

Understanding the Behaviour of Cigarette Smoking among Iranian Smokers: Application of Trans-Theoretical Model

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Abstract

Background: The Transtheoretical model has been widely used in the subject of cigarette smoking. This study aimed to understand the behaviour of smoking in smokers, according to the Transtheoretical model.

Material and Methods: Secondary analysis on two separate studies in different cities across the country was performed on 844 individuals who were enrolled via convenient sampling in 2010 and 2013. Measures used in this study include the process of change questionnaire of Prochaska et al., questionnaire of Di Clemente et al., questionnaire of temptation and decisional balance of Velicer et al. The gathered data were analysed using SPSS version 18 and Kruskal Wallis and Mann–Whitney U tests. Cohen's criterion for standardized effect size was used along with Spearman rank correlation.

Results: All constructs of the Transtheoretical model showed significant differences along the stages of cigarette consumption. Experiential Process of self-re-evaluation had the largest effect size (0.207). It was followed by the cons of smoking with effect size of 0.17. Dramatic relief and helping relationships had the smallest effect sizes with 0.025 and 0.048 respectively.

Conclusion: This study shows that the process of self-re-evaluation and cons of smoking are the most powerful predictors of development during the stages of smoking behaviour change.

Keywords: Transtheoretical model, Stages of Change, Processes of Change, Smoking, Iran.

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Introduction

Transtheoretical model (TTM) is a theory that is largely based on the stages and has been

widely used for understanding health-related behaviours, especially smoking cessation⁽¹⁾.

The main characteristic of this model is that people do not make black or white decisions to

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change their behaviour, but behaviour change is a gradual process which is divided into different parts and has various, specific stages which people should pass through⁽²⁾. TTM includes four constructs; stages of change, the processes of change, self-efficacy and decisional balance⁽³⁾.

Construct of stages of change includes a 5-step stage which includes: precontemplation, contemplation, preparation, action and maintenance. At precontemplation stage individuals do not intend to change behaviour within the next 6 months. At contemplation stage, individuals intend to adopt behaviours within the next 6 months. At the preparation stage, individuals are going to adopt behaviours within the next month. At action stage, People have changed their behaviours but it has been less than 6 months since the start of change in their behaviour. At the last stage ,called maintenance, individuals have changed their behaviour since more than 6 months ago.⁽⁴⁾ The processes of change construct indicates cognitive, emotional and behavioural strategies of behavioural change, which are overt and covert activities that individuals use to change and adjust the desired behaviour. It includes 10 processes that are divided into two groups of experiential processes (Consciousness Raising, dramatic relief, Self-re-evaluation, Environmental re-evaluation and Social Liberation) and behavioural processes (Self-Liberation, Counter Conditioning, Stimulus Control, Reinforcement Management and Helping Relationship)⁽⁵⁾.

Previous studies demonstrated that the use of cognitive processes are more emphasized in the pre-action stages (precontemplation, contemplation and preparation) while the behavioural processes are mostly used in the maintenance and action stages⁽⁶⁾. Based on the

TTM, the ten above processes are derived during the passage and movement of individuals from the stages, and the correct use of these processes In the proper stage will facilitate moving towards the next stage while the improper or lack of use will cause a delay⁽⁷⁻⁹⁾. Decisional balance construct is based on Janis and Mann model in which individuals will assess the pros and cons of the outcomes of change to desired behaviour⁽¹⁰⁾. According to the decisional balance construct, the individuals will not change their behaviour unless they evaluate the disadvantages of such behaviour is far outweighed compared to its benefits⁽¹¹⁾. According to temptation/self-efficacy construct, in order to maintain behaviour change, when exposed to situations with a high risk of behavioural relapse, there is a need of reliability and high self-efficacy. For example, a person who is quitting smoking, in order to avoid smoking in situations where there is a probability of smoking relapse (such as celebrations, difficulties and financial pressures), requires high self-efficacy⁽¹²⁾ The trans-theoretical model showed that, when passing from the pre-contemplation stage to maintenance, temptation to smoking decreases and self-efficacy increases^(2, 12, 13). To our knowledge, thus far there has been one study on the relationship of cigarette cessations stages and the constructs of the trans-theoretical model in Iran.Mansourian et al recent study revealed that just smoking temptation demonstrated notable effect size⁽¹⁴⁾. Therefore this study aimed to understand the behaviour of smoking among Iranian smokers in different stages of the TTM variables.

Material and Methods

Procedure

This cross-sectional study with a

descriptive-analytic approach was done in the years 2010 and 2013 by convenient sampling method on 884 smokers or former smokers. This study is the result of integrating two separate studies in relation to smoking based on TTM constructs which has been already published^(15, 16). Inclusion criteria were people who were smokers at the time of the study who were taking at least one cigarette per day or used to be taking the same amount⁽¹⁷⁾. Oral consents were acquired and the questionnaires were completed in the direct presence of questioners. They were also assured that their responses would be kept confidential. Both studies were approved by the Research Ethics Committees of Golestan and Isfahan University of Medical Sciences.

Subjects

Participants Male were selected from cities of Isfahan, Gorgan, Khomein, Tehran and Ahwaz. Among them, 572 (85%) were college students and the rest were from other parts of the society.

Measures

To investigate the stages of change in the studied population, questionnaire of Diclemente and colleagues stages of change construct was used which had 5 yes /no questions regarding the current status of smoking in the tested subjects^(17, 18). The reliability and validity of the questionnaire used in this study were approved in a previous study⁽¹⁵⁾.

To investigate the processes of change, Short form of Prochaska's⁽¹⁹⁾ processes of change questionnaire was used which consisted of 20 questions that included two subgroups of experiential processes (10 questions) and behavioural processes of smoking (10 questions).

Answering the questions was based on a 5-point spectrum from "never" to "repeatedly" with the scores of 1 to 5 respectively. Then the total score of each individual was divided by the number of questions so that the mean of scores were between minimum of 1 and maximum of 5. The Amount of Cronbach alpha reliability test for this section was $\alpha=0.845$.

Decisional balance construct was evaluated using the short form questionnaire of Velicer and colleagues⁽²⁰⁾. This construct consisted of 6 questions, which had two subgroups of smoking pros (3 questions) and smoking cons (3 questions). Response to the questions of this construct was based on a 5-point spectrum from "not important" to "extremely important" with the scores of 1 to 5 respectively. Then the total scores of each individual were divided by the number of questions so that the mean of scores were calculated between minimum of 1 and maximum of 5. The amount of Cronbach alpha reliability test for the benefits and disadvantages of smoking were $\alpha=0.706$ and $\alpha=0.570$ respectively.

The temptation construct consisted of 9 questions from the short form questionnaire of Velicer et al. ⁽²¹⁾, which itself contained three sub-groups. Thus, three questions were about evaluation of obsession level in positive social situations such as parties and celebrations, 3 questions about smoking temptation in situations of negative emotions such as anxiety and stress, and 3 other questions were about smoking habit situations, such as smoking right after waking up from sleep or its use to become cheery. Response to the questions of this construct was based on a 5-point spectrum from "not at all tempted" to "extremely tempted with the scores of 1 to 5 respectively. The amount of Cronbach alpha reliability test for this section was $\alpha=0.807$.

Statistical Analysis

In order to analyze the gathered data, SPSS version 18 was used for descriptive statistics (frequency distribution, mean and standard deviation). To assess the association between change in smoking and the TTM variables, we decided In case of normal distribution of the response variable, to use multiple analyses of variance with the standardized effect size (eta squared) with Tukey post hoc test. However, since the distribution of the observations and even the transformed did not have a normal distribution based on the Box-Cox transformation according to Shapiro-Wilk normality test; the nonparametric Kruskal-Wallis test was used. According to Cohen's criteria for standardized effect size, 0.01, 0.06 and 0.14 were considered as indicators of the presence of small, medium and large effect size respectively⁽²²⁾. The Spearman rank correlation test was used to investigate the correlation between the constructs. The statistical significance level was set at 0.05.

Results

The participants aged between 17-72 years with a mean (SD) of 27.87 ± 10.08 years.

The mean age of starting smoking was 18.59 ± 4.19 years. The mean and SD of the number of daily smoked cigarettes was 12.02 ± 9.60 and according to the 6 years median of smoking history it was determined that 50% of participants were smoker for more than 6 years and 50% were smokers for less than 6 years. The average duration of cigarette smoking was 9.28 ± 9.69. Of all the participants 511 (58.5%) were single, 229 (26.2%) were married, 47 (5.4%) were divorced, 18 (2.1%) were widowed, and 54 (6.1%) were unclear.

Of all the participants, 418 subjects (47.3 %) were in the precontemplation stage, 146 (16.5%) in the contemplation stage, 256 patients (29%) in the preparation stage, 34 patients (3.8%) in the action and 30 patients (4.3%) were in the maintenance stage (Figure 1).

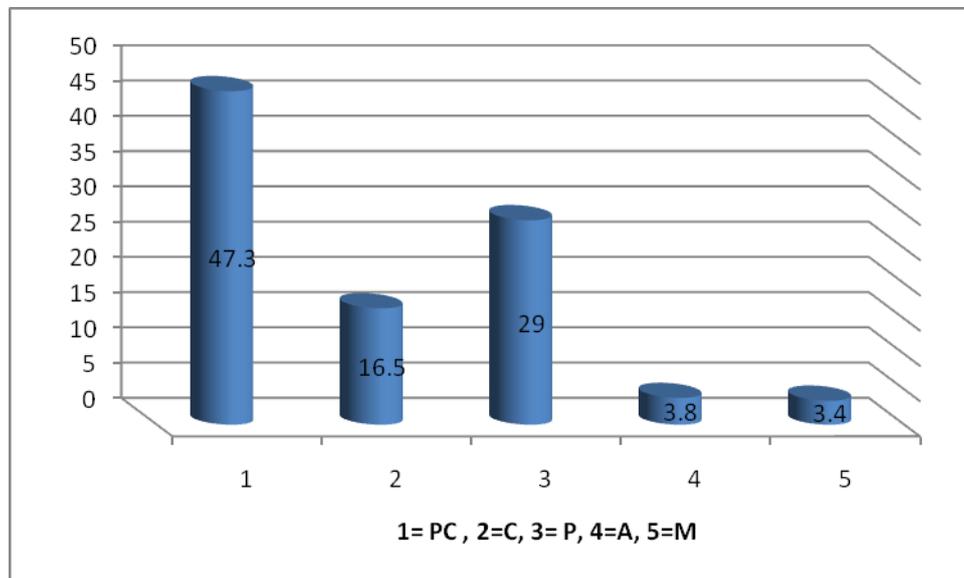


Figure 1: The frequency distribution of smoking behavioural change in the tested population

Based on the results of the Kruskal-Wallis test, all the constructs of the TTM showed significant differences compared to stages of change. The effect size of the error source was calculated for each area and the results are

shown in the Table 1. Experiential process of self-re-evaluation and cons of smoking had the largest effect sizes of 0.207 and 0.17 respectively.

Table 1. Mann-Whitney U for the TTM variable with $\alpha=0.0025$

TTM Construct	standardized effect sizes (eta squared)	Contrasts
Experiential Processes Dramatic relief	0.17 0.025	PC<C=P=A<M PC=C=P, PC<P, C=P=A=M
Environmental re-evaluation	0.056	PC=C =A=M, PC<P, C=P=A=M
Self-re-evaluation	0.207	PC<C<P, P=A=M, C=A=M, PC<M
Consciousness raising	0.084	PC<C<P, P=A, C=A=M, PC<M, P=A=M
Social liberation	0.088	PC<C<P, PC=A=M, C=A=M, P=A=M
Behavioural processes Helping relationships	0.16 0.048	PC<C<P=A=M PC=C=A, P=A=M, PC=C<P, PC=C<M
Self liberation	0.073	C=P=A=M, PC<C=P=A, PC=M
Counter conditioning	0.104	PC<C=P< M,P=A, PC<C<A, A=M
Reinforcement management	0.099	PC<C=P=A=M
Stimulus control	0.115	PC<C=P=A, PC<C<M, P=A=M
Temptation	0.09	PC>C>P=A=M
Cons	0.17	PC<C=A, PC<P=A=M, C<P=M
Pros	0.05	PC=C>M, PC>P>M, PC>A=M C=P

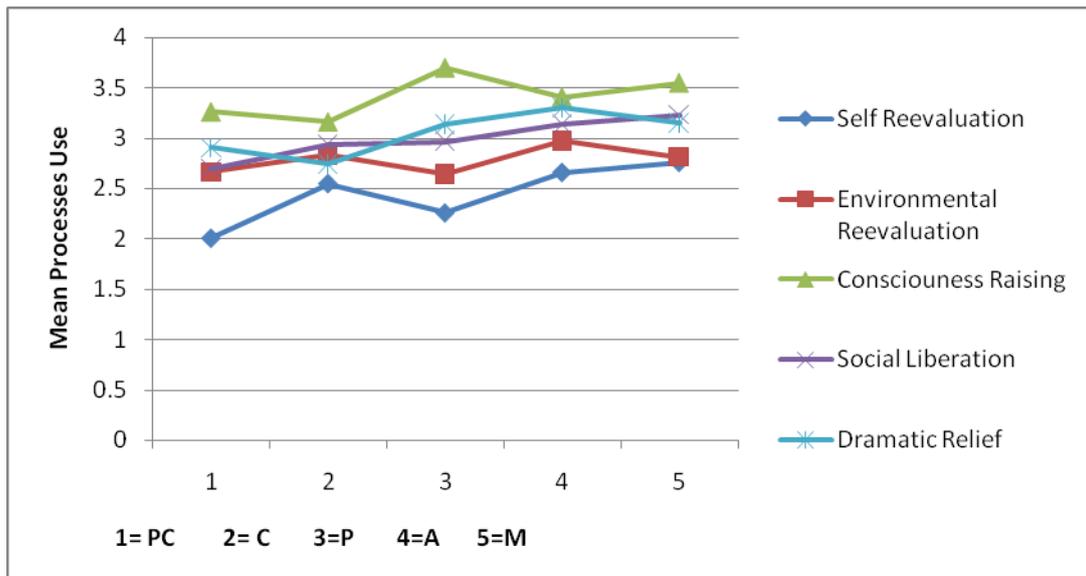


Figure 2: Experiential processes of change utilization across stages of change

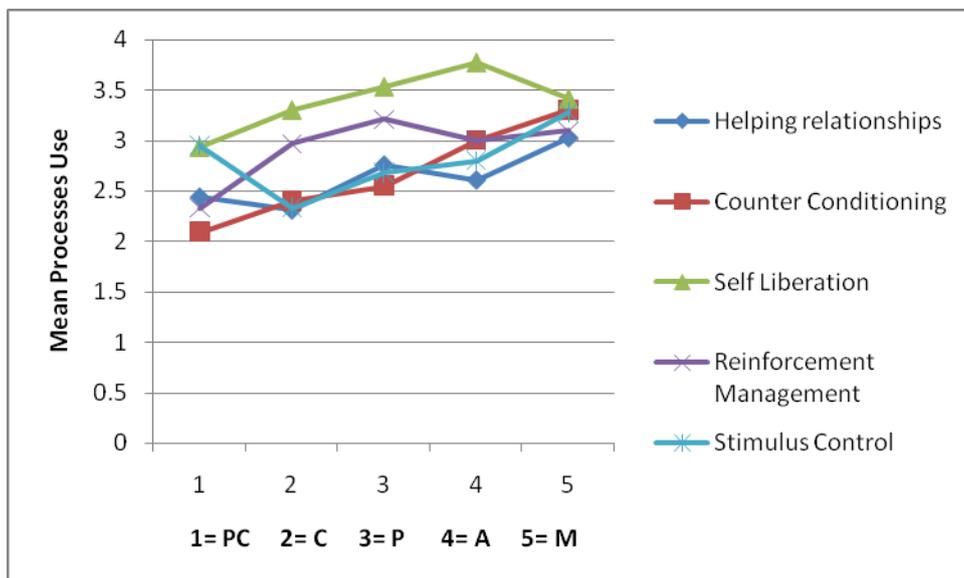


Figure 3: Behavioural processes of change utilization across stages of change

Stimulus control behavioural processes with effect size of 0.115 and counter conditioning with 0.104 had significant effect sizes (Table 1). Experiential process of dramatic relief with 0.025 had the smallest effect size and after that the process of helping relationships (0.048) and pros of smoking construct (0.049) had the smallest effect sizes

(Table 1). With the aim of finding the most significant differences between the 5 stages, paired comparison was done using the non-parametric Mann-Whitney test and these pair wise comparisons were repeated 10 times ever since. At each time, the error level was considered as $\frac{0.05}{2.5} = 0.025$. The paired Mann-Whitney test results showed different patterns

in TTM variables. In a way that in all cases except temptation and cons of smoking, there were significant differences between the precontemplation and contemplation stages. In general, cognitive processes, behavioural processes, and cons of smoking showed significant differences between precontemplation and the other four stages. This pattern is repeated in the process of self-re-evaluation, counter conditioning, reinforcement management, stimulus control, and cons of smoking (Table 1). Figure 2 shows the distribution pattern of the mean scores of experiential processes in the five steps and

Figure 3 shows the same values for the behavioural processes. The results show that the highest correlation were between the experiential processes and consciousness raising ($r = 0.733, p < 0.001$), the process of self-re-evaluation and the overall experiential processes ($p = 0.721, p < 0.001$). There was also high correlation between the process of stimulus control and the total behavioural processes ($r = 0.687, P < 0.001$). The correlation between the experiential processes and behavioural processes was also high ($r = 0.679, p < 0.001$) (Table 2).

Table 2. Correlation Coefficient Matrix for TTM Constructs

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1. Consciousness raising		0.220**	0.404**	0.444**	0.466**	0.733**	0.364**	0.309**	0.375**	0.438**	0.449**	0.557**	-0.072*	-0.128**	0.419**	
2. Dramatic relief			0.262**	0.304**	0.119**	0.552**	0.211**	0.103**	0.144**	0.170**	0.185**	0.226**	0.093**	-0.067	0.146**	
3. Environmental re-evaluation				0.294**	0.347**	0.649**	0.287**	0.219**	0.186**	0.290**	0.249**	0.351**	-0.006	-0.088**	0.334**	
4. Self-re-evaluation					0.407**	0.721**	0.344**	0.319**	0.326**	0.459**	0.444**	0.551**	0.100**	-0.132**	0.505**	
5. Social liberation						0.671**	0.333**	0.366**	0.248**	0.361**	0.315**	0.479**	0.024	-0.079*	0.463**	
6. Total Experiential processes							0.427**	0.358**	0.362**	0.498**	0.466**	0.619**	0.038	-0.150**	0.534**	
7. Helping Relationships								0.246**	0.339**	0.336**	0.388**	0.679**	-0.01	-0.039	0.301**	
8. Counter conditioning									0.236**	0.272**	0.300**	0.583**	-0.043**	-0.066	0.308**	
9. Self-liberation										0.258**	0.508**	0.643**	-0.230	-0.177**	0.267**	
10. Stimulus control											0.367**	0.687**	-0.024	-0.036	0.470**	
11. Reinforcement management												0.732**	-0.198**	-0.183**	0.373**	
12. Total behavioural processes													-0.123**	-0.140**	0.512**	
13. Temptation														0.400**	0.039	
14. Pros															-0.106**	
15. Cons																1.00

**Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Discussion

In this study, based on the Cohen criteria, the results indicate that, cognitive processes and behavioural processes have an equal effect size. But among the experiential processes, process of self-re-evaluation had the largest effect size even among all other studied constructs. This may be due to the fact that individual takes a lot of time to re-evaluate themselves and with the assessment of emotional and cognitive reactions, they experience more emotional reactions towards the adverse effects of smoking. Experiential

processes of social liberation and consciousness rising have medium effect sizes while dramatic relief have the smallest effect size. Among the behavioural processes, stimulus control processes, counter conditioning and reinforcement management have moderate to large effect sizes. In these three behavioural processes, individuals carry on actual and tangible measures to cease smoking or receive support and encouragement from relatives. Carlson et al. study results also showed that the behavioural process of reinforcement management is the

only process that could predict the success rate of smoking cessation⁽²³⁾. In this study the process of helping relationships had a small effect size. This may be due to the unavailability of sources of help to seek for advices or the lack of support of experts in the field of smoking cessation. In Woodruff et al. study there was a significant relationship between the number of daily smoked cigarettes in a week after the intervention with social support, self-efficacy and perceived benefits of quitting smoking so that their high levels lead to reduced number of smoked cigarettes⁽²⁴⁾.

The results of McAlister et al. indicated that the availability of telephone counselling service had increased the success rate of quitting smoking by 8%, compared to those who did not receive such services. At the same time this had affected the amount of cost-benefit of quitting smoking by more than a year⁽²⁵⁾. The centres of consulting services on smoking cessation are rarely found in Iran, therefore considering these enabling factors such as smoking cessation counselling centres and smoking cessation telephone lines could be helpful to increase the use of this process.

Hoepfner et al. study results on teenagers' smoking behaviour indicated that behavioural process of self-re-evaluation had the largest effect size (0.21) and behavioural processes of consciousness rising and dramatic relief had the smallest effect sizes (0.16). Among the behavioural process, self-liberation (0.42) and counter conditioning (0.38) had the largest and the helping relationships (0.04) had the lowest effect sizes which is consistent with our study⁽²⁶⁾. In Kim's study on Korean teenagers, the three behavioural processes of counter conditioning (0.29), stimulus control (0.25) and helping relationships (0.18) were the most

important predictors of the transitional stages of smoking while among the cognitive processes, self-re-evaluation had the largest effect size (0.20) which is also consistent with our findings⁽¹¹⁾. It is noteworthy to note that the difference between the above studies and the current study is their higher effect sizes of behavioural processes. This may be due to their larger study population in the last two stages (Action and Maintenance) compared to our study. The cultural diversity between the studied population and the difference in age groups of study population could be another involved factor. Another difference could be due to use of the short form of questionnaires in our study.

The results regarding the cons of smoking associated with smoking also showed that this construct has a large effect size which may be related to the fact that smokers consider the disadvantages and costs of smoking significant. However, the small effect size of the benefits of smoking shows that they do not believe smoking has many benefits. Carlson et al. study results indicated that the use of reinforcement, encouragement and support from relatives and increasing the visibility of the hazards of smoking are the most effective predictors of smoking cessation⁽²³⁾. The results also demonstrated that smoking temptation has a moderate effect size and temptation because of nicotine dependence can be relatively effective in smoking behaviour. A study on teenage smokers in Bulgaria by Anatchkova et al. showed that cigarette temptation effect size was 0.16⁽²⁷⁾. The interventional study of Haug et al. also concluded the same effect size in their smoking cessation program which are both higher than our results⁽²⁸⁾.

Limitations

The limitations of the study are thought to be

the followings: it was a cross sectional study, few people were present in the action and maintenance phases, the use of convenient sampling method and the short form of questionnaire for the construct of TTM in addition to the issue of having only male subjects. To overcome the above limitations, it is recommended to use the long-form of questionnaires, conduct longitudinal studies with more participants in the final stages and considering the gender balance for future studies.

Conclusion

This study showed that the processes of self-re-evaluation and cons of smoking are the most powerful predictors of development during the stages of smoking behaviour change. These two variables should be considered in any smoking cessation intervention in Iran.

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Authors Contributions

Study concept and design: Charkazi and Sharifirad; Acquisition of data: Charkazi and Ekrami; Analysis and interpretation of data: Seyyedghasemi and Charkazi; Drafting of the manuscript: Mansourian and Ekrami; Critical revision of the manuscript for important intellectual content: Sharifirad and Shahnaz; Statistical analysis: Seyyedghasemi; Administrative, technical, and material support: Charkazi and Shanazi; Study supervision: Sharifirad.

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- 7- البكالوريوس في التمريض، كلية الطب، جامعة جولستان للعلوم الطبية، جرجان، إيران.

الملخص

هدف الدراسة: أجريت هذه الدراسة لفهم سلوك التدخين لدى المدخنين وفقاً للنموذج عبر النظري وهذه النظرية قد استخدمت على نطاق واسع في موضوع التدخين لدى المدخنين.

المواد والطرق: تم إجراء تحليل ثانوي في دراستين منفصلتين في مدن مختلفة في جميع أنحاء البلاد على 844 الأفراد الذين كانوا مسجلين عن طريق أخذ العينات الراححة في عام 2010 و 2013. المواد المستخدمة في هذه الدراسة تشمل الاستبيان عمليه التغيير لبروجاسكا وآخرون، استبيان دي كليمنتي وآخرون، الاستبيان من إغراء والتوازن في اتخاذ القرارات لوليسر وآخرون. وقد تم تحليل البيانات التي تم جمعها باستخدام SPSS النسخة 18 باستخدام اختبارات كروسكال واليس ومان ويتي U. وقد استخدم معيار كوهين لموحد حجم التأثير جنباً إلى جنب مع سيرمان رتبة الارتباط.

النتائج: جميع بيانات النموذج عبر النظري كانت اختلافات كبيرة على طول مراحل استهلاك السجائر. كانت عملية التجريبية إعادة التقييم للنفس، أكبر حجم التأثير (0.207). تبع ذلك من سلبيات التدخين مع حجم التأثير 0.17. كانت الإغاثة مثيرة ومساعدة العلاقات أصغر الأحجام تأثيراً مع 0.025 و 0.048 على التوالي.

الخلاصة: هذه الدراسة تبين أن عملية إعادة التقييم الذاتي وسلبيات التدخين تنبئ أقوى من التنمية خلال مراحل التغيير في سلوك التدخين.

الكلمات الدالة: نموذج عبر النظري، مراحل التغيير، عمليات التغيير، التدخين.