Research Article

Immediate test-retest reliabilities of intention to quit smoking measures in current adult smokers

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Background: The Stages of Change (SOC) measure and Motivation To Stop Scale (MTSS) are regularly used to capture current smokers' intention to quit (ITQ) cigarette smoking. They were shown to have comparable performances in construct and predictive validity, but their immediate test-retest reliabilities have not been investigated. In this randomized online two-arm study, we examined the immediate test-retest reliability of both SOC and MTSS measures.

Methods: Adult current smokers were randomized to complete an electronic version of either the SOC or MTSS, which was filled out before and after completing a filler task. Test-retest reliability was assessed with Cohen's kappa coefficients. Intraclass correlation coefficients (ICC) were calculated as an index of reliability for the MTSS, when expressed as a continuous variable.

Results: A total of 722 participants were included in the analyses, with 311 and 411 completing the SOC and MTSS, respectively. The two measures showed high reliability; Cohen's kappa coefficients of the ITQ measures ranged from 0.73 to 0.95, corresponding to substantial agreement up to "almost perfect" or "perfect" agreement. The ICC coefficient for the MTSS was 0.86, corresponding to excellent agreement.

Conclusions: Both measures have good test-retest reliability over a brief time interval. Instrument selection should be driven by the specific study objective and whether the investigation is intended to measure ITQ specifically or more broadly.

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Introduction

Measuring the population health impact of tobacco harm reduction strategies requires assessing consumer perception and behavior concerning tobacco and nicotine products (TNPs), including intention to quit (ITQ) smoking or all TNP among current adult smokers or adult TNP users. Conducting such assessments requires psychometrically validated and comprehensive self-report instruments. The latter are central to conducting both tobacco product perception and intention (TPPI) studies as well as post-market surveillance studies that monitor the impact of changes in the external environment including communications and public health policies on individuals' ITQ over time.

ITQ smoking is the strongest predictor of making a future attempt to quit smoking [1][2][3][4][5] and is a prerequisite for initiating smoking cessation interventions [6]. Multiple underlying factors such as age, sex, broader socio-contextual factors [7][8][9], and product communications influence ITQ [10].

Instruments to measure ITQ need to show good psychometric performance, with key psychometric properties including reliability, validity, and sensitivity to change. Besides study-specific Likert scales [11][12], two commonly used and well-established instruments for assessing ITQ are the Stages of Change (SOC) measure and the Motivation To Stop Scale (MTSS) [11]. The SOC measure is based on the Prochaska and DiClemente SOC concept. The instrument assesses smokers' mental state for ITQ, which is categorized into the following three stages: 1) precontemplation (not thinking of quitting), 2) contemplation (thinking of quitting within the next 6 months), and 3) preparation (thinking of quitting within the next 30 days) [13][14]. Using this instrument, over two-thirds of adult smokers in the United States (US) have been found to report seriously considering quitting within the next 6 months [15]. The MTSS is based on the PRIME Theory of Motivation [16]. It is a measure of the motivation to stop smoking [17] that has also been used to capture ITQ smoking [11], e-cigarettes [18] and smokeless TNPs [19]. It incorporates three individual occasionally overlapping dimensions concerning motivation to quit: 1) intention (I intend to stop smoking in the next month), 2) desire (I want to stop smoking), and 3) belief (I think I should stop smoking) [17]. The MTSS was developed as part of The Smoking Toolkit Study, a large-scale survey conducted in the United Kingdom that assessed smoking prevalence, smoking patterns, and smoking cessation-related behavior [20].

Past research has indicated that both instruments have similar psychometric performance concerning construct and predictive and external validity [11][17][21][22][23][24][25][26][27]. Moreover, both the SOC measure and MTSS have been shown to discriminate between smokers who have made attempts to quit smoking versus those with no quit attempts. Specifically, the SOC measure has been demonstrated to show good test-retest reliability, also referred to as the stability of scores over time when no change is expected, over an 8-day interval [28]. However, to our knowledge, only one study assessed the immediate test-retest reliability of the SOC measure, but this has not been done for the MTSS [29]. Understanding the immediate test-retest reliability of these instruments is critical to TPPI studies and regulatory research of TNP use. In particular, assessing immediate test-retest reliability is central to understanding the stability of the scores over short periods of time and identifying meaningful differences and interpretating changes in ITQ in TPPI studies that examine the impact of stimuli material or communications on ITQ or motivation to quit smoking or all TNP use.

This randomized, two-arm, online study aimed to compare the immediate test-retest reliabilities of the SOC measure and MTSS for assessing ITQ smoking and ITQ "all tobacco and vaping products" in current adult smokers in the US. The findings are discussed in the context of current TNP use in regulatory research.

Materials & Methods

Study design and procedures

This was a randomized online two-arm study conducted in the US. Potential subjects were contacted from proprietary databases consisting of people who indicated an interest in participating in market research studies; they were screened for inclusion using basic demographic information. Eligible respondents received an email invitation to participate in a "study about tobacco products." Enrolled participants were adults of legal age for smoking (≥21 years old), US residents, current smokers defined as individuals smoking at least 1 cigarette a day or smoking at least 4 days per month, and who had smoked more than 100 cigarettes in their lifetime. As this study was categorized as market research, no ethics committee approval was applicable. All subjects provided their informed consent before participating. Fieldwork for the survey was conducted from December 17-20, 2019.

A total of 835 adults consented to study participation. Participants were randomized into SOC Study Arm 1 (n=366) or Study Arm 2 (n=469), which respectively used the SOC measure or the MTSS to

electronically capture ITQ smoking and ITQ "all tobacco and vaping products." The study assessed both ITQ of smoking and "all tobacco and vaping products" in line with US Food & Drug Administration (FDA) TPPI study guidance, which states that behavioral studies not only address the impact the introduction of a product has on cigarette smoking, but also the likelihood of quitting tobacco completely, which is not simply switching from cigarettes to another TNP [30].

As part of the experiment, participants filled out the respective ITQ measure (test) before they were given a filler task, then they again filled out the respective ITQ measure (retest). The filler task given between the two administrations of the ITQ measures was identical for both arms and consisted of 13 questions around general interests in life, travel, and technology use. This task aimed at switching the participants' focus to other topics unrelated to smoking before the retest assessment. Demographic questions were administered at the end of the online questionnaire. Questions on age, sex, and ownership/usage of technology devices were repeated as a quality check to exclude participants replying inconsistently. The average time it took participants to complete the online survey was seven minutes. Figure 1 provides an overview of the study design and procedures.

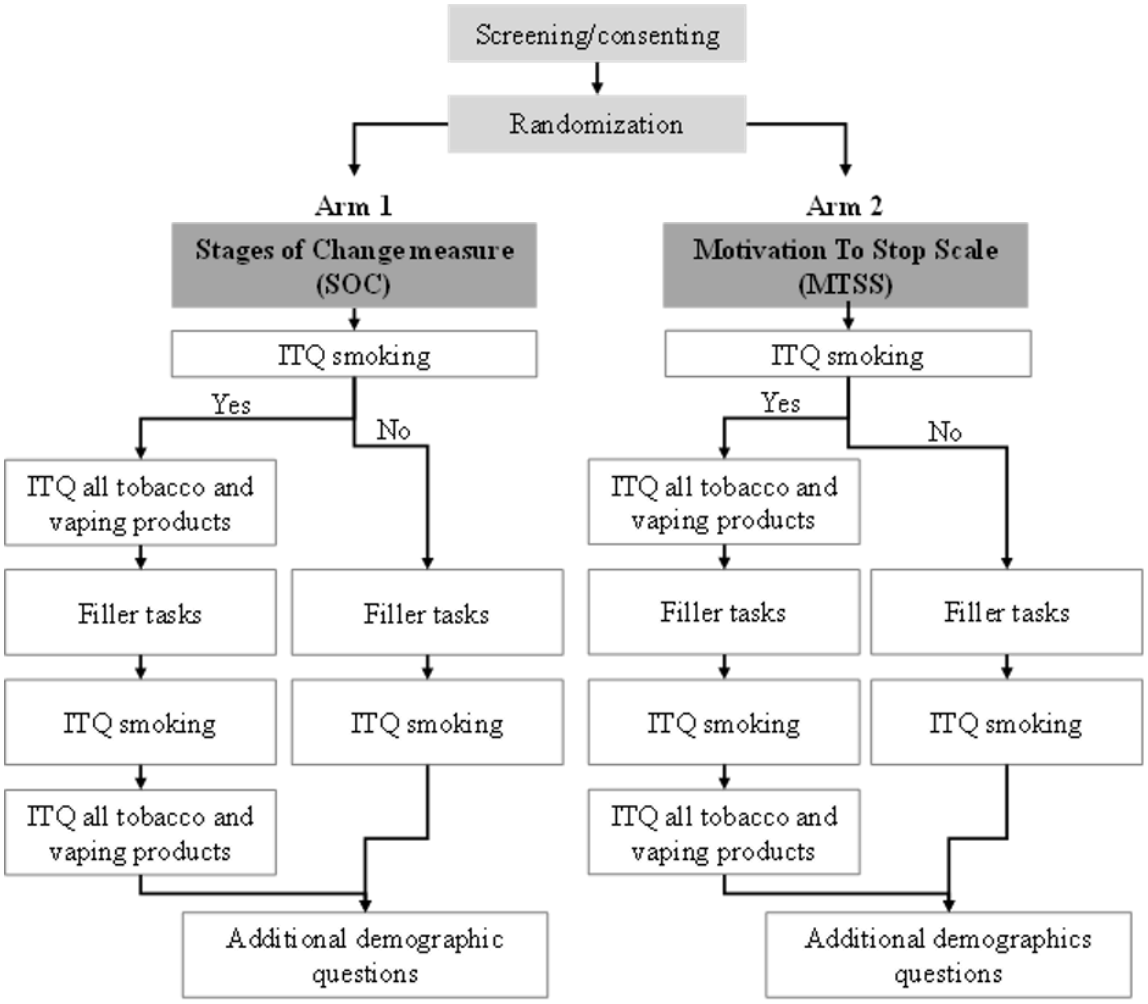

Figure 1. Overview of the study design and procedures. *Abbreviation: ITQ, intention to quit*

ITQ measures

Participants allocated to the first arm were asked to complete the SOC measure [13]. Using a dichotomous response scale ("yes/no"), participants were first asked if they were seriously considering quitting smoking within the next 6 months. Those who indicated "yes" were further asked if they were planning to quit smoking in the next 30 days. Participants completed SOC measure before they were given a filler task (test), then they again filled out the respective ITQ measure (retest). Only participants intending to quit smoking were asked to complete another set of assessments (test-retest) to capture ITQ "all tobacco and vaping products."

Participants allocated to the second study arm were asked to complete the MTSS [17], which consisted of an item asking participants to select one of seven response options that best described their belief, desire, or intention. Scales ranged from 1 to 7 (lowest to highest level of motivation to stop smoking, respectively). A "don't know" option was also provided. As per the developer's instructions, response options are interpreted as follows: 1: absence of any belief, 2: belief only, 3: moderate desire without intention, 4: strong desire without intention; 5: moderate desire with intention, 6: strong desire with long-term intention, and 7: strong desire with short-term intention [17]. Once participants completed the "test," they completed filler questions followed by a "retest." Participants strongly desiring or intending to quit smoking (those who selected response options 4, 5, 6, or 7) were asked to complete another set of MTSS (test-retest) to capture ITQ "all tobacco and vaping products."

Two categorizations were used to label smokers as "with intention" or "with no intention" to quit based on their MTSS responses (Table I). Briefly, in categorization 1, participants were considered "with intention to quit" if they answered 4 to 7, as per the questionnaire flow. In categorization 2, participants were considered "with intention to quit" if they answered 5 to 7, as per the developer [17]. In both categorizations, "don't know" was kept as a separate category.

Statistical analysis

All measured and derived demographics and subject characteristics are described in terms of absolute and relative frequencies. The SOC measure and MTSS capturing "smoking" and ITQ "all tobacco and vaping products" are presented as the overall number of subjects and the number and proportion of subjects endorsing each respective response option.

The test-retest reliability of the ITQ measures was assessed by computing Cohen's kappa coefficients for each item. Because this method depends on the scale of the variable, the weighted Cohen's kappa coefficients for each item with an ordinal scale were computed by applying the weighting methods developed by previous researchers [31][32]. Unweighted Cohen's kappa values were calculated for the nominal items. Kappa values of 0.2 or less indicate "slight" agreement, values between 0.21 and 0.40 indicate "fair," values between 0.41 and 0.60 indicate "moderate," values between 0.61 and 0.80 indicate "substantial," and values between 0.81 and 1.0 indicate "almost perfect or perfect" agreement [33]. The 95% confidence intervals (CIs) for Cohen's kappa coefficients were computed using the standard deviation of kappa as suggested by Fleiss, Cohen, and Everitt [34]. The

intraclass correlation coefficients (ICCs) for the test and retest assessments of the MTSS were also calculated.

ICCs were calculated as an index of reliability for the MTSS using a mixed-effects, consistency, single measurement model [31][35]. The MTSS was considered a continuous variable as proposed in the literature [17]. ICC values below 0.39 indicate "poor" accuracy, values between 0.40 and 0.59 indicate "fair" accuracy, values between 0.60 and 0.74 indicate "good" accuracy, and values between 0.75 and 1.0 indicate "excellent" accuracy [36].

The sample size calculation and corresponding target sample size were based on attaining adequate precision for Cohen's kappa and Cohen's weighted kappa for ITQ smoking and ITQ "all tobacco and vaping products." Sample size was recalculated in the interim analyses resulting in a larger sample size in Study Arm 2, as the initial sample size was not sufficient to estimate the 95% CI of the weighted Cohen's Kappa with an approximate +/- 0.02 precision and the assumption of 1% to 7% discordant answers and an expected change of only two categories (change of the answer to one lower level or one higher level) for ITQ Measure 2.

Analyses were performed on complete cases (n=722). Sensitivity analyses including individuals with inconsistent responses (n=113) were performed but did not alter the overall findings. Overall, the data show that the proportion of agreement between the categorized responses relating ITQ smoking and ITQ "all tobacco and vaping products" at Assessments 1 and 2 was similar between the complete case analysis and the analysis including all 835 participants (see Supplementary Table SI).

All analyses were performed with SAS® software (Statistical Analysis System, Version 9.4; Cary, NC, USA).

Results

Sample characteristics

Participant characteristics are presented in Table II. Overall, 722 current adult smokers were recruited for this study and randomized into the two study arms (n=311 Study Arm 1; n=411 Study Arm 2). Each study arm contained approximately 50% men and 50% women. Participant characteristics were similar across the two arms, with ~33% of participants in each of the three age groups: 21-35 years, 36-50 years, and 51-74 years. In both study arms, ~35% of participants had some college education,

30% reported an annual income between $10,000 and $29,999, and 92.9% and 93.4% reported being a daily smoker in Study Arms 1 and 2, respectively.

SOC test-retest reliability

Table III shows the proportion of smokers who completed the SOC measure and were categorized as "with intention" versus "with no intention" to quit smoking or to quit "all tobacco and vaping products." At the first test (Assessment 1), 66.2% of smokers (n=206) showed an ITQ smoking within the next 6 months. Since those with no ITQ smoking would have no intention to quit "all tobacco and vaping products," only the 206 participants who had showed an ITQ smoking within the next 6 months were asked their ITQ "all tobacco and vaping products." Among those participants, 86.4% (95% CI: 81.0-90.8%; n=178) reported that they had an ITQ "all tobacco and vaping products" within the next 6 months. Similar proportions of smokers with ITQ smoking (66.6%; 95% CI: 61.0%-71.8%; n=207) and "all tobacco and vaping products" (84.5%; 95% CI: 78.9%-89.2%; n=175) were observed at Assessment 2 (Table III).

The unweighted Cohen's kappa coefficients of 0.95 (95% CI: 0.91-0.99) and 0.82 (95% CI: 0.70-0.94) supported an almost perfect or perfect agreement between the assessments for ITQ smoking and ITQ "all tobacco and vaping products" within the next 6 months, respectively. Similarly, the unweighted Cohen's kappa coefficients of 0.88 (95% CI: 0.82-0.94) and 0.87 (95% CI: 0.80-0.94) supported an almost perfect or perfect agreement between the assessments for ITQ smoking and ITQ "all tobacco and vaping products" within the next 30 days, respectively (Table IV).

MTSS test-retest reliability

Table III shows that in applying categorization 1 (selected response options 4, 5, 6, or 7), 43.3% of smokers (n=178) showed an ITQ smoking at Assessment 1. Of these, 81.5% (n=145) reported that they intended to quit "all tobacco and vaping products." Applying categorization 2 (selected response options 5, 6 or 7), 30.4% of smokers (n=125) showed an ITQ smoking in Assessment 1, of which 53.9% (n=96) intended to quit "all tobacco and vaping products."

Similar proportions of smokers "with intention to quit smoking" and "intention to quit all tobacco and vaping products" were observed in Assessment 2 for categorization 1 or 2 (Table III).

The Cohen's kappa coefficients ranged between 0.73 and 0.88. An almost perfect or perfect agreement was observed for all items, except for ITQ "all tobacco and vaping products" when applying

categorization 1 with a Cohen's Kappa coefficient of 0.73, which still corresponded to substantial agreement (Table IV).

Analyzing the MTSS as a continuous variable did not reveal noticeable differences between the two assessments regarding ITQ smoking, with means of 3.4 in Assessments 1 and 2 (95% CI: 3.1-3.6; and 95% CI: 3.2-3.7, respectively). The mean of ITQ "all tobacco and vaping products," asked only of those who had already indicated having an ITQ smoking, was 4.8 (95% CI: 4.5-5.1) in Assessment 1 and 5.0 (95% CI: 4.7-5.3) in Assessment 2. The ICC for ITQ smoking was 0.93 (95% CI: 0.92-0.94), corresponding to excellent agreement between Assessments 1 and 2. Excellent agreement between the values in Assessments 1 and 2 was also observed for ITQ "all tobacco and vaping products" (ICC=0.86; 95% CI: 0.81-0.90).

Discussion

The aim of the study was to investigate the immediate test-retest reliability of two measures of ITQ—SOC measure and MTSS. Overall, the results show that both have high reliability with "almost perfect" to "perfect" agreement between two assessments, i.e., test and retest, separated by a brief filler task. Such findings have important implications for TPPI studies that often require assessing changes in ITQ in response to stimuli or communication material.

To our knowledge, the test-retest reliability of the two ITQ measures over a brief time interval had not been fully documented for both the SOC measure and MTSS. Brief time intervals are common in TNP regulatory research that assess changes in ITQ pre- or post-administration of different stimuli or communication material. Consequently, it is important to understand what changes or differences in ITQ are meaningful and occur as a result of interventions rather than random variations. Donovan and colleagues investigated the immediate test-retest reliability of a single study-specific item that categorized survey respondents into one of the four SOC categories: precontemplation, contemplation, preparation, and action [29]. Approximately 80% of the respondents were found to have given identical responses across the two-item iterations, with the measure displaying a moderate level of agreement (kappa = 0.72) for quitting smoking [29]. This is in contrast to another study, which found that ITQ changed spontaneously over short periods, with greater changes observed with repeated measures [37]. Compared to Donovan et al., Hughes and colleagues' assessed changes in ITQ over 7, 14, and 30 days. Similar to Donovan et al., our study examined the test-retest

reliability almost immediately, which better reflects the time lapse in pre- and post-intervention settings common to TPPI studies conducted for regulatory research purposes.

Our study findings also indicate that the instruments have similar performances in terms of test-retest reliability over a brief time interval. This is consistent with observations made by Hummel and colleagues who demonstrated that both the SOC measure and MTSS perform similarly in construct and predictive validity [11]. Despite these results, it is important to note that the two measures are not interchangeable and measure different concepts linked to ITQ. The SOC measure captures ITQ directly and can also be used to explore a potential shift from one stage to another among the precontemplation (not thinking of quitting), contemplation (thinking of quitting within the next 6 months), and preparation (thinking of quitting within the next 30 days) stages [13]. In contrast, the MTSS not only captures ITQ but also assesses, as part of the same item, additional overlapping dimensions of "motivation," namely, belief and desire [17]. The MTSS asks respondents to select one of seven response options about quitting to capture: intention (I intend/hope to stop), desire (I want to), and belief (I think I should stop smoking) [16][17]. However, while intention and desire to stop have been shown to predict quit attempts, belief alone that one should stop is not predictive of future quit attempts [38]. This means that depending on the concept of interest and context of use, the two instruments cannot be used interchangeably as the SOC measure solely captures ITQ while the MTSS captures ITQ as part of a broader concept of "motivation." Thus, selection of the most appropriate measure should be driven by the study's objective and whether the objective is to capture ITQ directly or motivation.

In terms of study limitations, the test-retest sessions were conducted as part of the same assessment. Since the time window between the two sessions was short, participants may have remembered their initial responses. However, this design was chosen to mimic test-retest conditions in TPPI studies that assess the impact of risk communications on ITQ before and after reading labeling materials related to various TNPs. The study design meets the US FDA 2009 guidance for patient-reported outcome measures (available at https://www.fda.gov/media/77832/download) on assessing the test-retest reliability of an instrument. Furthermore, assessing test-retest reliability for ITQ over a longer period may not be conclusive, as up to 25% of smokers' intentions change over a period as short as 7 to 14 days in the absence of any intervention [37]. In addition to the above limitation, it is important to highlight that the included measures have been mostly used and validated in adult smokers. Future psychometric validation studies with larger sample sizes should confirm the

appropriateness of these measures in assessing ITQ in other populations, such as users of smokeless and smoke-free products.

Conclusion

In summary, both the SOC measure and MTSS showed good immediate test-retest reliability in assessing ITQ smoking and "all tobacco and vaping products." This is consistent with previous research that reported that both instruments have similar psychometric performances, meaning both are appropriate for TPPI studies conducted for regulatory purposes. However, knowing that the SOC measure directly captures ITQ while the MTSS captures motivation to quit more broadly, the selection of the most appropriate instrument should be driven by the specific objectives of future studies, and whether the studies are intended to measure ITQ specifically or more broadly. Our findings underscore the importance of asserting test-retest reliability of ITQ measures in order to understand score stability over short periods of time and identify meaningful differences in ITQ in TPPI studies that assess the impact of communications or marketing and labelling material on ITQ or motivation to quit smoking and all TNP use.

Tables

ITQ	Categorization 1	Categorization 2[a]
With no ITQ	1. I don't want to stop smoking. 2. I think I should stop smoking but don't really want to. 3. I want to stop smoking but haven't thought about when.	1. I don't want to stop smoking. 2. I think I should stop smoking but don't really want to. 3. I want to stop smoking but haven't thought about when. 4. I REALLY want to stop smoking but I don't know when I will.
With ITQ	4. I REALLY want to stop smoking but I don't know when I will. 5. I want to stop smoking and hope to soon. 6. I REALLY want to stop smoking and intend to in the next 3 months. 7. I REALLY want to stop smoking and intend to in the next month.	5. I want to stop smoking and hope to soon. 6. I REALLY want to stop smoking and intend to in the next 3 months. 7. I REALLY want to stop smoking and intend to in the next month.
Don't know	Don't know	Don't know

Table I. MTSS-based categorizations for ITQ

[a] *As per the developer's instructions, response options are interpreted as follows: 1: absence of any belief, 2: belief only "I should," 3: moderate desire "I want" without intention, 4: strong desire "I really want" without intention, 5: moderate desire "I want" with intention "hope to soon," 6: strong desire "I really want" with long-term intention "in the next 3 months," and 7: strong desire "I really want" with short-term intention "in the next month"*[17].

Abbreviations: ITQ, intention to quit; MTSS: Motivation To Stop Scale.

		SOC measure (Arm 1; n=311)		MTSS (Arm 2; n=411)	
Variable	**Category**	**n**	**%**	**n**	**%**
Age group	21-35	101	32.5	135	32.8
	36-50	105	33.8	136	33.1
	51-74	105	33.8	140	34.1
Sex	Male	154	49.5	206	50.1
	Female	156	50.2	205	49.9
	Prefer not to say	1	0.3	.	.
Marital status	Never married (single)	78	25.1	112	27.3
	Living with a partner	47	15.1	77	18.7
	Married	108	34.7	145	35.3
	Legally separated	9	2.9	7	1.7
	Divorced	56	18.0	52	12.7
	Widowed	13	4.2	18	4.4
Occupational status	Currently working	171	55.0	207	50.4
	Temporarily laid off, sick leave or maternity leave	5	1.6	4	1.0
	Looking for work/unemployed	25	8.0	33	8.0
	Retired	30	9.6	52	12.7
	Disabled, permanently or temporarily	38	12.2	55	13.4
	Homemaker	33	10.6	46	11.2
	Student	3	1.0	8	1.9
	Other	6	1.9	6	1.5
Education	Less than high school	8	2.6	18	4.4
	Some high school or GED	21	6.8	32	7.8
	High school graduate	90	28.9	103	25.1

		SOC measure (Arm 1; n=311)		MTSS (Arm 2; n=411)	
Variable	**Category**	**n**	**%**	**n**	**%**
	Some college	109	35.0	143	34.8
	College graduate	64	20.6	83	20.2
	Advanced degree	19	6.1	32	7.8
Income group	Less than $10,000	37	11.9	39	9.5
	$10,000 to $29,999	87	28.0	126	30.7
	$30,000 through $44,999	62	19.9	65	15.8
	$45,000 through $59,999	37	11.9	59	14.4
	$60,000 through $74,999	22	7.1	35	8.5
	$75,000 through $99,999	27	8.7	38	9.2
	$100,000 through $149,999	14	4.5	21	5.1
	$150,000 and over	16	5.1	22	5.4
	I do not know	2	0.6	1	0.2
	Prefer not to say	7	2.3	5	1.2
Smoking group	Occasional smoker[a]	22	7.1	27	6.6
	Daily smoker	289	92.9	384	93.4

Table II. Participant characteristics

[a] *"Occasional smoker" is defined as adult smokers who smoke less than one cigarette per day.*

Abbreviations: GED, General Education Development; MTSS, Motivation To Stop Scale; SOC: Stages of Change.

		Assessment 1				Assessment 2			
	Variable	**n**	**%**	**95% CI**		**n**	**%**	**95% CI**	
SOC measure	**ITQ smoking**	-	-	-	-	-	-	-	-
	ITQ	206	66.2	60.7	71.5	207	66.6	61	71.8
	No ITQ	105	33.8	28.5	39.3	104	33.4	28.2	39
	Don't know	-	-	-	-	-	-	-	-
	Total	**311**	**100**	-	-	**311**	**100**	-	-
	ITQ all tobacco & vaping products	-	-	-	-	-	-	-	-
	ITQ	178	86.4	81	90.8	175	84.5	78.9	89.2
	No ITQ	28	13.6	9.2	19	32	15.5	10.8	21.1
	Don't know	-	-	-	-	-	-	-	-
	Total	**206**	**100**	-	-	**207**	**100**	-	-
MTSS (Categorization 1)	**ITQ smoking**	-	-	-	-	-	-	-	-
	ITQ	178	43.3	38.5	48.3	181	44	39.2	49
	No ITQ	224	54.5	49.6	59.4	225	54.7	49.8	59.6
	Don't know	9	2.2	1	4.1	5	1.2	0.4	2.8
	Total	**411**	**100**	-	-	**411**	**100**	-	-
	ITQ all tobacco & vaping products	-	-	-	-	-	-	-	-
	ITQ	145	81.5	75	86.9	157	86.7	80.9	91.3
	No ITQ	25	14	9.3	20	17	9.4	5.6	14.6
	Don't know	8	4.5	2	8.7	7	3.9	1.6	7.8
	Total	**178**	**100**	-	-	**181**	**100**	-	-
MTSS (Categorization 2)	**ITQ smoking**	-	-	-	-	-	-	-	-
	ITQ	125	30.4	26	35.1	125	30.4	26	35.1
	No ITQ	277	67.4	62.6	71.9	281	68.4	63.6	72.8
	Don't know	9	2.2	1	4.1	5	1.2	0.4	2.8

		Assessment 1				Assessment 2			
	Variable	**n**	**%**	**95% CI**		**n**	**%**	**95% CI**	
	Total	**411**	**100**	-	-	**411**	**100**	-	-
	ITQ all tobacco & vaping products	-	-	-	-	-	-	-	-
	ITQ	96	53.9	46.3	61.4	111	61.3	53.8	68.5
	No ITQ	74	41.6	34.3	49.2	63	34.8	27.9	42.2
	Don't know	8	4.5	2	8.7	7	3.9	1.6	7.8
	Total	**178**	**100**	-	-	**181**	**100**	-	-

Table III. Comparisons of ITQ smoking and ITQ "all tobacco and vaping products" within the next 6 months or 30 days among Assessments 1 and 2 of the SOC measure and MTSS Categorizations 1 and 2

Abbreviations: CI, confidence interval; ITQ, intention to quit; MTSS, Motivation to Stop Scale; SOC: Stages of Change.

			Assessment 2				Unweighted kappa coefficient (95% CI)
			With intention to quit	With no intention to quit	Don't know	Total	
SOC measure Assessment 1	**ITQ Smoking**						
	within the next 6 months	With ITQ	203 (65.3%)	3 (1.0%)		**206**	
		With no ITQ	4 (1.3%)	101 (32.5%)		**105**	0.95 (0.91-0.99)
		Total	**207**	**104**		**311**	
	within the next 30 days	With ITQ	110 (35.4%)	6 (1.9%)		**116**	
		With no ITQ	12 (3.9%)	183 (58.8%)		**195**	0.88 (0.82-0.94)
		Total	**122**	**189**		**311**	
	ITQ all tobacco & vaping products and vaping						
	within the next 6 months	With ITQ	170 (83.7%)	7 (3.4%)		**177**	
		With no ITQ	2 (1.0%)	24 (11.8%)		**26**	0.82 (0.70-0.94)
		Total	**172**	**31**		**203**	
	within the next 30 days	With ITQ	103 (50.7%)	7 (3.4%)		**110**	
		With no ITQ	6 (3.0%)	87 (42.9%)		**93**	0.87 (0.80-0.94)
		Total	**109**	**94**		**203**	

			Assessment 2				Unweighted kappa coefficient (95% CI)
			With intention to quit	With no intention to quit	Don't know	Total	
MTSS Assessment 1	**Categorization 1 ITQ Smoking**	With ITQ	169 (41.1%)	9 (2.2%)		**178**	0.88 (0.83-0.93)
		With no ITQ	12 (2.9%)	212 (51.6%)		**224**	
		Don't know		4 (1.0%)	5 (1.2%)	**9**	
		Total	**181**	**225**	**5**	**411**	
	ITQ all tobacco & vaping products and vaping products	With ITQ	141 (83.4%)	1 (0.6%)		**142**	0.73 (0.57-0.88)
		With no ITQ	9 (5.3%)	11 (6.5%)		**20**	
		Don't know	1 (0.6%)		6 (3.6%)	**7**	
		Total	**151**	**12**	**6**	**169**	
	Categorization 2 ITQ Smoking	With ITQ	112 (27.3%)	13 (3.2%)		**125**	0.84 (0.78-0.90)
		With no ITQ	13 (3.2%)	264 (64.2%)		**277**	
		Don't know		4 (1.0%)	5 (1.2%)	**9**	
		Total	**125**	**281**	**5**	**411**	
	ITQ all tobacco & vaping products and vaping products	With ITQ	93 (55.0%)	2 (1.2%)		**95**	0.83 (0.74-0.92)
		With no ITQ	12 (7.1%)	55 (32.5%)		**67**	

			Assessment 2				Unweighted kappa coefficient (95% CI)
			With intention to quit	**With no intention to quit**	**Don't know**	**Total**	
		Don't know	1 (0.6%)		6 (3.6%)	**7**	
		Total	**106**	**57**	**6**	**169**	0.88 (0.83-0.93)

Table IV. Agreement between the two SOC or MTSS measure assessments of ITQ smoking and ITQ "all tobacco and vaping products" within the next 6 months or 30 days

Abbreviations: CI, confidence interval; ITQ, intention to quit; MTSS, Motivation to Stop Scale; SOC, Stages of Change.

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Data availability statement

Data are available upon request. Inquiries can be directed to the corresponding author.

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