

# Investigating smoking behavior in Iranian smokers based on the transtheoretical model, a preliminary study for the lifestyle change

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## ABSTRACT

**Background:** Smoking causes more than 4 million deaths annually in the globe. This study aimed to understand the behavior of smoking in smokers, Ilam, Iran according to the Transtheoretical model. **Methods:** In a cross-sectional survey, 400 smokers who were enrolled via convenient sampling in 2015 completed a questionnaire based on TTM variables according to Rhode Island University. Gathered data were analyzed using SPSS 18. Alpha level set at 0.05. **Results:** Smoking temptation revealed large effect size (0.14). In General, two higher order processes of changes, cognitive and behavioral processes had significant effect size with 0.17 and 0.13, respectively. Conversely, other Most TTM variables showed low effect size. **Conclusions:** This study showed that except smoking temptation other TTM constructs demonstrated low effect size in Iranian smokers. The findings of the current study are inconsistent with TTM nature.

**Keywords:** Transtheoretical model, stages of change, processes of change, smoking, Iran.

## Introduction

Tobacco consumption is considered as one of the contributory factors in increasing the overall burden of diseases which annually causes 4 million deaths around the world and reduces the average life expectancy up to 14 years [1]. Additionally, smoking has been identified as 9% of global death [2]. Several

studies have shown that the prevalence of smoking in both genders is growing worldwide, particularly among young individuals [3, 4]. Epidemiological studies worldwide have demonstrated that smoking is highly associated with the incidence of non-communicable and chronic diseases such as cardiovascular disease, respiratory disease, cancer and stroke [5]. Cigarette mass production and widespread publicity, has led to turning many individuals into smoking and caused an excessive increase in the number of smokers during the past decade [6]. According to World Health Organization (WHO) report in 2015, in 2010 the prevalence of smoking in Iranian individuals aged 15-64 is up to 12 percent (approximately 6,729,700 persons). Besides, WHO predicting if tobacco control efforts continue at the same levels, in 2025 around 9% of the population (approximately 6,355,400 persons) will be smokers [7]. Another study in Iran showed that the prevalence of smoking is 15.3 percent and 1.2 percent are passive smokers and the highest prevalence belongs to age groups of 35-64 years.

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Furthermore, its consumption in men is higher than women and the average number of cigarette consumption is 14.69 cigarettes per day.<sup>[8]</sup>

## Transtheoretical Model

Transtheoretical model or TTM is a theory that is largely based on the stages and has been widely used for understanding health-related behaviors, especially smoking cessation<sup>[9]</sup>. The main characteristic of this model is that people do not make black or white decisions to change their behavior, but behavior change is a gradual process which is divided into different parts and has various, specific stages which people should pass through<sup>[10]</sup>. TTM includes four constructs; stages of change, the processes of change, self-efficacy and decisional balance<sup>[11]</sup>.

The construct of stages of change includes a 5-step stage which includes: pre contemplation, contemplation, preparation, action and maintenance. At pre contemplation stage individuals do not intend to change behavior within the next 6 months. At contemplation stage, individuals intend to adopt behavior within the next 6 months. At the preparation stage, individuals are going to adopt behavior within the next month. At action stage, People have changed their behaviors but it has been less than 6 months since the start of change in their behavior. At the last stage, called maintenance, Individuals have changed their behavior since more than 6 months ago.<sup>[12]</sup> The processes of change construct indicates cognitive, emotional and behavioral strategies of behavioral change which are overt and covert activities that individuals use to change and adjust the desired behavior. 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 behavioral processes (Self-Liberation, Counter Conditioning, Stimulus Control, Reinforcement Management and Helping Relationship)<sup>[13]</sup>.

Previous studies demonstrated that the use of cognitive processes are more emphasized in the pre-action stages (pre contemplation, contemplation and preparation) while the behavioral processes are mostly used in the maintenance and action stages<sup>[14]</sup>. 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<sup>[15-17]</sup>. 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 behavior<sup>[18]</sup>. According to the decisional balance construct, the individuals will not change their behavior unless they evaluate the disadvantages of such behavior is far outweighed compared to its benefits<sup>[19]</sup>. According to temptation/self-efficacy construct, in order to maintain behavior change, when exposed to situations with a high risk of behavioral relapse, there is a need for 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<sup>[20]</sup>. The trans-

theoretical model showed that, when passing from the pre-contemplation stage to maintenance, temptation to smoking decreases and self-efficacy increases<sup>[10, 20, 21]</sup>.

To our knowledge, thus far there have been limited studies<sup>[22-24]</sup> on the relationship of cigarette cessations stages and the constructs of the transtheoretical model in Iran. Therefore this study aimed to understand the behavior of smoking among smokers in different stages of the TTM variables.

## Material and Methods

### Procedure

A cross-sectional study was done in 2015 by convenient sampling method on 400 smokers or former smokers. 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<sup>[25]</sup>. 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. The study was approved by the Research Ethics Committees of Ilam University of Medical Sciences, Ilam, Iran.

### Participants

The participants were aged between 14-90 years with a mean (SD) of  $37.77 \pm 14.57$  years. The mean age of smoking onset was  $23.01 \pm 7.62$  years. The mean and SD of the number of daily smoked cigarettes was  $14.42 \pm 8.02$ . The average duration of cigarette smoking was  $14.34 \pm 13.00$  years. Of all the participants 373 (93.2%) were men, 230 (57.5%) were married. Of them, 158 (39.5%) were the smoked water pipe. Regarding smoker friends, 168 (42.1%) announced half or more than half of their close friends are smokers.

Of all the participants, 70 subjects (17.5 %) were in the pre contemplation stage, 104 (26%) in the contemplation stage, 209 patients (52.25%) in the preparation stage, 8 patients (2%) in the action and 9 patients (2.25%) were in the maintenance stage.

### Measures

To investigate the stages of change in the studied population, the 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<sup>[25, 26]</sup>. The reliability and validity of the questionnaire used in this study were approved in a previous study<sup>[22]</sup>.

To investigate the processes of change, Short form of Prochaska's<sup>[27]</sup> processes of change questionnaire was used which was consisted of 20 questions that included two subgroups of experiential processes (10 questions) and behavioral processes of smoking (10 questions).

Answering to the questions were based on a 5-part Likert 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 range of scores were calculated between the minimum of 1 and maximum of

5. The Amount of Cronbach alpha reliability test for this section was  $\alpha=0.874$ .

Decisional balance construct was evaluated using the short form questionnaire of Velicer and colleagues [28]. 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-part Likert spectrum from "not important" to "extremely important" 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 range of scores were calculated between the minimum of 1 and maximum of 5. The amount of Cronbach alpha reliability test for the pros and cons of smoking were  $\alpha=0.814$  and  $\alpha=0.678$  respectively.

The temptation construct consisted of 9 questions from the short form questionnaire of Velicer et al. [29], 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-part Likert 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  $\alpha=0.880$ .

## 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 the 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 [30]. 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 highest smoking temptation was in contemplators and the lowest were in maintenance. Besides, the highest nicotine dependencies were in people of contemplation and maintenance. Conversely, the lowest nicotine dependencies was in people of action stage (Graph 1).

In line with pros of smoking the less range were in action stage. Conversely, the o cons of smoking were in the highest range

among action stage (Graph 2). Besides, respecting to cons there was a significant difference between the people in pre contemplation stage with preparation stage ( $p=0.037$ ), contemplation with preparation ( $p=0.012$ ), and contemplation with action ( $p=0.011$ ), and preparation with action ( $p=0.030$ ). Concerning to pros of smoking, there were significant differences between pre contemplation with contemplation ( $p=0.005$ ) as well as contemplation and preparation ( $p=0.005$ ) (table 1).

Experiential processes use was more in preparation, action and maintenance stages than pre contemplation and contemplation stages (graph 3). In addition, people in action and maintenance stages were used more behavioral processes than other stages (graph 3).

The effect size was calculated for each area and the results are shown in Table 1. Two higher order processes, Experiential and behavioral processes had partially large the effect size with 0.174 and 0.130, respectively. Additionally, temptation had notable effect size with 0.141. Other processes and constructs showed low or middle effect size (table1).

## Discussion

In this study, the results indicate that, based on the Cohen criteria, in general, cognitive processes have more effect size than behavioral processes. Conversely, People in the early stage of smoking have been reported less cognitive processes which are inconsistent with TTM. According to TTM, we expected to more use of cognitive processes in early stages of smoking. However, few people were in later stages, action and maintenance which are considered as a potential limitation of the current study.

Among the experiential processes, Process consciousness rising had the medium effect size even among all other studied constructs. This may be due to the fact that individual takes more of time to re-evaluate themselves and with the assessment of emotional and cognitive reactions, they experience less emotional reactions towards the adverse effects of smoking. Among the behavioral processes, all of the processes had lower effect size even helping the relationship and stimulus control had more effect size than others. However, regarding Processes of change variable, our findings are in consistent with other studies [19, 31-36]. It is noteworthy to mention the difference between the above studies and the current study is their higher effect sizes of behavioral processes which may be due to their bigger study population in the last two stages (Action and Maintenance) compared to our study. The cultural diversity the studied population and the difference in age groups of study population could be another involved factor. Another difference could be due to the use of the short form of questionnaires in our study.

The results regarding the cons and pros associated with smoking also showed that these constructs have low effect size which may be related to that smokers haven't considered the disadvantages and advantages of smoking significantly.

However, the small effect size these variables show that they do not believe smoking has many benefits and costs. Conversely to the current study, 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 predictor of smoking cessation [34].

Regarding with temptation, the results revealed considerable effect size with 0.141. Temptation because of nicotine dependence can be relatively effective in smoking behavior. Our finding supported the results of other researches. A study on teenage smokers in Bulgaria by Anatchkova et al. showed that cigarette temptation effect size was 0.16 [31]. The interventional study of Haug et al. also concluded the same effect size in their smoking cessation program which is both higher than our results [35].

This study encounters some limitations which are considered to its generalize ability: it was a cross sectional study, few smokers were presented in the last stages, the use of convenient sampling method and the short form of questionnaire for the construct of the TTM. Besides, male gender inclusions is another limitation of the current survey. It is recommended to use the long-form of the questionnaires, longitudinal and prospective studies with more participants in the last stages and considering the gender balance for future studies.

### Competing of interests:

The authors declare that they have no competing interests

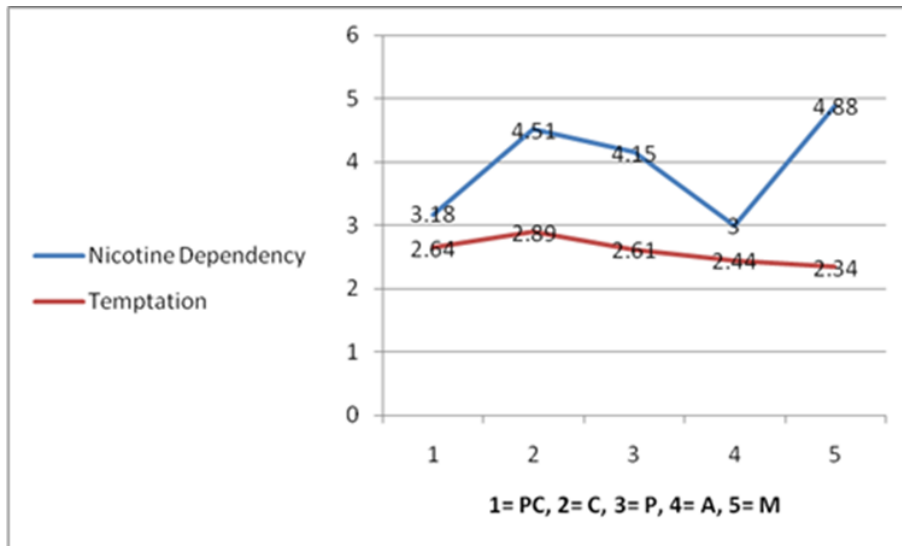
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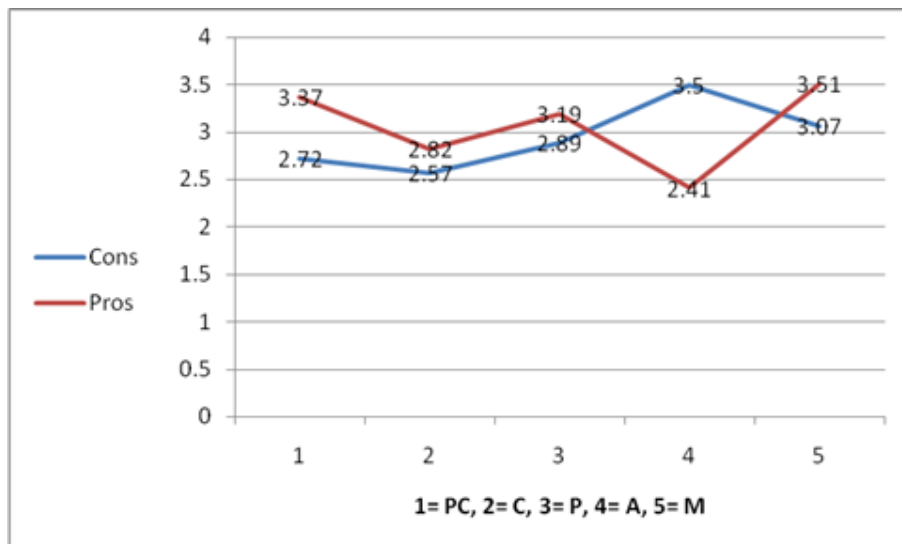
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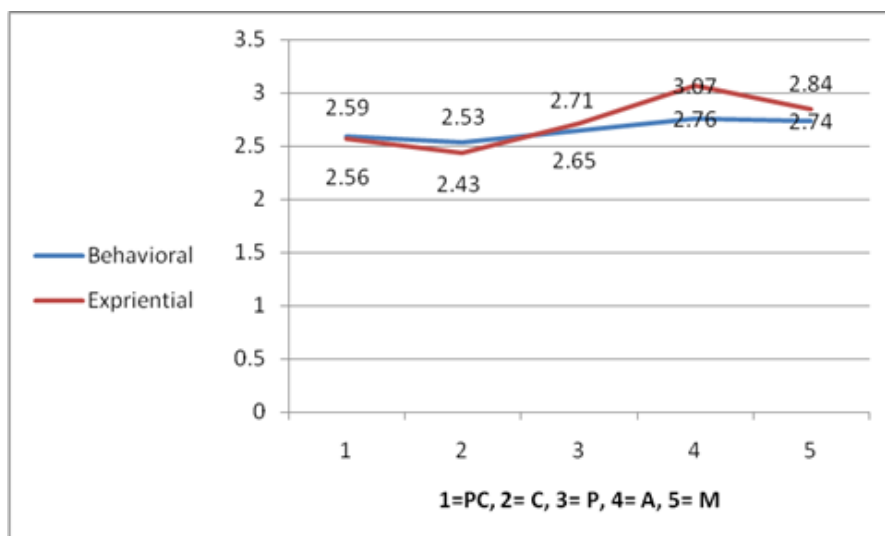
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**Graph 1:** Mean scores of temptation and nicotine dependency in smoking stages of change  
PC= Pre contemplation, C= contemplation, P=preparation, A= action, M=maintenance



**Graph 2:** Mean scores of Cons and pros in smoking stages of change  
PC= Pre contemplation, C= contemplation, P=preparation, A= action, M=maintenance



**Graph 3:** Mean scores of experiential and behavioral processes of change in smoking stages of change  
PC= Pre contemplation, C= contemplation, P=preparation, A= action, M=maintenance

Table 1: Mean and SD of TTM Constructs in stages of change

TTM variables	PC(n=70)	C (n=104)	P (n=209)	A (n=8)	M (n=9)	p-value	Effect size
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD		
Cognitive Processes	2.56±0.70	2.43±0.70	2.71±0.56	3.07±0.34	2.84±0.58	<0.001	0.174
Dramatic Relief	2.39±0.97	2.26±0.91	2.65±0.88	2.81±1.06	3.22±0.45	<0.001	0.064
Environmental re-evaluation	2.84±0.82	2.61±0.77	2.83±0.74	3.00±0.59	2.94±0.52	0.095	0.018
Self re-evaluation	2.31±0.90	2.82±0.93	2.62±0.79	3.12±0.51	2.61±0.74	0.011	0.030
Social Liberation	2.97±1.00	2.45±0.98	2.87±0.82	3.18±1.59	3.22±0.66	<0.001	0.047
Behavioral Processes	2.59±0.96	2.53±0.58	2.65±0.58	2.76±0.52	2.74±0.76	0.573	0.130
Consciousness rising	2.39±1.09	2.34±1.04	2.90±0.86	2.43±0.70	2.43±0.70	0.006	0.035
Helping Relationships	2.71±1.01	2.46±0.97	2.60±0.84	3.25±0.46	2.94±1.07	0.45	0.056
Self - Liberation	2.61±1.14	2.51±1.01	2.76±0.86	3.37±0.58	3.22±0.66	0.012	0.030
Counter Conditioning	2.14±0.83	2.19±0.85	2.40±0.74	2.37±0.74	2.96±0.96	0.022	0.028
Reinforcement	2.71±1.01	2.46±0.97	2.60±0.84	2.56±0.49	2.80±1.43	0.677	0.028
Stimulus Control	2.39±0.97	2.48±0.97	2.53±0.85	2.62±0.79	2.50±0.75	0.725	0.054
Cons of Smoking	2.72±1.00	2.57±1.02	2.89±0.85	3.50±0.47	3.07±1.11	0.015	0.030
Pros of Smoking	3.37±1.28	2.82±1.26	3.19±0.92	2.41±0.61	3.51±1.13	0.012	0.050
Temptation	2.64±1.03	2.89±0.97	2.61±0.80	2.44±1.36	2.34±0.70	0.071	0.141
Nicotine Dependency	3.18±2.35	4.51±2.38	4.15±2.31	3.00±1.85	4.88±3.17	0.160	0.065

PC= Pre contemplation, C= contemplation, P=preparation, A= action, M=maintenance