Psychological predictors of male smokeless tobacco use initiation and cessation: A 16-year longitudinal study

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Abstract

Aims—To test whether psychological factors longitudinally predict male smokeless tobacco (SLT) initiation and cessation.

Design—Sixteen year longitudinal design with 95% retention at year six and 82% at year sixteen.

Setting—Forty Washington State school districts.

Participants—SLT use data were gathered on a cohort of adolescents (91% Caucasian). For SLT initiation, the sample size was 2,468. For SLT cessation, sample sizes were 219 (age 20 outcome) and 192 (age 28 outcome).

Measurements—Self-reported psychological measures of parental disobedience ("parent-noncompliance"), peer influence ("friend-compliance"), rebelliousness, and thrill-seeking were taken at ages 12 and 18. SLT use was measured at ages 12, 18, 20, and 28.

Findings—For SLT initiation, scoring high on the following psychological factors at age 12 at least doubled the odds of daily SLT use at age 18 (p < .001): friend-compliance (OR: 2.56, 95% CI: 1.78 – 3.68), rebelliousness (OR: 2.16, 95% CI: 1.46 – 3.19), and thrill-seeking (OR: 2.33, 95% CI: 1.45 – 3.75). For SLT cessation, none of the psychological factors at age 18 predicted SLT cessation at age 20 or 28 (p value range: .06 to .94).

Conclusion—Peer influence, rebelliousness, and thrill-seeking appear to strongly predict smokeless tobacco initiation among male youth in the USA.

Keywords

smokeless tobacco; males; adolescents; young adults; longitudinal

Introduction

Smokeless tobacco (SLT; including chew, dip, and snuff) use remains a serious public health problem. In many countries, SLT is available to anyone over the age of 18 [1]. Some countries limit accessibility by banning advertising or banning use, but tobacco companies

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circumvent these laws [1]. SLT is less dangerous than cigarettes, but is not a safe alternative to cigarettes [2]. While American SLT is less toxic than South Asian varieties [3], use of all SLT varieties is linked to serious health consequences including cancer, stroke, heart disease, gum disease, and tooth decay [2] as well as male infertility [4].

The majority of SLT initiation begins in adolescence (ages 11 through 18) [5; 6]. Use is most common among males: in 2009, 11.0% of male (vs. 1.5% female) high school students were current SLT users (i.e., at least monthly) [2]. Significant levels of cessation begin in young adulthood (ages 18 to 28) [7]. Indeed, data from the Hutchinson Smoking Prevention Project [8] show that, of adolescent males who used SLT daily at age 18, 22% quit by age 20, while 31% quit by age 28.

Most SLT research focuses on its value as a cigarette smoking harm reduction method. For tobacco, harm reduction means lowering health risks by having users switch from cigarettes to smokeless tobacco. Since the value of SLT harm reduction is debated (for reviews, see [9; 10]), this study is concerned with understanding the predictors of SLT use.

To address the problems of SLT initiation and cessation among males, basic research on the psychological influences on male adolescent SLT initiation and young adult SLT cessation would inform theory and guide interventions aimed at improving the modest success rates of young male SLT prevention and cessation interventions [11; 12]. Little is known about what theory-based psychological factors prospectively predict SLT initiation and cessation. This study addresses this knowledge gap.

Theory of Triadic Influence and male adolescent and young adult SLT use

A major theory relevant to understanding male SLT use initiation and cessation is the Theory of Triadic Influence (TTI) [13; 14]. TTI, which is based on over 20 years of extant research, utilizes the strengths of prior theories, including personality and social learning, and organizes them into a coherent framework relevant to the study of male SLT use [13]. TTI has consistently predicted adolescent and young adult substance use [e.g. tobacco; 15].

TTI posits three "streams of influence": (1) interpersonal, (2) attitudinal, and (3) intrapersonal [14]. Within each of these three streams, there are three "levels of causation" (from farthest to closest): (1) ultimate, (2) distal, and (3) proximal or immediate [14]. Within these streams and levels are a core set of risk factors. First, distal-level interpersonal factors [14], including: (a) a weak desire to comply with parents (i.e., parent-noncompliance; [16]) and (b) a strong desire to comply with friends (i.e., friend-compliance; [17]). Second, distal-level attitudinal factors include rebelliousness, defined as the extent to which individuals prefer behavior that does not conform to authority in general [17]. Third, ultimate-level intrapersonal factors are broad dispositional factors [13] such as thrill seeking, a component of sensation seeking, which represents individual differences in the desire to engage in risky behavior [18].

Other ultimate-level factors, including biological [13], have predicted cigarette smoking and thus may predict SLT use [19; 20]. However, there is a dearth of research on psychological factors such as parent non-compliance, friend compliance, rebelliousness, and thrill-seeking. Overall, these are important factors for SLT initiation and cessation because we posit that they are markers of a subpopulation of deviant-prone males.

There is little empirical research on the role of these TTI-based psychological factors in male adolescent and young adult SLT use. Indeed, there is a small literature on SLT use, most of which focused on specialized subgroups (e.g. military recruits) instead of the general population and few were theory-based [21]. *In terms of predicting SLT initiation,*

several studies show the predictive role of beliefs about the safety, acceptability, and prevalence of SLT [22; 23]. Other studies showed that peer use and concurrent experimentation with other drugs as being key predictors [23; 24; 25]. *Regarding SLT experimentation,* a four-year longitudinal study found that living in a rural area, not having two married parents in the household, involvement in risky behaviors, physical fights, truancy from school, and having a girlfriend were important predictors [25]. Several more recent studies have looked at college students, finding that belonging to a fraternity as well as novelty seeking were associated with SLT experimentation [26; 27]. Cross-sectional studies have examined psychosocial correlates of adolescent SLT use such as extraversion and psychoticism, but none of these examined *young adult SLT initiation* [28; 29; 30].

For predicting cessation of SLT use, there are few relevant studies, none of which used a theory-based approach or examined psychological predictors. Specifically, one longitudinal study [31] compared SLT use to concomitant use (SLT and cigarettes), and found that those who use SLT alone are more likely to quit. Moreover, a recent study [32] found that following a program and using nicotine replacement therapy were significant predictors of short-term (i.e., four weeks) cessation in a sample of Bangladeshi-born women living in the U.K.

Study aims

Using data from a large representative longitudinal cohort, this paper fills major gaps in needed theory-based empirical research by reporting a longitudinal study of TTI-consistent interpersonal, attitudinal, and intrapersonal psychological factors as predictors of male adolescent and young adult SLT use. The TTI-consistent psychological factors are (1) parent-noncompliance, (2) friend-compliance, (3) rebelliousness, and (4) thrill-seeking. The outcomes are SLT use initiation at age 18 and SLT cessation at ages 20 and 28. The theory and previous research reviewed above [22; 23; 25] illustrate that these psychological factors are markers of deviant-prone young males that may initiate and not quit SLT use. Thus, we hypothesize the following:

- Hypothesis 1: Males scoring higher on the psychological risk factors at age 12 would have higher odds of SLT *initiation* at age 18.

- Hypothesis 2: Males scoring higher on the psychological risk factors at age 18 would have lower odds of SLT *cessation* at ages 20 and 28.

Methods

Eligible Study Sample

The sample was drawn from the combined control and intervention cohort from a large randomized Washington State school-based tobacco use prevention trial, the Hutchinson Smoking Prevention Project (HSPP) [8].

The eligible SLT *initiation* study sample was defined as all of the male adolescents who, at baseline (age 12) provided the following data: (1) TTI psychological factors and (2) reported never using SLT. Of these 2,603 eligible participants, 2,468 (95%) provided follow-up data on SLT use at age 18, thereby comprising the total sample for SLT initiation.

The eligible SLT *cessation* study sample was defined as all of the male adolescents who at baseline (age 18) provided the following data: (1) TTI psychological factors and (2) reported using SLT daily. Of these 233 eligible participants, 219 (93%) provided follow-up data on SLT use at age 20, and 192 (82%) provided follow-up data on SLT use at age 28. These 219 and 192 comprised the total sample for SLT cessation at ages 20 and 28, respectively. The entire sample was 91% Caucasian.

Procedures

The age 12 and 18 data collections were conducted using a classroom survey (or by mail and telephone for absentees and those no longer enrolled in the school district). The age 20 and 28 data collections were conducted using a mailed survey with telephone follow-up for non-responders. All procedures were approved annually by the Fred Hutchinson Cancer Research Center's Institutional Review Board.

Predictor Measures

Four TTI-consistent psychological factors at ages 12 and 18—Factors measured at age 12 provided baseline predictor data for the SLT initiation analysis. Factors measured at age 18 provided baseline data for the SLT cessation analysis. The factors were as follows: First, *parent-noncompliance* was measured with a two-item scale (Cronbach alphas = 0.53 at age 12 and 0.68 at age 18). A sample item for this factor was: "I try to do what my parents want me to do" (reverse coded). Second, *friend-compliance* was measured with a three-item scale (Cronbach alphas = 0.67 at age 12 and 0.58 at age 18). A sample item for this factor was: "I do what my friends want me to do, even if I really don't want to." Third, *rebelliousness* was measured with a four-item scale (Cronbach alphas = 0.59 at age 12 and 0.51 at age 18). A sample item for this factor was: "I don't believe in following the rules." Fourth, *thrill-seeking* was measured with a two-item scale (Cronbach alphas = 0.55 at age 12 and 0.46 at age 18). A sample item for this factor was: "I look for dangerous things to do just for excitement." The response options for each of the items in these scales were "Not like me" (coded "0"), "A little like me" (coded "1"), "Somewhat like me" (coded "2"), and "Just like me" (coded "3"). A full list of the measures is included as supplementary material. These same measures were used in previous studies [33; 34].

Scores for each of the four psychological scales were calculated as the sum of the item raw scores. The means (and ranges) for each of the scales, with higher scores indicating higher levels on the given psychological scale, were the following: parent-noncompliance, 2.0 (0 – 6) at age 12 and 2.7 (0 – 6) at age 18; friend-compliance, 1.6 (0 – 9) at age 12 and 1.9 (0 – 8) at age 18; rebelliousness 4.4 (0 – 12) at age 12 and 5.7 (0 – 12) at age 18, and thrill seeking 3.1 (0 – 6) at age 12 and 4.4 (0 – 6) at age 18.

Outcome Measures

Initiation of SLT use by age 18—In the age 18 survey, respondents were asked "How often do you currently use chewing tobacco or snuff?" with responses ranging from "Have never used chewing tobacco or snuff" to "More than 10 times per day." For this study, initiation was defined as responding with at least daily use. We chose daily use because it is the most clinically important level: young adult males who use SLT daily are *the most* at risk for health problems and nicotine dependence [35]. To enhance reliability of self-reported tobacco use, participants provided a saliva specimen just before survey administration since doing so increases truthful reporting [36; 37].

Cessation of SLT use by age 20—In the age 20 survey, respondents were asked "When was the <u>last time</u> you used chewing tobacco or snuff?" The response options were "Within the last week", "Within the last month", "1–6 months ago", "7–12 months ago", and "More than a year ago". Cessation was defined as responding with "1–6 months ago" or longer. A tobacco use cessation outcome of at least six months is desirable since it is the recommended minimum definition of successful abstinence among untreated users [38; 39]. However, since there were just two years between the age 18 SLT use measure and the age 20 SLT cessation measure, only a small number of the study sample had quit using SLT for at least six months (n = 58). In the peer-reviewed empirical literature, SLT quit durations range from one month [32], to three months [40], to six months [41]. While all standard

lengths of cessation are subject to relapse [42], a one-month cessation outcome provided sufficient data for the analysis that is within the acceptable range of studies reported to date.

Cessation of SLT use by age 28—In the age 28 survey, respondents were asked "How often do you currently use chewing tobacco or snuff?" The response options were "Not at all", "Less than once a month", "Once a month or more, but not once a week", "Once a week or more, but not daily", and "At least daily". Cessation was defined as responding with "Not at all." Although it would have been ideal to have a measure of the length of time respondents had remained quit, this was not available from the survey question. Biochemical verification of SLT cessation would also have been ideal, though rates of misreporting are low in observational studies [43].

Analytic Approach

We calculated a series of logistic regression models to examine to what extent TTI measures predict an SLT transition (i.e., initiation or cessation). We categorized TTI measures by quartiles in each respective SLT transition analysis to establish and estimate thresholds where the risk of an SLT transition is substantially greater than at lower TTI levels. There were variations in the quartile cut-points for the psychological scales due to the fact that the response distributions did not yield perfect 25% cut-points. With each model, we used a Wald test for homogeneity to assess the influence of TTI quartiles on making an SLT transition. We used Stata's robust and cluster variance estimators to account for the intraclass correlation introduced by clustering of study participants attending the same school district. Randomized condition (i.e., intervention vs. control) from the original study design was adjusted for in all models, and since participation in team sports is a highly consistent predictor of SLT use [44; 45], this factor at age 12 was adjusted for in models for SLT initiation. Age 12 school performance (i.e., self-report of school grades) and parent education were also adjusted for in these models. In the analyses of SLT cessation at age 28, we also adjusted for the categorical level of SLT usage at the age 18 (1–3 times/day, 4–10 times/day, >10 times/day). All statistical analyses were conducted with Stata statistical software (version 10.1).

Results

SLT Initiation

Of the 2,468 adolescent males who never tried SLT at age 12, 233 (9.4%) reported daily SLT use at age 18. As shown in Table 1, higher levels of friend-compliance, rebelliousness, and thrill-seeking, all measured at age 12, significantly predicted at least two times higher odds of daily SLT usage at age 18 ($p < 0.001$). Parent non-compliance, measured at age 12, did not significantly predict daily SLT use at age 18 ($p = .33$). Non-daily users could be more similar to daily users than never users, or they might have a set of unique characteristics. Accordingly, we re-ran the analyses without non-daily users. The results were nearly identical to those that include non-daily users since 88% of the less-than-daily SLT users were 'never-users.' See Supplemental Table 1.b."

SLT Cessation

Of the 233 adolescent males who used SLT daily at age 18, 52 (22%) quit by age 20, while 73 (31%) quit by age 28. However, as shown in Table 2, none of the psychological factors measured were significant predictors of SLT cessation at age 28 (all $p > .05$) and the results were similar for cessation outcomes at age 20 (p-values ranging from 0.06 to 0.86). To confirm these results, we re-ran all of the analyses using a two-level mixed model, with a random sample of schools (random effect) at level two and subjects (random effect) at level one. The results yielded similar odds ratios (< 5% difference) and statistical inference (all p-

values < 0.001 and >.05 remained so). Note that all of these comparisons are of the extreme values of the predictors (e.g., Quartile 1 vs. Quartile 4 for friend compliance).

Discussion

Interpretation of Results for Hypothesis 1

In strong support of Hypothesis 1, the results show that scoring high on friend-compliance, rebelliousness, and thrill-seeking at least doubles the odds that an adolescent male will become a daily SLT user. Consistent with the predictions of TTI, friend compliance and rebelliousness strongly predicted young male SLT use initiation. As a theoretical implication, TTI states that ultimate-level intrapersonal factors (such as thrill-seeking) are less predictive of behavior, whereas the results of this study show that thrill-seeking was also a strong predictor of SLT use initiation. Perhaps the role of ultimate-level intrapersonal factors is more important for SLT use initiation than suggested by the theory. Our interpretation of the non-significant parent-noncompliance prediction is that SLT use is rarely targeted by parents. Thus, children who use SLT may not be consciously disobeying their parents. Future research should examine the mechanisms by which friend-compliance, rebelliousness, and thrill-seeking lead young males to begin SLT use, as well as the parental role in initiation of SLT use.

Interpretation of Results for Hypothesis 2

There was no evidence to support Hypothesis 2 that males scoring higher on the psychological risk factors would have a lower probability of SLT cessation at ages 20 and 28. To our knowledge, no prior published research has examined psychological factors predictive of cessation of SLT use in male young adults. Our results do not necessarily mean that these factors are not important to cessation of SLT use. Indeed, the sample sizes in Study 2 were small and thus there may not have been enough power to detect significant results. As a theoretical implication, while TTI states that these psychological factors are important for this behavior, it is possible that they are less important for this age group. By ages 20 and 28, males are likely old enough to be independent and thus make their own decisions regarding their behaviors. Interestingly, friend compliance was nearly significant in the age 20 cessation outcome ($p = 0.06$):SLT users with the highest level of friend compliance are approximately 60% less likely to quit SLT at the age of 20 (OR = 0.39, 95% CI: 0.15 to 0.97). While not definitive here, perhaps this factor is more predictive of SLT cessation in early young adulthood (i.e., age 20) than in later young adulthood (i.e., age 28). Regarding the other psychological factors, since these males are old enough to be no longer facing parental discipline, rebelliousness may no longer be an influence on their SLT use. Rebelliousness toward authority in general may not be influential in this age group since SLT use is a covert behavior, and thus there is little societal sanctioning of this behavior. Future research should more closely examine the potential influence of these and other related psychological factors on SLT cessation.

Comparison with Smoked Tobacco

Previous studies using the same predictors for cigarette smoking [33; 34] found that these TTI-consistent psychological predictors (parent non-compliance, friend compliance, rebelliousness, and thrill-seeking) are important predictors of smoking transitions between the ages of 14 and 17. In terms of initiation, parent non-compliance and friend compliance measured at age 18 predicted initiation of daily smoking by age 28. Similarly, friend compliance was an important predictor of initiation in the current study on SLT. In terms of cessation, friend compliance predicted smoking continuation in young adulthood. In the current study on SLT, friend compliance was nearly significant in predicting SLT cessation at age 20 ($p = .06$). Taken together, this body of research suggests the hypothesis that similar

TTI-consistent psychological factors predict both smoked and smokeless tobacco use initiation –and possibly cessation. Future research should test this hypothesis.

Comparison with Prior Research

The current study contributes a much-needed longitudinal study to the body of research conducted to date. There are few longitudinal studies, and the most methodologically rigorous conducted to date spanned four years, had lower retention (62%), and was published in 1998 [25]. Overall, the current study fills important and overdue gaps in the literature using theory-based psychological predictors and the rigorous methodology of a long-term (16-year) prospective design with high levels of retention.

Preventative Implications

The results of this study suggest that friend-compliance, rebelliousness, and thrill-seeking are key factors in young male initiation of SLT use. Thus, interventions should be developed to target these deviance-prone factors in order to prevent young males from starting use of SLT. To save precious resources, interventionists can specifically target young males who score high on these psychological factors: friend-compliance, rebelliousness, and thrill-seeking.

Limitations

Key limitations are the following: First, power for the cessation analysis was limited by relatively small sample sizes that yielded wide confidence intervals. Second, the psychological factors were measured with only a few items per factor, thereby contributing to their modest reliability. In order to survey this large number of adolescents longitudinally with high retention, such brevity was essential. Third, all measures of SLT use were self-reported, although there is evidence that self-reported SLT use is accurate [43]. Fourth, there was a difference in cessation measures at ages 20 and 28, which limits the comparisons between these ages. Fifth, all of the comparisons were of the extreme values of the predictors (e.g., Quartile 1 vs. Quartile 4 for friend compliance). Finally, there is limited generalizability to females, older adults, other countries, and other races. While the study sample is representative of the majority of SLT users in the US [about 85% of all US SLT users are Caucasian; 46] the results may not generalize to non-Caucasian SLT users who make up about 15% of SLT users in the US.

Conclusions

Using a large longitudinal study with a high retention rate, this study provides the first evidence that males who scored high on friend-compliance, rebelliousness, and thrill-seeking at age 12 had at least double the odds of becoming a daily SLT user by age 18. Targeting these psychological predictors may prevent SLT use among young males.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Table 1

Age 12 demographic and psychological predictors of SLT initiation by age 18 among never-users at age 12.

Characteristic at age 12	SLT Initiation Age: 18		OR (95% CI)*	p-value
	None or less than daily	*Daily*		
N	**2,235**	**233**		
Experimental Condition				
Control	1,185 (91.9%)	105 (8.1%)	ref	
Experimental	1,050 (89.1%)	128 (10.9%)	1.38 (0.83 – 2.27)	0.21
Participate in Team Sports, n (%)				
No	708 (93.2%)	52 (6.8%)	ref	
Yes	1,527 (89.4%)	181 (10.6%)	1.61 (1.21 – 2.14)	0.001
Parent's Level of Education, n (%)				
High School	719 (90.3%)	77 (9.7%)	ref	
> High School	1,351 (90.7%)	138 (9.3%)	0.95 (0.63 – 1.42)	
Missing	165 (90.2%)	18 (9.8%)	1.00 (0.56 – 1.78)	0.95
Parent Non-compliance, n (%)				
1st Quartile, score = 0	366 (88.6%)	47 (11.4%)	ref	
2nd Quartile, score = 1	522 (90.8%)	53 (9.2%)	0.82 (0.54 – 1.23)	
3rd Quartile, score = 2	606 (89.9%)	68 (10.1%)	0.88 (0.59 – 1.31)	
4th Quartile, score = 3+	741 (91.9%)	65 (8.1%)	0.72 (0.50 – 1.04)	0.33
Friend Compliance, n (%)				
1st Quartile, score = 0	586 (93.9%)	38 (6.1%)	ref	
2nd Quartile, score = 1	298 (91.1%)	29 (8.9%)	1.45 (0.95 – 2.20)	
3rd Quartile, score = 2	253 (91.0%)	25 (9.0%)	1.50 (0.98 – 2.29)	
4th Quartile, score = 3+	350 (85.4%)	60 (14.6%)	2.56 (1.78 – 3.68)	< 0.001
Rebelliousness, n (%)				
1st Quartile, score = 0 – 2	530 (92.7%)	42 (7.3%)	ref	
2nd Quartile, score = 3 – 4	695 (92.9%)	53 (7.1%)	0.95 (0.61 – 1.49)	
3rd Quartile, score = 5 – 6	604 (89.6%)	70 (10.4%)	1.43 (0.99 – 2.07)	
4th Quartile, score = 7+	406 (85.7%)	68 (14.3%)	2.16 (1.46 – 3.19)	< 0.001
Thrill-seeking, n (%)				
1st Quartile, score = 0 – 1	554 (93.7%)	37 (6.3%)	ref	
2nd Quartile, score = 2 – 3	698 (92.2%)	59 (7.8%)	1.28 (0.79 – 2.08)	
3rd Quartile, score = 4	430 (89.0%)	53 (11.0%)	1.80 (1.07 – 3.01)	
4th Quartile, score = 5 +	553 (86.8%)	84 (13.2%)	2.33 (1.45 – 3.75)	< 0.001

*All logistic regression models adjust for experimental condition, age 12 participation in team sports, school grades, and parent education; ref = reference category for odds ratios. P-values are from a Wald's test of homogeneity in SLT acquisition rates across predictor categories.

Percentages are row-based.

Table 2

Age 18 psychological predictors of SLT cessation by age 28 among age 18 daily SLT users.

Characteristic at age 18	SLT Cessation Age: 28		OR (95% CI)*	p-value
	Continued SLT Use	*SLT Cessation*		
N	**121**	**71**		
SLT Usage				
1 – 3 times per day	56 (56.0%)	44 (44.0%)	ref	
4 – 10 times per day	43 (71.7%)	17 (28.3%)	0.50 (0.26 – 0.96)	
> 10 times per day	22 (68.7%)	10 (31.3%)	0.58 (0.18 1.81)	0.09
Experimental Condition				
Control	55 (63.2%)	32 (36.8%)	ref	
Experimental	66 (62.9%)	39 (37.1%)	1.07 (0.57 – 1.99)	0.84
Participate in Team Sports, n (%)				
No	43 (62.3%)	26 (37.7%)	ref	
Yes	78 (63.4%)	45 (36.6%)	0.90 (0.49 – 1.65)	0.72
Parent's Level of Education, n (%)				
High School	43 (68.3%)	20 (31.7%)	ref	
> High School	66 (59.5%)	45 (40.5%)	1.55 (0.84 – 2.84)	
Missing	12 (66.7%)	6 (33.3%)	1.36 (0.53 – 3.46)	0.37
Parent Non-compliance, n (%)				
1st Quartile, score = 0 – 1	26 (57.8%)	19 (42.2%)	ref	
2nd Quartile, score = 2	35 (66.0%)	18 (34.0%)	0.75 (0.33 – 1.70)	
3rd Quartile, score = 3	21 (56.8%)	16 (43.2%)	1.11 (0.53 – 2.32)	
4th Quartile, score = 4+	39 (68.4%)	18 (31.6%)	0.65 (0.33 – 1.28)	0.56
Friend Compliance, n (%)				
1st Quartile, score = 0	30 (55.2%)	16 (34.8%)	ref	
2nd Quartile, score = 1	27 (57.4%)	20 (42.6%)	1.45 (0.75 – 2.79)	
3rd Quartile, score = 2	29 (61.7%)	18 (38.3%)	1.22 (0.57 – 2.62)	
4th Quartile, score = 3 +	35 (67.3%)	17 (32.7%)	0.83 (0.35 – 1.98)	0.30
Rebelliousness, n (%)				
1st Quartile, score = 0 – 4	33 (56.9%)	25 (43.1%)	ref	
2nd Quartile, score = 5	20 (66.7%)	10 (33.3%)	0.69 (0.25 – 1.90)	
3rd Quartile, score = 6 – 7	40 (69.0%)	18 (31.0%)	0.63 (0.25 – 1.61)	
4th Quartile, score = 8 +	28 (60.9%)	18 (39.1%)	0.92 (0.34 – 2.48)	0.71
Thrill-seeking, n (%)				
1st Quartile, score = 0 – 3	33 (66.0%)	17 (34.0%)	ref	
2nd Quartile, score = 4	17 (51.5%)	16 (48.5%)	1.92 (0.65 – 5.68)	
3rd Quartile, score = 5	39 (62.9%)	23 (37.1%)	1.15 (0.47 – 2.84)	
4th Quartile, score = 6 +	32 (68.1%)	15 (31.9%)	0.89 (0.37 – 2.09)	0.54

*All logistic regression models adjust for experimental condition, age 12 participation in team sports, school grades, and parent education, and age 18 level of SLT usage; ref = reference category for odds ratios. P-values are from a Wald's test of homogeneity in SLT cessation rates across predictor categories.

Percentages are row-based.