Survey of the Relationship between Extroversion and Transition in Cigarette and Hookah Smoking Stages in High-School Students in Tabriz: A Longitudinal Study

Abstract

Background: Smoking is a public health problem that affects the adolescent population's health. This study aimed to investigate the relationship between extroversion (compared with introversion) and transition in cigarette and hookah smoking stages in high-school students to use the results in smoking prevention programs. **Methods:** A sample of 2312 students aged 15–16 years in Tabriz were included in the study. Demographic characteristics, cigarette, hookah smoking status, and Eysenck's extroversion questionnaires were completed by all students in the selected schools. Eight months later, cigarette and hookah smoking status were assessed again to determine transition in smoking stages. The marginal homogeneity (MH) test was used to compare the smoking status at the beginning and 8 months later. The generalized estimating equation (GEE) method with the ordinal link was applied to estimate the effect of extroversion on transition in smoking stages. **Results:** The mean (standard deviation) age of the students participating in the study was 15.5 (0.5) years. MH test results showed that, in general, transmission in the stages of both cigarette and hookah smoking in 8 months was significant in students (P-value < 0.0001). Extrovert personality had a significant positive effect on the transition from lower stages to higher cigarette and hookah smoking stages according to the GEE with ordinal link ($P = 0.01$). In cigarette and hookah smoking, extrovert persons transited to higher stages 1.64 and 1.55 times more than introvert persons. **Conclusions:** Being an extrovert person had a significant effect on the transitioning to higher stages of smoking cigarettes and hookah. In designing cognitive programs to prevent people from smoking or encourage them to quit smoking, considering this dimension of personality trait can be useful in the efficacy of the program.

Keywords: *Adolescent students, cigarette smoking, extroversion, hookah smoking, stages of smoking*

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Introduction

Adolescence is an important period that poses a great challenge in the field of control and prevention of smoking.[1] About 85–90% of smokers start smoking before the age of 20, and this predicts smoking in adulthood.[2]

In addition to cigarette smoking, using hookah in many parts of the world has become the first or second most common method of smoking.[3] Exposure to nicotine by using a hookah is addictive, and young people who like hookah smoking are more likely to start smoking.[4] The World Health Organization has described smoking as an epidemic in developing countries.[5] In the Middle East, hookah has quickly replaced cigarettes as the most popular method of tobacco use among young people.[6]

In the Eastern Mediterranean regions, the percentage of adolescent smokers is increasing (2% of females and 7% of males).[7] A study including a sample of school children in several countries of the Arabian Peninsula showed that the prevalence of hookah ranged from 9% to 15% and was more than the prevalence of cigarette smoking.[8] Smoking among Iranian youths is common and has even been shown to be growing.[9] In a study conducted in Iran, students aged 14–18 were selected. The prevalence of smoking was 9.5% and that of hookah was 10.4%.[10]

Smoking is a complex behavior that is associated with psychosocial, economic–political, and biochemical factors, and there cannot be a single reason to start smoking in adolescents.[11] Many researchers have considered smoking behavior in adolescents as a development in a series of stages. A study in 1980 suggested that smoking has a complex

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course and takes several steps for a person to become a smoker.[12]

Relatively stable personality traits are specific characteristics and main indicators of behavior.[13] Many studies have shown that personality is one of the main risk factors associated with abusive behaviors,[14] so it is vital to examine the extent to which personality affects negative health behaviors.[15]

Extroversion and introversion are the main dimensions of human personality. Extroversion is manifested in the tendency to go out, talkativeness, and energetic behavior, whereas introversion is more pronounced in individual behavior and restraint.[16] The study of personality traits and smoking started in the 1970s, and almost from the very beginning, extroversion has been considered one of the main factors.[17] Most studies that have examined the extroversion effect on smoking were in the adult population[18] or developed countries.[13] The results obtained from previous studies are contradictory. Some of these studies have found a significant relationship between extroversion and smoking,[15,19,20] and others could not find a significant relationship between them.[21,22] Also, no study has been found to measure the effect of extroversion on smoking stage transition through time. Studying the effect of personality traits (extroversion/introversion) on smoking through time will reveal the trend of transition between stages and in different personalities. The result will be used to increase the efficacy of primary and secondary prevention programs (by identifying the characteristics of high-risk individuals). In the current study, by recruiting school children, the transition between smoking stages was studied over 8 months.

Methods

The study was conducted between February and October 2017 in a sample of students aged 15–16 years in Tabriz, the capital city of East Azerbaijan province in northwest Iran. Samples were selected by the multi-stage cluster sampling method. The first clusters were schools; 21 high schools were randomly selected from all high schools in Tabriz. The second clusters were classes; considering the type of high schools (private/state), gender of students, and required sample size, 91 classes were chosen randomly and all students in the classes were included in the study. The total number of students who participated in the study was 2312.

After the purpose of the study was explained, informed consent was obtained from students. Then, the students completed their questionnaire without a name in the class. The questionnaire included questions about cigarette and hookah smoking, extroversion scale, and other demographic characteristics.

Extroversion was measured using the Eysenck Personality Questionnaire[23] for the age group above 15 years old.

The section associated with extroversion and introversion of this questionnaire contained 24 questions, where the answer to each question was a "yes" or "no", and each of the questions received a score of 1 or 0 according to the guideline on how to use the questionnaire. Therefore, the range of scores was from 0 to 24. Higher scores denote a higher extrovert personality. In a psychometric study of this questionnaire in Iran, Pearson's correlation coefficient and Cronbach's alpha were 0.88 and 0.79, respectively.[24]

Cigarette smoking was assessed by a valid algorithm for the cigarette smoking status in adolescents.[25] According to recent studies,[9,26] the cigarette smoking status in this study was considered as per the following three stages:
1. Never smoked: Students who have never smoked;
2. Experimental smokers: Students who have experimented with cigarette smoking and have smoked less than 100 cigarettes;
3. Regular smokers: Students who have smoked 100 cigarettes or more during their life.

Hookah's use was assessed using a multiple-choice question with the answers of "never smoked", "just experimented", "sometimes", "at least once a month", and "at least once a week". Then, the students were placed with regard to their answers in one of the three following groups:
1. Never smoked: Students who have never smoked hookah (even a puff);
2. Experimental smokers: Students who have experimented the hookah or smoked a hookah occasionally (just experimenter, sometimes);
3. Regular hookah user: Students who use hookah at least once a month.

To facilitate the follow-up of students in the second phase of the study, which took place 8 months later, each student was assigned a special code that was recorded at the top of the form in both phases of the study. In the second phase, students completed another questionnaire that included cigarette and hookah smoking status.

Cross-tabulating the status of cigarette and hookah smoking in the first and second phases of the study will show the amount of transition between smoking stages during 8 months. The marginal homogeneity (MH) test was used to compare the smoking status at the beginning and 8 months later among the student. Also, the generalized estimating equation (GEE) with the ordinal logit link was used to assess the effect of extroversion in the transition between smoking stages. Also, the effect of gender, having smoker friends, social-economic status, self-injury history, living with parents, and peer smoking was adjusted in the fitted model.

The analysis was done by R 3.6.2. The plan of study and questionnaire was approved by the Ethics Committee of the Tabriz University of Medical Sciences (ethical code: IR.TBZMED.REC.1396.990) and the Research Committee of Education Organization of East Azerbaijan Province.

Results

2312 students entered the study in the first phase. 2256 students had completed the questionnaires correctly. From a total of 2256 students participating in the study in the first phase, 1836 were followed up and 420 students were excluded from the study for any reason (students changed school in the second phase, were absent from class in the second phase, and also, the days of completing the questionnaire coincided with the beginning of the camps and tours organized by the schools). The mean (standard deviation) age of the students who participated in the study was 15.5 (0.5) years. Among the students, 46.7% were male and 53.3% were female. Also, 22% of them were introverts and 78% were extroverted persons. The frequency distribution of personality type was not different concerning gender, 77% of males and 78% of female students were extroverts ($\chi^2 = 1.12$, $P = 0.29$). The frequency distribution of covariates across levels of cigarette and hookah smoking is reported in Table 1 with a Chi-square test for the relationship. The covariate's gender, having smoker friends, socio-economic status, self-injury history, living with parents, and peer smoking had a relationship with smoking status at the beginning of the study.

Counts (%) of transition between stages are reported for introverts, extroverts, and all students in Table 2. Looking at Table 2, transitions occurred in both personality types. All transitions occurred to higher stages. All of the off-diagonal elements in the lower triangular of the transition matrix were zero. This means that no transition occurred from higher stages to lower stages. The MH test compares the off-diagonal counts in the transition matrix for introverts, extroverts, and all students.

The result of the MH test is reported in the last column of Table 2. In all categories of personality in both cigarette and hookah smoking, the MH test was significant ($P < 0.001$). The transitions that occurred between smoking stages during 8 months were significant. Also, the MH test showed that in both male and female students, the transition was significant ($P < 0.001$).

The marginal distribution in Table 2 shows the frequency of smoking stages in the first and second phases (rows and columns with total counts). In all transition matrixes, the percentage of non-smokers decreased in the second phase, and the percentage of the experimental and regular smokers increased.

The GEE with a cumulative ordinal logit link was used to estimate the effect of personality type (in the presence of other covariates) on the transition between smoking stages in both cigarette and hookah groups during the period from the first to the second phase of the study. The result of fitting the GEE model is reported in Table 3. According to the results, being an extrovert had a significant positive effect on the transition from lower stages to higher stages

in cigarette and hookah smoking ($P = 0.01$). In cigarette smoking, extrovert students tend to transit to a higher stage of smoking 1.64 times than introvert students. The ratio was 1.55 in hookah smoking. Also, gender had no significant effect on the transition to a higher stage in both cigarette and hookah use. Having smoker friends, socio-economic status (in hookah use), self-injury, and peer smoking had a significant positive effect on the transition to higher stages, and living with parents had a negative effect (on cigarette smokers).

Discussion

The results showed that there was a significant relationship between personality type and transition in smoking stages in both cigarette and hookah use after controlling the effect of confounding variables: gender, having smoker friends, socio-economic status, self-injury history, living with parents, and peer smoking. All transitions occurred to higher stages. The transitions were investigated in extrovert and introvert students separately. In both cases, transitions were to higher stages and were significantly different from the first phase of the study. The transitions in extrovert persons were more frequent than in introvert persons. The GEE method revealed that an extrovert person tends to transit to higher stages approximately 1.5 times more than introvert persons.

In developing countries that have been able to reduce the trend of tobacco consumption, the relationship between personality type (extrovert/introvert) and tobacco consumption is weaker than in societies that have not been successful in this issue.[27] Especially, hookah consumption in these countries is increasing rapidly and exceeds the amount of cigarette smoking and has become the first method of smoking, mainly among teenagers and young adults.[3,6] The result of this study also showed that the amount of smoking during 8 months increased considerably.

Extroverts are more likely to seek excitement and communication with others in the community, and as a result of this desire, they may be more likely than introverts to engage in risky behaviors, including smoking.[28] This could be one of the reasons for the high transition in smoking stages in students subject to the current study.

There is a discrepancy in the results of studies about the relation between extroversion and smoking; some studies state a positive relation,[15,19,20] and some others state that there is no significant relationship.[21,22] Various reasons have been cited for this discrepancy. Older studies often found a significant relationship. However, later studies did not achieve the same results. Eysenck states two reasons for this contradiction. First, the extroversion scale used in the earliest studies erroneously included sociability and impulsiveness. Later, when fluidity was added to Eysenck's theory as the main personality dimension, most stimulus items (extroversion impulsiveness items) were assigned to

Table 1: Frequency distribution of smoking stages in levels of measured covariates

	Nonsmoker (%)	Experimenter (%)	Regular (%)	Total (%)	P^a
Cigarette					
Gender					
Male	777 (74.14)	185 (17.65)	86 (8.21)	1048 (46.66)	<0.001
Female	1037 (86.56)	153 (12.77)	8 (0.67)	1198 (53.34)	
Self-injury history					
No	1604 (83.94)	249 (13.03)	58 (3.04)	1911 (90.44)	<0.001
Yes	104 (51.49)	69 (34.16)	29 (14.36)	202 (9.56)	
Having smoker friend					
No	1446 (89.20)	162 (9.99)	13 (0.80)	1621 (77.26)	<0.001
Yes	256 (53.67)	154 (32.29)	67 (14.05)	477 (22.74)	
Socio-economic status					
Very low	324 (79.41)	70 (17.16)	14 (3.43)	408 (20.18)	0.288
Low	316 (79.60)	58 (14.61)	23 (5.79)	397 (19.63)	
Middle	330 (82.09)	62 (15.42)	10 (2.49)	402 (19.88)	
High	335 (82.51)	56 (13.79)	15 (3.69)	406 (20.08)	
Very high	323 (78.97)	64 (15.65)	22 (5.38)	409 (20.23)	
Peer smoking					
High & very high	564 (73.25)	149 (19.35)	57 (7.40)	770 (36.18)	<0.001
Not high	1152 (84.83)	175 (12.89)	31 (2.28)	1358 (63.82)	
Living with parents					
No	99 (69.72)	33 (23.24)	10 (7.04)	142 (6.66)	0.003
Yes	1622 (81.47)	291 (14.62)	78 (3.92)	1991 (93.34)	
Hookah					
Gender					
Male	583 (56.22)	382 (36.84)	72 (6.94)	1037 (46.67)	<0.001
Female	802 (67.68)	370 (31.22)	13 (1.10)	1185 (53.33)	
Self-injury history					
No	1257 (65.43)	609 (31.70)	55 (2.86)	1921 (90.44)	<0.001
Yes	69 (33.99)	112 (55.17)	22 (10.84)	203 (9.56)	
Having smoker friend					
No	1145 (70.33)	463 (28.44)	20 (1.23)	1628 (77.23)	<0.001
Yes	178 (37.08)	248 (51.67)	54 (11.25)	480 (22.77)	
Socio-economic status					
Very low	274 (66.99)	124 (30.32)	11 (2.69)	409 (20.14)	<0.001
Low	259 (64.75)	132 (33.00)	9 (2.25)	400 (19.69)	
Middle	243 (60.30)	152 (37.72)	8 (1.99)	403 (19.84)	
High	262 (64.06)	128 (31.30)	19 (4.65)	409 (20.14)	
Very high	224 (54.63)	162 (39.51)	24 (5.85)	410 (20.19)	
Peer smoking					
High and very high	418 (53.80)	308 (39.64)	51 (6.56)	777 (36.33)	<0.001
Not high	918 (67.40)	416 (30.54)	28 (2.06)	1362 (63.67)	
Living with parents					
No	77 (54.23)	56 (39.44)	9 (6.34)	142 (6.62)	0.053
Yes	1262 (63.04)	669 (33.42)	71 (3.55)	2002 (93.38)	

[a]Chi-square test

the psychoticism scale, resulting in recent studies failing to establish a positive relationship between extroversion and smoking behavior as before. The second reason proposed by Eysenck is that significant changes in social attitudes toward smoking acceptance have occurred in recent years, especially among men. As a result, men are less likely to be seduced into smoking by peer groups and friends. According to Eysenck, "Today, smoking behavior in society is more distasteful than ever before, and extroversion and smoking may be socially excluded, thereby reducing the expected correlation."[17] However, this study indicates the possible impact of this personality trait on the rate of smoking in adolescent students.

Buczkowski *et al*.[18] have recently shown that there is a link between extroversion and the onset and continuation

Table 2: Transition matrix in smoking stages with MH test from the first phase to the second phase of the study in high school students (15–16 years old) in Tabriz

Cigarette Smoking

Personality	Smoking Stage	Second phase				MH Test*
		Never Count (%)	Experimenter Count (%)	Regular Count (%)	Total Count (%)	P
First phase						
Introvert	Never	314 (91)	25 (7.2)	6 (1.7)	345 (87.12)	<0.001
	Experimenter	0 (0)	36 (80)	9 (20)	45 (11.36)	
	Regular	0 (0)	0 (0)	6 (100)	6 (1.52)	
	Total	314 (79.3)	61 (15.4)	21 (5.3)	396 (100)	
Extrovert	Never	1038 (91)	86 (7.5)	17 (1.5)	1141 (79.79)	<0.001
	Experimenter	0 (0)	194 (85.1)	34 (14.9)	228 (15.94)	
	Regular	0 (0)	0 (0)	61 (100)	61 (4.27)	
	Total	1038 (72.6)	280 (19.6)	112 (7.8)	1430 (100)	
All	Never	1352 (91)	111 (7.5)	23 (1.5)	1486 (81.38)	<0.001
	Experimenter	0 (0)	230 (84.2)	43 (15.8)	273 (14.95)	
	Regular	0 (0)	0 (0)	67 (100)	67 (3.67)	
	Total	1352 (74)	341 (18.7)	133 (7.3)	1826 (100)	

Hookah Smoking

Personality	Smoking Stage	Never Count (%)	Experimenter Count (%)	Regular Count (%)	Total Count (%)	MH Test* P
First phase						
Introvert	Never	255 (89.2)	29 (10.1)	2 (0.7)	286 (71.86)	<0.001
	Experimenter	0 (0)	99 (96.1)	4 (3.9)	103 (25.88)	
	Regular	0 (0)	0 (0)	9 (100)	9 (2.26)	
	Total	255 (64.1)	128 (32.2)	15 (3.8)	398 (100)	
Extrovert	Never	766 (88.4)	90 (10.4)	11 (1.3)	867 (60.42)	<0.001
	Experimenter	0 (0)	467 (90.9)	47 (9.1)	514 (35.82)	
	Regular	0 (0)	0 (0)	54 (100)	54 (3.76)	
	Total	766 (53.4)	557 (38.8)	112 (7.8)	1435 (100)	
All	Never	1021 (88.6)	119 (10.3)	13 (1.1)	1153 (62.90)	<0.001
	Experimenter	0 (0)	566 (91.7)	51 (8.3)	617 (33.66)	
	Regular	0 (0)	0 (0)	63 (100)	63 (3.44)	
	Total	1021 (55.7)	685 (37.4)	127 (6.9)	1833 (100)	

*Marginal homogeneity test

of smoking. Compared to introverts, extroverts are more likely to be influenced by environmental factors that affect smoking, and these factors change their attitudes toward smoking more quickly. This aspect of extroversion could affect smoker extrovert students to transit to higher smoking stages than introverts. Given the importance of prevention in the field of smoking in adolescents and young people and also the very valuable role of school-based prevention programs, the result of this study could be used in defining prevention programs for adolescent students in Iran.

Planning a study with more samples, a wider age group, and a longer follow-up with several time measurements could help to understand the trend of transition during the time and to obtain more information about the effect of personality type on the smoking status over time.

The students who participated in this study were limited to 15–16-year-old students, which can limit the generalizability of the results to other age groups.

Conclusions

A significant transition in smoking during the 8-month interval between the first and second phases occurred in both cigarette and hookah smoking stages. All transitions were to higher stages in smoking. The personality type (extrovert/introvert) had a significant effect on the transition to higher stages as extrovert persons transited to higher stages considerably more than introvert persons. In designing cognitive programs to prevent people from smoking or quitting smoking, considering this dimension of personality trait can increase the efficacy of programs.

List of abbreviations

MH: Marginal homogeneity
GEE: Generalized estimating equation.

Acknowledgment

Table 3: GEE with the ordinal logit link to determine the adjusted effect of personality type on smoking stage transition in the students aged from 15 to 16 in Tabriz

Covariates	Level of Variables	β	Exp (β)ᵃ	95% CI		P
				Lower	Upper	
Cigarette Smoking						
Constant	Nonsmoker/(Experimenter and Regular)	1.49		0.89	2.08	0.00
	(Nonsmoker and Experimenter)/ Regular	3.37		2.76	3.99	0.00
Person Type	Extrovert	0.49	1.64	0.10	0.88	0.01
	Introvert	Ref				
Gender	Female	−0.11	0.90	−0.63	0.41	0.68
	Male	Ref				
Having Smoker Friend	Yes	1.62	5.04	1.37	1.87	0.00
	No	Ref				
Socio-economic Status	Very high	0.03	1.03	−0.32	0.38	0.86
	High	−0.25	0.78	−0.61	0.12	0.19
	Middle	−0.23	0.80	−0.58	0.13	0.21
	Low	−0.04	0.96	−0.40	0.31	0.81
	Very low	Ref				
Self-Injury History	Yes	1.16	3.19	0.84	1.47	0.00
	No	Ref				
Living with Parents	Yes	−0.43	0.65	−0.84	−0.01	0.04
	No	Ref				
Peer Smoking	Not high	−0.21	0.81	−0.45	0.03	0.09
	High and very high	Ref				
Hookah Smoking						
Constant	Nonsmoker/(Experimenter and Regular)	0.84		0.34	1.34	0.00
	(Nonsmoker and Experimenter)/Regular	3.81		3.28	4.35	0.00
Person Type	Extrovert	0.44	1.55	0.10	0.77	0.01
	Introvert	Ref				
Gender	Female	−0.27	0.76	−0.70	0.16	0.22
	Male	Ref				
Having Smoker Friend	Yes	1.22	3.39	0.99	1.45	0.00
	No	Ref				
Socio-economic Status	Very high	0.57	1.77	0.28	0.86	0.00
	High	0.24	1.27	−0.05	0.53	0.10
	Middle	0.24	1.27	−0.05	0.53	0.11
	Low	0.07	1.07	−0.22	0.37	0.64
	Very low	Ref				
Self-Injury History	Yes	1.01	2.75	0.71	1.31	0.00
	No	Ref				
Living with Parents	Yes	−0.16	0.85	−0.53	0.21	0.40
	No	Ref				
Peer Smoking	Not high	−0.27	0.77	−0.47	−0.07	0.01
	High and very high	Ref				

ᵃOdds ratio of the categorical variables

the Educational Office of Tabriz, the management team of schools, teachers, and all of the participant students who cooperated with the research team in all steps of the study.

Ethical approval

The plan of study and questionnaire was approved by the Ethics Committee of the Tabriz University of Medical Sciences (ethical code: IR.TBZMED.REC.1396.990) and the Research Committee of Education Organization of East Azerbaijan Province.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not

be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflicts of interest

There are no conflicts of interest.

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