Original Article

Factorial structure of the Brazilian version of the Modified Reasons for Smoking Scale

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ABSTRACT

Objective. To characterize the factorial structure and psychometric properties of the Brazilian version of the Modified Reasons for Smoking Scale (MRSS).

Methods. The sample consisted of 311 smokers (214 male; mean age: 37.6 ± 10.8 years), who came to Hemocentro de Ribeirão Preto to donate blood. Volunteers answered 21 items of the Brazilian version of the MRSS, Fagerström test, and the Brazilian Criterion of Economic Classification. Scores of MRSS items were evaluated based on their grouping, employing exploratory factorial analysis. The influence of clinical features over the final factorial solution scores was also investigated.

Results. Factorial analysis led to the characterization of seven factors: dependence, stimulation, pleasure to smoke, hand-mouth activity, social interaction, tension reduction/relaxation, and habit/automatism. Four questions were excluded due to factorial loadings below 0.3. The final version was made up of 17 items showing a minimal factorial loading of 0.376. Women showed high scores in dependence (3.5 X 3.1), tension reduction/relaxation (4.1 X 3.5), and hand-mouth activity (2.4 X 2.0). Lower Fagerström test scores were associated to low scores in dependence, tension reduction/relaxation, habit/automatism and stimulation.

Conclusion: The Brazilian version of the MRSS, comprised of 17 items, showed satisfactory factorial structure and psychometric properties.

Keywords: Smoking cessation. Scales. Validation studies.

Introduction

Although the psychoactive properties of nicotine are the main element associated to the onset of smoking dependence, the motivations for smoking cigarettes appear to be varied and multidimensional. There is recurring evidence that tobacco dependence goes beyond nicotine dependence itself[1-4]. The latter is supposedly only a dimension within a larger scenario. The so-called "tobacco dependence" supposedly reflects the pharmacological dependence to nicotine, as well as other psychosocial aspects of the condition. Therefore, the identification of the various reasons which lead someone to smoke may help establish individualized quitting strategies.

Smoking has been described as a way for individuals to control their feelings[1]. According to Tomkins, there are four basic motivational characteristics of the behavior of smokers: (i) the search for positive affect, (ii) the search for relief from negative affect, (iii) dependence and (iv) habit. Based on this model, Horn and Waingrow have created a scale to identify the dominant reasons that lead people to smoking[5]. This scale is called Reasons for Smoking Scale - RSS, and it has been used for decades in North America. It is the most frequently used measurement to assess the psychological reasons that lead someone to smoke.[6-8]

In the initial study, the RSS was applied to 2094 adult smokers and, through a factorial analysis, six motivational elements were defined: (i) stimulation, (ii) pleasure/relaxation, (iii) sensorimotor manipulation, (iv) habit, (v) dependence and (vi) reduction in negative feelings[9]. Several authors who have used the RSS have identified these same six motivational groups[10].

A few years ago, a modification in the RSS was proposed, including new questions in order to cover a seventh motivational domain, i.e., social interaction, which originated from a model

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previously proposed in the literature.[11] The new scale, composed of 21 questions, was designated the Modified Reasons for Smoking Scale - MRSS.[12] The psychometric properties of the MRSS were evaluated in a sample composed of 330 French smokers and led to the characterization of seven motivational domains: (i) dependence, (ii) the pleasure of smoking, (iii) tension reduction/relaxation, (iv) social interaction, (v) stimulation, (vi) habit/automatism and (vii) hand-mouth activity. This analysis resulted in the exclusion of 2 questions (due to their low factor loadings), and the final version of the MRSS was composed of 19 items. In this initial study, a correlation was found between high scores for *habit/automatism* and high rates of relapse after an anti-smoking intervention.[12]

The MRSS has been recently translated and transculturally adapted to Brazilian Portuguese, from an English language version obtained from the original authors.[13] This study aims to investigate the factorial structure and psychometric properties of this Brazilian version of the scale, which have not yet been described.

METHODS

Research subjects

The volunteer smokers were selected among blood donors who spontaneously came to Hemocentro de Ribeirão Preto to donate. During the period of the study, as part of the initial assessment of all donors, those who had smoked at least one cigarette over the past week were asked to participate in the study. Individuals under 18 years of age, who reported comorbidities, or history of substance or alcohol abuse were excluded. Illiterate individuals and individuals whose primary literacy language was not Brazilian Portuguese. Individuals who agreed to take part in the investigation signed an Informed Consent form and then, in a calm atmosphere, answered the self-report standard questionnaire. This study was approved by the Ethics Committee for Research on Humans of the Ribeirão Preto Hospital das Clínicas, at Universidade de São Paulo.

In the period from December 2006 to October 2007, 311 volunteers were interviewed, 214 men and 97 women. The mean age of the sample was 37.6 ± 10.8 years, ranging from 18.1 and 65.9 years. The distribution of the sample among social classes was as follows: A1: 2 (0.6%); A2: 12 (3.9%); B1: 26 (8.4%); C: 170 (54.7%); D: 40 (12.9%) and E: 5 (1.6%). The mean education level of the sample was 9.0 ± 3.8 years, which corresponds to incomplete secondary school. The mean time smoking of the sample was 20.4 ± 11.3 years, and the mean daily cigarette intake was 15 ± 9.2 cigarettes. The sample's degree of nicotine dependence, assessed by the Fagerström nicotine dependence test, could be classified as light, with a mean score of 3.7 ± 2.4 (ranging between 0-9).

Research instrument

The questionnaire applied was composed of the MRSS 21 questions, the Fagerström nicotine dependence test, demographic information, items related to the subject's smoking history, and to the Brazilian Criterion of Economic Classification.[14-17]

The version of the MRSS selected for use has undergone translation and cross-cultural adaptation for Brazilian Portuguese, according to the traditional methodology, as previously described (Annex).[13,18,19] The original scale in English was obtained from Dr. Irvin Berlin, at Centre Hospitalier-Universitaire Pitié-Salpêtrière, Paris. This instrument was first translated to Portuguese by three Brazilian physicians who had lived in English-speaking countries for long periods. A consensus version was then obtained after analysis by a multidisciplinary group made up of two pulmonologists, one psychiatrist and one psychologist. This Portuguese version was then back-translated to English by an American translator, with satisfactory results. The scale's cultural identity assessment was initially confirmed in a sample of 20 smokers with no comorbidities, all employees of the Ribeirão Preto Hospital das Clínicas. This consensus version was used in all subsequent studies. The answers to the MRSS are expressed in Likert scale scores, ranging from 1 to 5 (Annex). The translated Portuguese version showed high degree of test-retest reliability in comparisons using the transtheoretical model obtained by Berlin et al., with intra-class correlation coefficients ranging from 0.59 and 0.87, as previously published.[13]

The Fagerström nicotine dependence test is a classic assessment instrument for smokers, made up of six questions and a total score ranging from 0 to 10. It has been widely used in Brazil for years, and higher scores are associated to lower degrees of chemical dependence to nicotine.[14-16]

Statistical analysis

The results obtained were tabulated in data spreadsheets and analyzed using the SPSS, version 13.0 (SPSS-Incorporated, Cambridge, MA, 2001). Data referring to the demographic characteristics and smoking history of subjects were expressed in means and standard deviation values. The scores of MRSS questions were evaluated by Exploratory Factorial Analysis, through the principal component technique, with varimax rotation, in order to investigate the validity of the scale construct.[20] The explanatory factorial analysis is a statistical method used to identify the underlying structure of groups with a large number of variables. It reduces these variables to a smaller set of structured factors, and is widely used in developing and interpreting research instruments in the field of psychology. The number of 311 volunteers, for a factorial analysis of a 21-question scale, provided a ratio of 14.8 individuals per question, which is above the recommended value of 10 respondents per item. The sample requirements for factorial analysis, with Kaiser-Meyer-Olkin test value of 0.75 and significant Bartlett's sphericity test, were met. A minimum factorial loading value of 0.3 was established for acceptance of a question within one of the factors generated. The internal consistency of the generated factors was assessed by the Cronbach's alpha test, and the minimum acceptable values were above 0.50.[21,22]

The behavior analysis of the detected factors, for the clinical variables sex, age, and Fagerström test, was performed with the use of the Multivariate Analysis of Variance (MANOVA), with Bonferroni post-test, when indicated. In these tests a statistical significance level equal or below 5% was established. For the analysis, volunteers were divided into the following age groups: up to 30 years; from 31 to 40 years; from 41 to 50 years, and over 50 years. Fagerström test scores were divided into three categories: light dependence (scores from 0-4), moderate (scores from 5-7), and heavy (scores equal or over 8).

RESULTS

The factorial analysis identified a solution with seven factors, which explain 62.4% of the total variance of responses (Table 1). The breakdown of these factors, along with the respective factorial loading values obtained for each question, is listed in Table 2. The application of a factorial loading value over 0.3 for the inclusion of items to factors led to the exclusion of four questions from the original version (questions number 12, 16, 17 and 21). The designations given to each of the factors, based on the original terminology previously used in the literature were as follows:

Factor 1: Dependence (questions 5 and 19).
Factor 2: Stimulation (questions 1, 8 and 15).
Factor 3: Pleasure of smoking (questions 3 and 10).
Factor 4: Hand-mouth activity (questions 2 and 9).
Factor 5: Social interaction (questions 7 and 14).
Factor 6: Tension reduction/relaxation (questions 4,11 and 18).
Factor 7: Habit/automatism (questions 6,13 and 20).

Internal consistency levels of the generated factors, measured by Cronbach's alpha coefficient, are also listed on Table 2.

Behavioral analysis of the detected factors, due to the clinical variables sex, age and Fagerström test, is listed on Table 3. Women showed significantly higher scores in factors dependence, tension reduction/relaxation and hand-mouth activity. Women also showed a tendency for higher scores in the social

Table 1. Percentage of variance explained by factors from factorial analysis

Factor	% variance	% cumulative
1	21.91	21.91
2	8.40	30.31
3	7.68	37.98
4	7.07	45.05
5	6.55	51.60
6	5.77	57.37
7	4.97	62.35
8	4.59	66.93
9	4.49	71.42
10	4.19	75.61
11	3.21	78.82
12	3.14	81.96
13	2.98	84.94
14	2.81	87.75
15	2.33	90.07
16	2.22	92.29
17	2.03	94.31
18	1.65	95.96
19	1.46	97.42
20	1.30	98.72
21	1.28	100

Table 2. Breakdown and factorial loading of the factors identified by the Brazilian version of the MRSS

Question	Factor 1 Dependence	Factor 2 Stimulation	Factor 3 Pleasure of smoking	Factor 4 Hand-mouth activity	Factor 5 Social interaction	Factor 6 Tension reduction	Factor 7 Habit/ automatism
19. Enormous craving	0.878						
5.Unbearable	0.415						
12 Alert*	0.241						
17.Comfortable and relaxed*	0.235						
1. Keep alert		0.767					
8.Stimulate		0.739					
15. Uplifting		0.621					
10.Pleasurable			-0.871				
3.Pleasurable and relaxing			-0.828				
9.Steps to light up				0.805			
2. Hand-mouth activity				0.779			
16.Watching the smoke*				0.169			
7. Talking and relating					0.887		
14. Safer					0.643		
21. With other people*					0.281		
11. Uncomfortable or upset						-0.875	
4. Angry						-0.745	
18. Sad						-0.435	
13. Without realizing							0.687
20. Without remembering							0.478
6. Automatically							0.376
Cronbach's alpha coefficients for final versions of factors	0.62	0.77	0.82	0.61	0.58	0.75	0.52

* Questions excluded from final version, due to low factorial loadings

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Table 3. Influence of some clinical features over the scores of factors in the Brazilian version of the MRSS

	Dependence	Stimulation	Pleasure of smoking	Hand-mouth activity	Social interaction	Tension reduction/ relaxation	Habit/ automatism
Sex	M: 3.1* F: 3.5	M: 1.8 F: 1.9	M: 3.7 F: 3.9	M: 2.0* F: 2.4	M: 1.6** F: 1.8	M: 3.5* F: 4.1	M: 1.7 F: 1.8
Age (years)	≤ 30: 3.2 31-40: 3.0 41-50: 3.1 >50: 2.8	≤ 30: 1.9 31-40: 1.8 41-50: 1.7 >50: 1.7	≤ 30: 3.9 31-40: 4.2+ 41-50: 3.5 >50: 3.5	≤ 30: 2.2 31-40: 2.0 41-50: 1.8 >50: 2.1	≤ 30: 2.2+ 31-40: 3.0 41-50: 3.1 >50: 2.8	≤ 30: 3.9 31-40: 3.8 41-50: 3.5 >50: 3.5	≤ 30: 1.6 31-40: 1.7 41-50: 1.8 >50: 1.7
Fagerström test	L: 2.7* Mod:3.7 H: 4.0	L: 1.7 Mod:1.8 H: 2.8*	L: 3.7 Mod:3.9 H: 4.1	L: 1.9 Mod:2.1 H: 2.2	L: 2.2 Mod:2.1 H: 4.0	L: 3.4* Mod:4.1 H: 4.3	L: 1.5* Mod:2.1 H: 2.2

M: male; F: female; L: light; Mod: moderate; H: heavy
* $p < 0.05$ in relation to other groups; ** $p < 0.10$ in relation to other groups
$p < 0.05$ in relation to 41-50 years age group;
Annex: Modified reasons for smoking scale translated to Brazilian Portuguese

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interaction factor. The age group of smokers 41 and 50 years old showed significantly lower scores of pleasure of smoking and social interaction to those between 31 and 40 years old, and under 30 years old, respectively. In the Fagerström test, the group with light nicotine dependence showed significantly lower scores in dependence, tension reduction/relaxation and habit/automatism compared to smokers with moderate and heavy dependence. Furthermore, the groups with light and moderate nicotine dependence showed significantly lower scores in stimulation, compared to the group with heavy dependence.

DISCUSSION

Smoking is nowadays a major public health problem. The estimated number of annual deaths from smoking-related diseases worldwide is of 5,000,000. Likewise, it is estimated that half the smokers will have their lifespan shortened by a smoking-related disease.[23] Although harmful effects of cigarettes are highly publicized, the difficulty of smokers to quit the habit are widely acknowledged.[24]

Nicotine is a psychoactive drug that can strongly influence cerebral functions.[4,24] Although nicotine dependence is the main factor associated to smoking, data from the literature suggest that the addiction shows a multifactorial spectrum.[1-4] The characterization of various factors which lead people to smoke may contribute to the development of anti-smoking interventions specific for each individual. The main instruments proposed thus far, for that purpose, have been the RSS and MRSS scales. In fact, up to this moment we have found only one publication devoted to the validation of the latter in a foreign language.[12]

The present article investigated the factorial structure and psychometric properties of a translated and trans-culturally adapted version of the MRSS for Brazilian Portuguese.[13] Volunteers for this study were selected among individuals who spontaneously came to donate blood in a reference center for hemotherapy in the state of São Paulo. This strategy allowed us to investigate the motivational profile for smoking cigarettes in a context closer to the community's epidemiological reality. It is possible that a different motivational profile could have been

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Anexo: Escala razões para fumar modificada traduzida para o português falado no Brasil.

1. Eu fumo cigarros para me manter alerta.
2. Manusear um cigarro é parte do prazer de fumá-lo.
3. Fumar dá prazer e é relaxante.
4. Eu acendo um cigarro quando estou bravo com alguma coisa.
5. Quando meus cigarros acabam, acho isso quase insuportável até eu conseguir outro.
6. Eu fumo cigarros automaticamente sem mesmo me dar conta disso.
7. É mais fácil conversar e me relacionar com outras pessoas quando estou fumando.
8. Eu fumo para me estimular, para me animar.
9. Parte do prazer de fumar um cigarro vem dos passos que eu tomo para acendê-lo.
10. Eu acho os cigarros prazerosos.
11. Quando eu me sinto desconfortável ou chateado com alguma coisa, eu acendo um cigarro.
12. Quando eu não estou fumando um cigarro, eu fico muito atento a isso.
13. Eu acendo um cigarro sem perceber que ainda tenho um outro aceso no cinzeiro.
14. Enquanto estou fumando me sinto mais seguro com outras pessoas.
15. Eu fumo cigarros para me "por para cima".
16. Quando eu fumo um cigarro, parte do prazer é ver a fumaça que eu solto.
17. Eu desejo um cigarro especialmente quando estou confortável e relaxado.
18. Eu fumo cigarros quando me sinto triste ou quando quero esquecer minhas obrigações ou preocupações.
19. Eu sinto uma vontade enorme de pegar um cigarro se fico um tempo sem fumar.
20. Eu já me peguei com um cigarro na boca sem lembrar de tê-lo colocado lá.
21. Eu fumo muito mais quando estou com outras pessoas.

As alternativas e o peso das respostas para cada questão são:

( ) Nunca [1] ( )Raramente [2] ( )Às vezes [3] ( )Frequentemente [4] ( )Sempre [5]

obtained if volunteers had been selected in a different way, such as, for instance, a quit smoking program.

The literature shows inconsistencies in the definition and inclusion criteria of smokers in studies.[25] A regular smoker is usually defined as one who smokes at least one cigarette per day everyday, or almost everyday. However, there are divergences in the way to define occasional smokers, which end up being classified into categories that reflect the frequency or intensity of cigarettes smoked, such as having smoked at least two cigarettes during the previous week, or smoking at least one cigarette per week, but not daily. The inclusion criteria for volunteers was having smoked at least one cigarette during the previous week, which allowed the study to select regular smokers and occasional smokers who had recently smoked. In this way, the instrument properties could be investigated in a sample whose nicotine dependence profile was sufficiently broad. The need to smoke cigarettes over the previous week also contributed to select subjects who had fresh experiences of cigarette smoking, which was likely to facilitate self-reporting of underlying motivational factors.

In the present study, the questions of the Brazilian version of the MRSS showed a factorial structure consistent to predictions and previous publications. As previously reported by Berlin et al., questions 12 and 21 showed very low factorial loadings, which justified their removal from the final version of the instrument.[12] Furthermore, in the present study, the factorial loadings of questions 16 and 17 were also low, which also led to their exclusion. Therefore, the factors dependence, social interaction, pleasure of smoking and hand-mouth activity were satisfactorily defined with the use of only two questions each.

The present factorial analysis showed very similar results to those of the previous international study carried out in France, since the breakdown of five of the seven factors established were identical.[12] The factors hand-mouth activity and pleasure of smoking excluded, in the Brazilian version, questions 16 and 17, which is largely justified by cultural differences. However, the degree of smoking dependence of volunteers in the previous study was substantially higher than that observed in the present article. Whereas the mean number of cigarettes smoked daily by volunteers in the French study was 26.5 ± 8.5, the mean for the present article was 15 ± 9.2. Additionally, the mean Fagerström test score for the first group was 6.2 ± 2.0, while the second group scored 3.7 ± 2.4. Therefore, small differences regarding the breakdown of factors, compared to the initial article, could have been, to some extent, due to differences in the samples of both studies regarding the degree of smoking dependence. Even though, based on the Fagerström test, the degree of smoking dependence of most volunteers in the present study can be classified as light to moderate, the situation in which individuals were approached was not related to quitting scenarios, unlike the French study. The data obtained through this study serve as a confirmation of the original factorial model validity in a scenario in which smokers were not actively attempting to quit the habit.

In the French study, the factor dependence was positively associated to the number of cigarettes smoked daily, whereas the factor habit/automatism was significantly higher in the group of smokers who smoked more than one pack per day.[12] The factor dependence also showed significant association with Fagerström test scores over 6. In the current study, smokers classified as light nicotine dependence showed lower scores in dependence, tension reduction/relaxation and habit/automatism than those of the subgroups classified as moderate and heavy nicotine dependence. Likewise, the subgroup classified as heavy nicotine dependence showed mean stimulation score higher than that of the remaining subgroups. This set of results suggests that, like the original version, the Brazilian version of the MRSS shows significant associations with the Fagerström test.

In the previous study, women showed a different profile of reasons for smoking from that of men, with high scores in tension reduction/relaxation, stimulation and social interaction.[12] In the present investigation, women showed significantly higher mean scores in dependence, tension reduction/relaxation and hand-mouth activity. A trend for higher social interaction scores was also spotted. The similarities found regarding associations between the Fagerström test and factors, as well as the influence of sex over the reasons for smoking profile, function as a confirmation of the validity of this Brazilian version of the MRSS.

As previously mentioned, one of the limitations of the present study is the fact that the degree of nicotine dependence in the sample was not high. Additionally, the sample had a limited number of volunteers from socioeconomic classes A, B and E. These facts could have contributed for the exclusion of the four questions with low factorial loadings and consequent transformation of the original 21-question scale to the final version with only 17 questions.

The results obtained by this study made it possible to conclude that the Brazilian version of the MRSS shows satisfactory factorial structure and psychometric properties. The establishment of the 17-question version will allow additional investigations, aiming to better describe the real usefulness of such instrument in the care of Brazilian smokers.

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