

Psychometric Properties of the Processes of Change Scale for Smoking Cessation in Turkish Adolescents

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Abstract. The aim of the present study was to adapt a ten-factor the Processes of Change Scale for Smoking Cessation and to conduct validity and reliability analysis. Processes of change for smoking cessation scale were administered to a sample of 276 adolescents. In scale adaptation studies, first-order and second-order confirmatory factor analysis were used for structure validity. To determine the reliability of the scale, Cronbach's Coefficient Alpha and test-retest were used. T-test and a corrected item-total correlation were used for item analysis. Corrected item-total correlations and T-test, which for comparison of lower 27% and upper 27% groups were formed according to total scores of the test, were used for item analysis. Confirmatory factor analysis provided a good fit. Coefficient Alpha was calculated for each of the two item scales. Values ranged from a low of 0.60 to a high of 0.85. Furthermore, Coefficient Alpha was calculated 0.84 for experiential processes and 0.78 for behavioral processes. Scale's test-retest reliability values ranged from a low of 0.62 to a high of 0.88. In the result of the item analysis, corrected item-total correlations were ranged from a low of 0.20 to a high of 0.55; and T-test values were ranged from a low of 5.73 ($p < .001$) to a high of 12.20 ($p < .001$). These findings show that the Turkish version of the Processes of Change Scale for Smoking Cessation is a valid and reliable instrument.

Keywords: smoking cessation, processes of change, adolescent, scale

Introduction

Smoking is a leading cause of preventable diseases all over the world, and disability in many developed (Reitzel Mazas, Cofta-Woerpel, Li, & Cao, 2010; Sanchez, Opaleye, Martins, Ahluwalia, & Noto, 2010; Sims, 2009). It is a habit that starts in adolescence (Sims, 2009) with an average age of onset ranked between 13-15. (Çelikel, Çelikel, & Erkorkma, 2009; Fawibe, Shittu, 2011) and an overt male preponderance (Akindele, Babalola, Adesola, & Eme, 2010; Salawu, Danburam, Isa, & Agbo, 2010). According to the World Health Organisation (WHO), nearly 6 million people die due to tobacco use in a year of whom more

than 5 million are from direct tobacco use and more than 600 000 are nonsmokers exposed to second-hand smoke.

Most of the research about smoking focuses on emotional, social, psychological, and behavioral factors are considered affecting the smoking in adolescents (Kim, 2004). Some psychological problems, such as peer pressure, smoking parents or siblings, tobacco adverts, absence of restriction at home, stress and unemployment, may cause in the use of cigarette (El-Mhamdi, Wolfcarius-Khiari, Mhalla, Ben Salem, & Soltani, 2011; Osungbade & Oshiname, 2008; Sanchez et al., 2010). Adolescents are directly influenced by peers for decision to smoke (Ahmed, Rizwan-ur-Rashid, McDonald, & Ahmed, 2008; Babatunde et al., 2012; Odeyemi, Osibogun, Akinsete, & Sadiq, 2009; Yahya, Hammangabdo, & Omotara, 2010).

A great amount of studies examined associated with smoking factors in adolescence such as depression, suicidal ideation, parental smoking status and the abuse of other substances (e.g. Goodman & Capitman, 2000; Soteriades & DiFranza, 2003; Stanton, Oei, & Silva, 1994). Some of these studies (Goodman & Capitman, 2000; Hockenberry, Timmons, & Vander Weg, 2010) indicate that there is relationship between smoking and depression, other researchers (Afifi, Cox, & Katz, 2007; Bronisch, Höfler, & Lieb, 2008; Riala, Viilo, Hakko, & Räsänen, 2007) state that there is correlation between smoking and increased likelihood of suicidal ideation and/or behaviors. However, some findings show that the relationship between smoking and suicidal ideation are mixed (Boden, Fergusson, & Horwood, 2007; McGee, Williams, & Nada-Raja, 2005). Iglesias, Cavada, Silva, & Caceres (2007) indicate that smoking associated with the factors about the abuse of other substances such as alcohol and marijuana. Furthermore, parental socio-economic level and adolescent smoking were found to be negatively associated (Tyas & Pederson, 1998).

The possibility of quitting among adolescent depends the prevalence of smoking among their peers (Paavola, Vartiainen, & Puska, 2001). That is, influence of friends are the most important factors contributing to smoking cessation. However, health problems play a significant role in attempts to quit smoking. Moreover, education in schools about health problems related smoking may be encouraging smoking cessation (Babatunde et al., 2012).

Adolescent smoking cessation research is limited, so researches must be made about smoking cessation in adolescent samples. In literature, there are few scale with regard to smoking cessation all over the world, but there isn't any instrument to measure this subject in Turkey. The aim of the present study was to adapt a scale to measure processes of change. It was previously developed for adult smokers by Prochaska Velicer, DiClemente, & Fava (1988), and adapted for adolescent by Hoepfner et al. (2006). The scale includes ten processes and have ten primary factors and two higher order factor that represent to experiential and behavioral dimensions (Hoepfner et al., 2006; Prochaska et al., 1988). *Behavioral processes include stimulus control, counter conditioning, reinforcement management, self liberation, and helping relationships. Experiential processes include consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation* (Hoepfner et al., 2006, pp. 1364).

Method

Participants

Participants of the study consisted of 276 eight-grade students in Sultangazi, İstanbul. Participants include 122 males and 144 females. All the participants participated to the study voluntarily. The data collection and its analyses were done anonymously. Ages of individuals participating to the study ranked from 13 to 15. The perceived socio-economic status was 17% high-level income, 18% lower level income, and 25% mid-level income. 40% of Participants didn't answer about socio-economic status. The perceived academic achievement level was 36% high-level academic achievement, 8% lower level academic achievement, and 53% mid-level academic achievement. 3% of participants didn't answer about academic achievement. There was smoking individually in family for majority of participants, 10 of them were siblings, 118 of them were fathers, 15 of them were mothers, 34 of them were fathers and mothers, 12 of them fathers and siblings. In addition, all individuals were smoking in the family of 6 participants.

Instrument

Processes of Change for Smoking Cessation Scale. The scale has been developed by Hoepfner et al. (2006) in order to measuring processes of change for smoking cessation. The measure consists of 20 items to assess the participants' use of the 10 processes of change for smoking cessation. Participant ratings are made on a 5-point Likert scale, ranging from "never" to "very often". The scale includes 10 primary factors representing the processes of change and two second order factors that grouped the processes into five behavioral (e.g., I stay away from places that remind me of smoking) and five experiential processes (e.g., I think about information I have read about how to stop smoking) of change. The experiential processes include; consciousness raising, dramatic relief, environmental reevaluation, social liberation, self reevaluation primary factors. The behavioral processes include; helping relationships, stimulus control, counter conditioning, reinforcement management, self liberation primary factors. Each primary factor of scale has two items.

In the analysis about original form of the scale, Coefficient Alpha was calculated for each of the two item scales. Values ranged from a low of 0.60 to a high of 0.84. The model fit was very good with $\chi^2(159) = 964,88$, χ^2/df ratio=6.068, RMSEA= 0.08, and CFI (Bentler, 1990)= 0.92. All structural paths were statistically significant at the 0.05 level. The primary loadings were generally in the moderate (0.60 to 0.80) and high range (more than 0.80). The loadings for the secondary structure were all in the high range (Hoepfner et al. 2006).

Data Analysis

E-mail communication was established with the authors of the paper describing the psychometric aspects of the processes of change for smoking cessation scale, who granted the necessary permission. In the proces of translation of the

processes of change for smoking cessation scale into Turkish, 5 expert translators, translated scale items firstly into Turkish, and then back into English again to examine their consistence. Following this, the Turkish version was given to 43 adolescents who were asked to identify unclear items. After that, scale' Turkish form and English form were applied to adolescent in order to examined between two forms linguistic equivalence. In scale adaptation studies, confirmatory factor analysis were used for structure validity. To determine the reliability of the scale, Cronbach's (1951) Coefficient Alpha and test-retest reliability were used. T-test and a corrected item-total correlation were used for item analysis.

Findings

Linguistic Equivalence

In this study, firstly, the linguistic equivalence of the Processes of Change Scale was examined between Turkish form end English form. Results are illustrated in Table 1. According to the result of analysis, between Turkish form end English form correlation coefficients ranged from a low of 0.65 to a high of 0.90, and were statistically significant at the $p < 0.001$ level.

Table 1: The linguistic equivalence of the Processes of Change Scale

Factors	Application	\bar{x}	DF	r
Experiential processes	English form	46,08	4,75	.75**
	Turkish form	46,20	4,08	
Consciousness raising	English form	9,29	1,23	.71**
	Turkish form	9,66	1,00	
Dramatic relief	English form	8,50	2,41	.77**
	Turkish form	8,37	2,53	
Environmental reevaluation	English form	9,83	0,38	.68**
	Turkish form	9,45	1,14	
Social liberation	English form	9,04	1,30	.70**
	Turkish form	8,91	1,10	
Self reevaluation	English form	9,41	1,71	.65**
	Turkish form	9,79	0,58	
Behavioral processes	English form	47,75	3,56	.90**
	Turkish form	47,70	3,99	
Helping relationships	English form	8,87	1,96	.77**
	Turkish form	9,04	1,92	
Stimulus control	English form	9,83	0,48	.84**
	Turkish form	9,70	0,62	
Counter conditioning	English form	9,54	0,93	.69**
	Turkish form	9,83	0,48	
Reinforcement management	English form	9,70	0,55	.66**
	Turkish form	9,45	1,21	
Self liberation	English form	9,79	0,65	.87**
	Turkish form	9,66	1,09	

** $p < 0.001$, * $p < 0.05$

Structure Validity

The structural equation modeling was used to fit the hypothesized confirmatory factor analysis model (Figure. 1 and Figure 2) to the sample of 276 adolescents. Ten primary factors of processes of change for smoking cessation scale were analyzed with first-order confirmatory factor analysis to investigate the factor structure having been found by Hoepfner in validity and reliability study of scales' original form.

First-order Confirmatory Factor Analize. CFA was applied to confirm the ten-factor structure found in original form of scale in CFA. According to the result of analysis, model's accordance indexes and chi-square value were acceptable ($\chi^2=201,82$ $df=125$, $p=0.0000$). Accordance index values were found as $RMSEA=.047$, $GFI=.93$, $CFI=.96$, $IFI=.96$, $NFI=.90$, $AGFI=.89$ and $SRMR=.04$. All structural paths were statistically significant at the 0.05 level, and are represented in Figure 1.

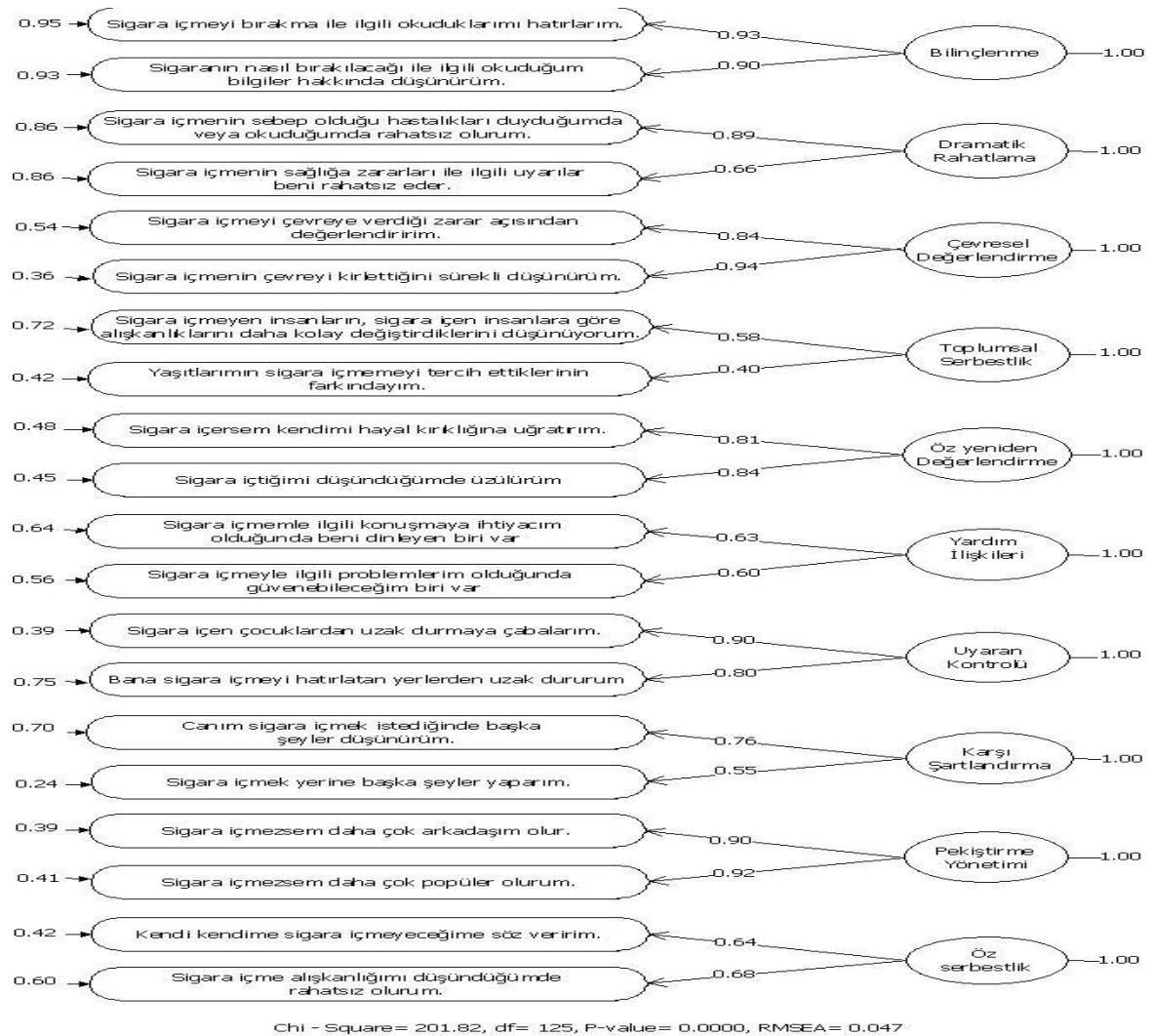


Figure 1: Factor loadings for the first-order factor structure

Second-order Confirmatory Factor Analysis. First-order confirmatory factor analysis revealed ten factors for smoking cessation processes of change scale. Second-order confirmatory factor analysis was conducted to test whether these ten primary factors were predicted by second-order factors, which are latent variables (experiential processes and behavioral processes). According to the result model provided a good fit to the data ($\chi^2 / df = 2.42$), RMSEA=.072, GFI=.90, CFI=.90, IFI=.90, AGFI= .85 ve SRMR= .07). All structural paths were statistically significant at the 0.05 level, and were represented in Figure 2.

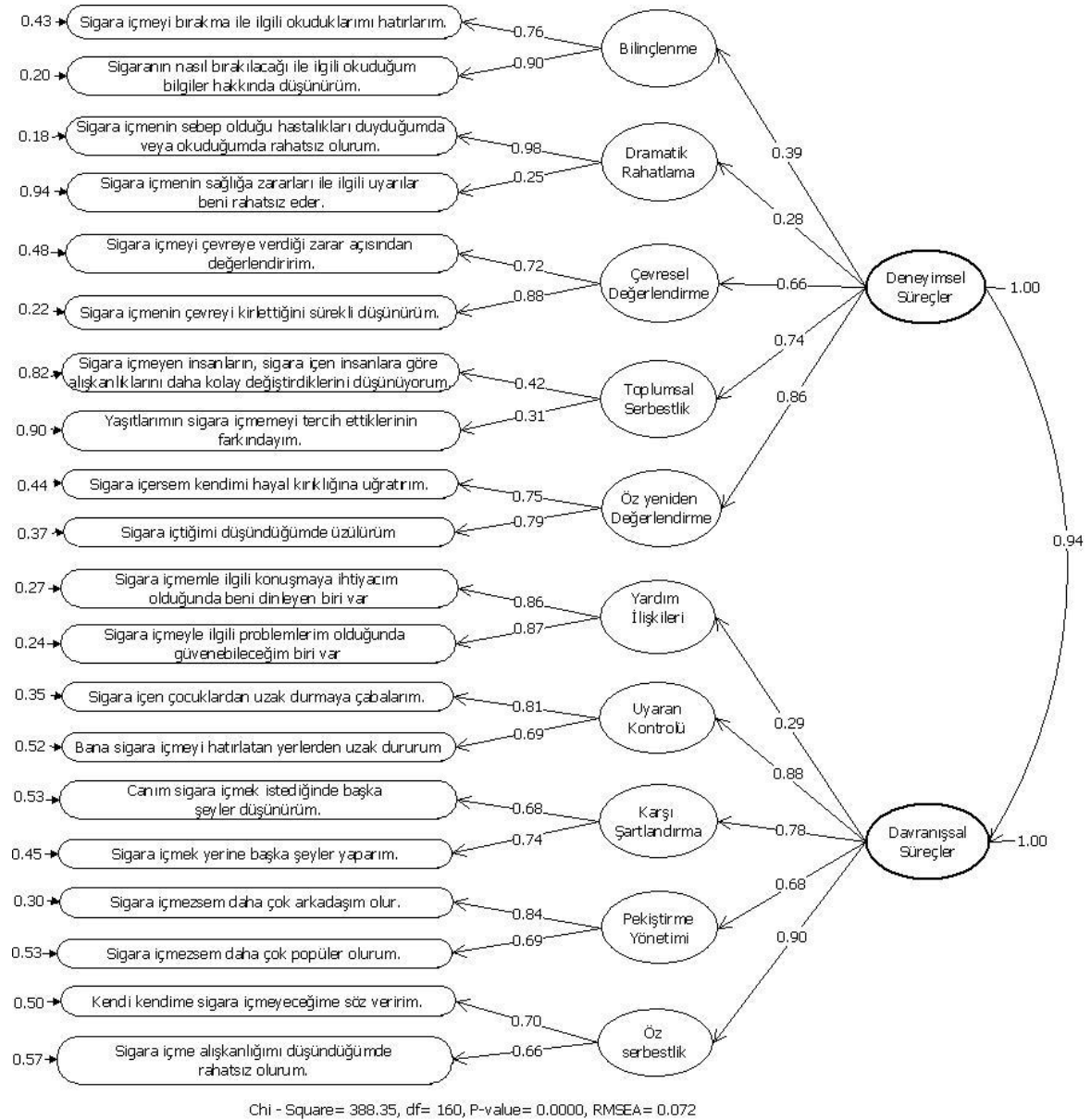


Figure 2: Factor loadings for the second-order factor structure

Reliability

Cronbach's (1951) Coefficient Alpha was calculated for each of the two item subscales. Their internal consistence coefficients were found to be 0.80 for consciousness raising; 0.60 for dramatic relief; 0.77 for environmental reevaluation; 0.61 for social liberation; 0.74 for self reevaluation; 0.85 for helping relationships; 0.71 for stimulus control; 0.63 for counter conditioning; 0.72 for reinforcement management; and 0.63 for self liberation. In summary, values ranged from a low of 0.60 to a high of 0.85 and were statistically significant at the $p < 0.001$ level. Furthermore, Cronbach's Alpha internal consistence coefficient was used to examine the reliability of two second order factors. Their internal consistence reliability coefficients were found to be 0.84 for experiential processes; and 0.78 for behavioral processes. If we consider that preassumed and required reliability is 0.60 (Büyüköztürk, 2010), the scale's reliability level is adequate. Test-retest reliability was used to examine the reliability of the subscales. The findings concerning the test-retest reliability analysis are shown in Table 2.

Table 2: The test-retest reliability of the Processes of Change Scale

Factors	Application	\bar{x}	DF	r
Experiential processes	First application	43,72	4,88	.83**
	Second application	44,20	5,48	
Consciousness raising	First application	9,28	1,17	.82**
	Second application	9,52	0,96	
Dramatic relief	First application	7,48	2,08	.62**
	Second application	7,44	2,36	
Environmental reevaluation	First application	8,92	1,63	.73**
	Second application	8,88	1,73	
Social liberation	First application	8,48	1,61	.70**
	Second application	8,76	1,56	
Self reevaluation	First application	9,56	0,96	.79**
	Second application	9,60	0,95	
Behavioral processes	First application	46,20	4,94	.88**
	Second application	46,60	4,22	
Helping relationships	First application	8,20	2,84	.80**
	Second application	8,12	2,69	
Stimulus control	First application	9,40	1,04	.78**

	Second application	9,60	0,91	
Counter conditioning	First application	9,72	0,73	
	Second application	9,84	0,47	.70**
Reinforcement management	First application	9,40	0,86	
	Second application	9,24	1,30	.72**
Self liberation	First application	9,48	1,32	
	Second application	9,32	1,80	.87**

** $p < 0.001$, * $p < 0.05$

Scale's test-retest reliability coefficients were found to be 0.82 for consciousness raising; 0.62 for dramatic relief; 0.73 for environmental reevaluation; 0.70 for social liberation; 0.79 for self reevaluation; 0.80 for helping relationships; 0.78 for stimulus control; 0.70 for counter conditioning; 0.72 for reinforcement management; and 0.87 for self liberation. In summary, test-retest values ranged from a low of 0.62 to a high of 0.88 and were statistically significant at the $p < 0.001$ level. Furthermore, test-retest reliability coefficients were found to be 0.83 for experiential processes; and 0.88 for behavioral processes. In summary, values ranged from a low of 0.62 to a high of 0.88 and were statistically significant at the $p < 0.001$ level.

Item Analysis

Corrected item-total correlations and T-test, which for comparison of lower 27% and upper 27% groups were formed according to total scores of the test, were used for item analysis. The findings concerning the item analysis are shown in Table 3.

Table 3: The items of the processes of change scale, corrected item-total correlation, and t-test

Items	r_{jx}	T-test
1	.44	10,59***
2	.52	12,20***
3	.40	9,64***
4	.20	9,05***
5	.54	8,97***
6	.49	8,43***
7	.38	10,31***
8	.27	5,83***
9	.34	5,82***

10	.36	6,10***
11	.37	11,32***
12	.38	10,88***
13	.55	8,38***
14	.54	8,91***
15	.51	8,28***
16	.46	5,73***
17	.48	8,57***
18	.45	11,30***
19	.51	6,72***
20	.49	7,90***

** $p < 0.001$, * $p < 0.05$

In the result of the item analysis, it was found that corrected item-total correlations were ranged from a low of 0.20 to a high of 0.55; and T -test values were ranged from a low of 5,73 ($p < .001$) to a high of 12.20 ($p < .001$); and were statistically significant at the $p < 0.001$ level.

Discussion

In the literature, it is seen that there is little research about this subject, so such scales must be developed in order to research, and must be adapted other cultures. In CFA, the hierarchical model from the original inventory produced a good fit to these data. Further, the underlying structure of the processes of change for adolescents is comparable to that observed for adults (Prochaska et al., 1988). The ten processes can be organized into five behavioral and five experiential processes of change as in the original form. The relationship between the ten first-order factors and the two second-order factors were generally higher in the adolescent sample. The correlation between the two second order factors (behavioral and experiential processes) was also higher in the adolescent sample ($r = 0.94$). Alternatively, it may reflect less differentiation between experiential and behavioral processes among adolescent smokers. Future research can address this issue more clearly.

Analysis conducted to assess construct validity was first-order and second-order confirmatory factor analyses, which yielded significant chi-square value and adequate fit indices. According to the generally accepted criteria a good fit can be claimed whether GFI, AGFI, CFI, IFI, and NFI indices are above .90; RMSEA and SRMR are below .10 (Schermelleh-Engel, Moosbrugger, & Müller, 2003). A rule of thumb for this index is that .90 is indicative of good fit relative to the baseline model, while values greater than .85 may be considered as acceptable fit. Furthermore, Hu and Bentler (1999) gave evidence that .90 might not be a reasonable cutoff for all fit indices under all circumstances. They suggested to raise the rule of thumb minimum standard for the CFI and the NNFI from .90 to .95 to reduce the number of severely misspecified models that are considered acceptable based on the .90 criterion. In this regard, the results indicated that these model has acceptable fit indices. Regarding these criteria, model provided

a good fit to the data. Considering the recommendation that internal consistency coefficient (.86) can be considered as a construct validity indicator for the whole scale (Anastasi & Urbina, 1997; Büyüköztürk, 2010; Dağ, 2005) together with factor structure, reliability coefficients, good fit indices obtained by first-order and second-order confirmatory factor analysis, it can be concluded that the processes of change scale is a valid measurement tool for Turkish culture. High reliability estimates indicate that the scale is reliable. The scale adapted in this current study which has simple factors and which is easy to answer makes a major contribution to the research area. It can be concluded that the research accomplished its aim.

Internal consistence, item total correlation and t-test results are high and meaningful makes scale reliable. If we consider that preassumed and required reliability is .60 (Büyüköztürk, 2010), the scale's reliability level is adequate. In this context, satisfactory to good internal consistency reliability level of the scale was found for the total score and subscale scores ($p < .001$). In interpretation of item total correlation .30 and higher items, it is differentiate with its items, we see that item total correlation is adequate (Büyüköztürk, 2010). In low-high 27% groups t-test results have meaningful differences. Item total correlation and 27% low-high group comporison result show that results are distinguishing as original form. We can say that Turkish form of the processes of change scale can be used as valid and reliable as a result of studies.

Based on these results, this adolescent version of the processes of change scale for smoking cessation is recommended for use as a brief, validated, and appropriately adapted measure for assessments and interventions for smoking cessation with adolescents. Beyond serving as an assessment tool, the processes of change scale can also be used for intervention purposes (Hoepfner et al. 2006; Velicer et al., 1993). The efficacy of such interventions in targeting smoking cessation for adults has been supported by previous research (Prochaska, Velicer, Fava, Rossi, & Tsoh, 2001; Prochaska et al., 2004; Velicer, Prochaska, Fava, LaForge, & Rossi, 1999). Until now, research on predictors of smoking cessation among adolescents found that amongst others, self-efficacy, social influence of peers knowledge, and beliefs about smoking are important predictors of smoking cessation (Dijk, Reubsat, de Nooijer, & de Vries, 2007; Radtke, Scholz, Keller, Knaäuper, & Hornung, 2011).

Some suggestions may be made as a result of validity and reliability studies. The sample size of adolescent smokers in the study is expandable. However, it is not always possible to determine the number of smokers at the beginning of studies in school settings, because there is a wide variation of smokers in each school class. Future studies should vary the answering format in order to account for this explanation. Further research is also recommended to examine the processes of change scale in different samples in Turkey (e.g., in adults). In order to test long-term effects of the processes of change on smoking cessation, a longitudinal design would be needed. In addition, it is required to test the processes of change scale in relation to other concepts such as risk perceptions, outcome expectancies, attitudes, or descriptive norms to analyze their contribution to health behaviour change in more detail.

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