients (N = 24) attended eight weekly individual therapy sessions. They completed assignments between sessions and received two “booster” text messages between each session to reinforce concepts learned and practiced during counseling sessions. Participants were also provided with a 10-week supply of nicotine transdermal patches. Participants completed behavioral and self-report measures of task persistence at baseline, at end-of-treatment, and three-months after the quit date. The protocol is IRB approved and the trial is registered with [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT03346291) (NCT03346291).

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Inclusion criteria included being between 18 and 64 years old, smoking at least five cigarettes per day, denying problematic alcohol and drug use, having a SCID-5 confirmed diagnosis of schizophrenia or schizoaffective disorder, and reporting no hospitalizations in the past eight weeks. Participants were excluded if they were already receiving tobacco dependence treatment, indicated contraindications for using the nicotine patch, or reported issues likely to make continued participation or follow-up difficult. Demographic and other baseline participant characteristics are displayed in Table 1.

The a priori hypothesis in this proof-of-concept study was that at least one measure of task persistence would significantly change between baseline and 3-month follow-up at $p < 0.10$. Task persistence was measured by breath holding persistence (Hajek et al., 1987), Mirror Tracing Persistence Task (Strong et al., 2003), Temperament and Character Inventory – Persistence Scale (Cloninger, 1994), Brief Persistence Measure (Steinberg et al., 2007), Tridimensional Personality Questionnaire (Cloninger, 1987), Distress Tolerance Scale (Simons and Gaher, 2005), Multiple Object Tracking Test (Erlikhman et al., 2013; Keane et al., 2011) and the Thoughts About Smoking Questionnaire (TASQ).

The TASQ is a 14-item self-report questionnaire created for this study assessing beliefs and expectancies relevant to persistence and quitting smoking (e.g., “sometimes I really need a cigarette”). Items are rated on a 7-point Likert-type scale with responses ranging from “totally disagree” to “totally agree.” A total score is derived by calculating a mean score across all items. Internal consistency reliability for this measure in the current sample was $\alpha = 0.848$.

There were no significant differences between baseline and end-of-treatment or between baseline and 3-month follow-up in breath-holding persistence, mirror tracing persistence, the Temperament and Character Inventory – Persistence Scale, Brief Persistence Measure, or the Distress Tolerance Scale (all $p > 0.10$). On the Multiple Object Tracking Task, there were significant changes in the non-hypothesized direction with respect to the number of trials attempted, $t(19) = 3.156$, $p = 0.005$, and on time persisting, $t(19) = 3.867$, $p = 0.001$ between baseline and end-of-treatment and between baseline and 3-month follow-up, $t(19) = 2.405$, $p = 0.027$ (trials attempted), and $t(19) = 2.788$, $p = 0.012$ (time persisting). Consistent with hypotheses, there was a significant decrease in scores on the TASQ (suggesting a significant increase in task persistence) from baseline to end-of-treatment, $t(19) = 5.137$, $p < 0.001$, and from baseline to 3-month follow-up, $t(19) = 5.742$, $p < 0.001$.

Interestingly, the TASQ was the only measure assessing changes in cognitions, rather than behaviors. This finding provides evidence that the cognitive therapy approaches to change cognitions about smoking implemented in this study were successful in helping smokers with schizophrenia to reframe their thoughts about smoking. It may also suggest that improvements in task persistence were limited to smoking related issues and may not be generalizable to other areas (e.g., mirror tracing, breath-holding) because we did not detect increases in task persistence via the other measures used in this study. It remains to be seen if the cognitive restructuring of thoughts about smoking can be applied by smokers with schizophrenia to influence actual smoking behavior.

Because the TASQ was the only measure of task persistence to show evidence of the signal we were assessing (i.e., significant change in task persistence in the hypothesized direction), it is the only measure we further examined in an exploratory hypothesis proposing that changes in task persistence are related to changes in cigarettes per day. A mixed model analysis examining associations between cigarettes smoked per day and scores on the TASQ across 4 time-points (baseline, target quit date, end-of-treatment, and 3-month follow-up) indicated that on average, cigarettes per day decreased by 1.5 (95% CI $-0.2 - 3.2$, $p = 0.080$) per unit decrease in scores on the TASQ.

A strength of this study includes the fact that the intervention was theory-based. Task persistence is reduced in smokers with schizophrenia and it is therefore reasonable to hypothesize that a cognitive behavioral approach to increasing task persistence in this population could be associated with improved cessation rates. Our study methods also followed an accepted stage model of therapy development (Rounsaville et al., 2001). Future research will examine questions appropriate for later stages of therapy development (Carroll and Nuro, 2006; Rounsaville et al., 2001) such as initial efficacy for cigarette abstinence and task persistence as a mediator of the intervention. The current proof-of-concept study, funded by the National Institute on Drug Abuse (R21DA041163), suggests that issues related to task persistence should continue to be explored in smokers with schizophrenia.

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Table 1

Participant characteristics (N = 24).

	M (SD)	%
Age	47.63 (10.83)	
Female		45.8%
Marital Status		
Never Married		70.8%
Divorced		16.7%
Separated		4.2%
Other or unknown		8.3%
Race		
White		50.0%
Black/African American		41.7%
Am. Indian or Alaska Native		4.2%
Other		4.2%
Hispanic Ethnicity		8.3%
Education Completed		
0–11th grade		33.3%
12th grade		41.7%
1 + year of college		25.0%
Employment		
Not working and not looking for work		79.2%
Looking for work		12.5%
Working for pay		8.3%
FTCD Score	5.74 (2.00)	
WISDM Primary Dependence Motives	4.71 (1.28)	
Age regular smoking	16.27 (7.25)	
“I COULD quit smoking (0–10)	5.92 (2.26)	
“It is IMPORTANT for me to quit (0–10)	9.54 (0.884)	
CES-Depression	1.29 (2.16)	
BSI – Paranoid Ideation Scale	1.28 (0.74)	
BSI – Psychoticism Scale	1.05 (0.83)	
BSI – Global Severity Index	1.01 (0.65)	
TEPS Total Score	4.24 (0.66)	
TEPS Anticipatory	4.18 (0.73)	
TEPS Consummatory	4.33 (0.78)	
TPI Hedonic Responsiveness	3.51 (0.61)	
TPI Desire for Pleasant Experiences	3.51 (0.53)	
TPI Engagement in Pleasant Experiences	3.17 (0.51)	
Snaith-Hamilton Pleasure Scale	10.25 (5.01)	

Note: FTCD = Fagerstrom Test for Cigarette Dependence (potential range from 0 – 10); BSI = Brief Symptom Inventory raw scores; TEPS = Temporal Experience of Pleasure Scale; TPI = Tripartite Pleasure Inventory.