University of São Paulo Reasons for Smoking Scale: a new tool for the evaluation of smoking motivation*, **

Escala Razões para Fumar da Universidade de São Paulo: um novo instrumento para avaliar a motivação para fumar

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Abstract

Objective: To develop a new scale aimed at evaluating smoking motivation by incorporating questions and domains from the 68-item Wisconsin Inventory of Smoking Dependence Motives (WISDM-68) into the Modified Reasons for Smoking Scale (MRSS). **Methods:** Nine WISDM-68 questions regarding affiliative attachment, cue exposure/associative processes, and weight control were added to the 21 questions of the MRSS. The new scale, together with the Fagerström Test for Nicotine Dependence (FTND), was administered to 311 smokers (214 males; mean age = 37.6 ± 10.8 years; mean number of cigarettes smoked per day = 15.0 ± 9.2), who also provided additional information. We used exploratory factor analysis in order to determine the factor structure of the scale. The influence that certain clinical features had on the scores of the final factor solution was also analyzed. **Results:** The factor analysis revealed a 21-question solution grouped into nine factors: addiction, pleasure from smoking, tension reduction, stimulation, automatism, handling, social smoking, weight control, and affiliative attachment. For the overall scale, the Cronbach's alpha coefficient was 0.83. Females scored significantly higher for addiction, tension reduction, handling, weight control, and affiliative attachment than did males. The FTND score correlated positively with addiction, tension reduction, stimulation, automatism, social smoking, and affiliative attachment. The number of cigarettes smoked per day was associated with addiction, tension reduction, stimulation, automatism, affiliative attachment, and handling. The level of exhaled CO correlated positively with addiction, automatism, and affiliative attachment. **Conclusions:** The new scale provides an acceptable framework of motivational factors for smoking, with satisfactory psychometric properties and reliability.

Keywords: Smoking; Validation studies; Tobacco use cessation.

Resumo

Objetivo: Desenvolver uma nova escala voltada para a avaliação da motivação para fumar, incorporando questões do 68-item *Wisconsin Inventory of Smoking Dependence Motives* (WISDM-68, Inventário Wisconsin dos Motivos de Dependência ao Fumo, de 68 itens) na *Modified Reasons for Smoking Scale* (MRSS. Escala Razões para Fumar Modificada). **Métodos:** Nove questões do WISDM-68 relativas à associação estreita, exposição a gatilhos/ processos associativos e controle de peso foram incorporadas às 21 questões da MRSS. Um total de 311 fumantes (214 homens; idade média = 37,6 ± 10,8 anos; média de cigarros consumidos ao dia = 15,0 ± 9,2) responderam a nova escala, o *Fagerström Test for Nicotine Dependence* (FTND, Teste de Fagerström para Dependência de Nicotina) e outras questões. Empregamos a análise fatorial exploratória para determinar a estrutura fatorial da escala. A influência de algumas características clínicas nos escores da solução fatorial final foi também avaliada. **Resultados:** A análise fatorial revelou uma solução com 21 questões agrupadas em nove fatores: dependência, prazer de fumar, redução da tensão, estimulação, automatismo, manuseio, tabagismo social, controle de peso e associação estreita. Para a escala como um todo, o coeficiente alfa de Cronbach foi de 0,83. As mulheres exibiram maiores escores para dependência, redução da tensão, manuseio, controle de peso e associação estreita do que os homens. Os escores do FTND correlacionaram-se positivamente com dependência, redução da tensão, estimulação, automatismo, tabagismo social e associação estreita. O número de cigarros fumados ao dia se associou com dependência, redução da tensão, estimulação, automatismo, associação estreita e manuseio. Os níveis de CO exalado mostraram associações positivas com dependência, automatismo e associação estreita. **Conclusões:** A nova escala fornece um quadro aceitável dos fatores motivacionais associados ao tabagismo, com confiabilidade e propriedades psicométricas satisfatórias.

Descritores: Tabagismo; Estudos de validação como assunto; Abandono do uso de tabaco.

Introduction

The psychoactive properties of nicotine are generally considered to constitute the most important element of nicotine dependence. However, there is evidence that the motivation for smoking is multidimensional.[1-3] Therefore, nicotine addiction might involve factors other than physical dependence on nicotine, which would mean that nicotine dependence is a broad construct, comprising various psychosocial facets. Accurate identification of the distinctive factors that drive people to smoke might inform decisions regarding the development of public policies for smoking prevention and control, as well as those regarding the design of tailored smoking cessation strategies.

The motivations for smoking have been studied for decades, and some motivational factors have been described, including the desire to maximize positive affects/minimize negative affects, addiction, and habit.[2] Based on this model, Horn & Waingrow created the Reasons for Smoking Scale (RSS), which has long been the instrument most commonly employed to measure smoking motivation in North America.[4-6]

In 1969, the RSS was applied to 2,094 adult smokers, and six motivational elements were identified by factor analysis: stimulation; pleasurable relaxation; habitual smoking; addictive smoking; negative affect reduction; and sensorimotor manipulation.[7] Other authors have studied the RSS and have obtained comparable results.[8]

The authors of a study conducted in France suggested a change in the RSS, introducing three new items related to an additional motivational factor designated "social smoking" and bringing the total number of items to 21. The new instrument was designated the Modified Reasons for Smoking Scale (MRSS).[9] The psychometric properties of this scale were evaluated in a group of 330 adult smokers, and seven factors were identified: addictive smoking; pleasure from smoking; tension reduction/relaxation; social smoking; stimulation; habit/automatism; and handling. Two items exhibited low factor loadings and were excluded from the final version of the scale, which was therefore composed of 19 questions.[9]

Another tool that was developed to characterize the motivational reasons for smoking is the 68-item Wisconsin Inventory of Smoking Dependence Motives (WISDM-68).[10,11] This instrument is based on theoretically grounded motives for drug use, approaches previously uninvestigated aspects, and can be considered the most complete evaluation of smoking motivation available. A study involving 775 smokers showed that the subscales of the WISDM-68 have acceptable internal consistency, are differentially present across the levels of smoking intensity, and have a multidimensional structure.[10] In addition, validity analyses indicated that the subscales are significantly related to the intensity of smoking, as well as to symptoms of dependence and relapse, as defined in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.[11] The final version of the WISDM-68 includes 68 items that assess 13 motives for smoking: affiliative attachment; automaticity; loss of control; behavioral choice/melioration; cognitive enhancement; craving; cue exposure/associative processes; negative reinforcement; positive reinforcement; social/environmental goads; taste/sensory process; tolerance; and weight control. The number of items related to each motive ranges from 4 to 7, most motives comprising 5 items.

The WISDM-68 provides a comprehensive evaluation of smoking motivations. However, the great number of questions makes its routine use in clinical practice somewhat problematic. In addition, a close comparison between the questions and the factors derived from the MRSS and the WISDM-68 reveals some degree of overlap between the solutions obtained. Of the 13 WISDM-68 motives, 9 are represented, to some degree, in the MRSS.

The WISDM-68 automaticity motive, for example, is defined by 5 items: "I often smoke without thinking about it"; "I smoke without deciding to"; "I frequently light cigarettes without thinking about it"; "I find myself reaching for cigarettes without thinking about it"; and "Sometimes I'm not aware that I'm smoking". Similarly, the MRSS habit/automatism motive is defined by the following phrases: "I smoke cigarettes automatically without even being aware of it"; "I light up a cigarette without realizing I still have one burning in the ashtray"; and "I've found a cigarette in my mouth and did not remember putting it there".

Other examples of similarities between the elements of the two scales are the WISDM-68 cognitive enhancement motive and the MRSS stimulation motive. The former is defined by the following sentences: "I smoke when I really need to concentrate"; "I frequently smoke to keep my mind focused"; "Smoking helps me stay focused"; "My concentration is improved after smoking a cigarette"; and "Smoking helps me think better". The latter is defined by the following sentences: "I smoke cigarettes to keep myself from slowing down"; "I smoke cigarettes to stimulate me, to perk myself up"; and "I smoke cigarettes to give me a lift". However, 4 of the 13 WISDM-68 motives appear not to be minimally covered by the MRSS: affiliative attachment; behavioral choice/melioration; cue exposure/associative processes; and weight control.

The objective of the present study was to describe the development, the psychometric properties, and the factor structure of a new questionnaire, containing the seven traditional factors of the MRSS and certain items derived from the WISDM-68.

The final instrument, designated the University of São Paulo Reasons for Smoking Scale (USP-RSS), has the potential to become a relevant tool for the evaluation of smoking motivations in various clinical settings.

Methods

The new instrument was developed simultaneously with the analysis of the factor structure and psychometric properties of a Brazilian Portuguese-language version of the MRSS.[12] Volunteers (smokers only) were recruited from among consecutive blood donors at the Ribeirão Preto Blood Bank, located in the city of Ribeirão Preto, Brazil. All volunteers completed a single form containing 53 questions. In all cases, the volunteers were able to complete the form in less than 60 min. The data collected were employed in order to analyze the structure and properties of the Brazilian Portuguese-language version of the MRSS, as well as to investigate the effect of the addition of 9 questions derived from the WISDM-68. Although the data had been obtained on a single occasion, due to the distinctive objectives of the investigations, the individual statistical analysis, and the enormous amount of results, we chose to report our results

in two different studies, one by Souza et al.[12] and the present one.

The original MRSS scale, in English, was kindly provided by Ivan Berlin, of the *Centre Hospitalier Universitaire Pitié-Salpêtrière* (Paris, France). The WISDM-68 questionnaire had been previously published, and electronic consent for its use was obtained from the first author of the original article, Megan E. Pipe, of the Center for Tobacco Research and Intervention, at the University of Wisconsin Medical School (Madison, WI, USA).

The WISDM-68 questions dealing with motives that are not covered by the MRSS (affiliative attachment; cue exposure/associative

Table 1 – Factors obtained by principal axis factoring and the corresponding proportions of variance explained.

Factor	Eigenvalue		
	Total	Variance, %	Cumulative variance, %
1	5.904	19.681	19.681
2	1.879	6.262	25.942
3	1.766	5.886	31.829
4	1.619	5.398	37.227
5	1.517	5.055	42.282
6	1.448	4.828	47.110
7	1.319	4.396	51.507
8	1.150	3.834	55.341
9	1.139	3.798	59.139
10	1.000	3.333	62.472
11	0.976	3.255	65.726
12	0.920	3.068	68.795
13	0.900	3.000	71.795
14	0.828	2.761	74.555
15	0.792	2.642	77.197
16	0.738	2.461	79.658
17	0.685	2.283	81.941
18	0.635	2.118	84.059
19	0.610	2.033	86.092
20	0.554	1.848	87.940
21	0.540	1.800	89.740
22	0.476	1.586	91.326
23	0.443	1.476	92.802
24	0.418	1.393	94.195
25	0.394	1.312	95.507
26	0.339	1.129	96.637
27	0.305	1.016	97.653
28	0.266	0.886	98.539
29	0.258	0.861	99.400
30	0.180	0.600	100.00

processes; weight control; and behavioral choice/melioration) were considered for addition to the MRSS. In order to minimize the number of items, only 3 representative questions from each of the first 3 motives were chosen to be inserted into the new instrument. The authors deemed that the behavioral choice/melioration motive would add little to the potential clinical usefulness of the new scale, and questions related to this domain were not included. The scoring system used in the MRSS, a Likert scale ranging from 1 to 5, was applied to all 30 questions. The original composition of the new questionnaire is available in the online version of this publication (Appendix 1).

All 30 questions were submitted to a process of translation to Brazilian Portuguese and transcultural adaptation for use in Brazil, as previously described.[13] A final, consensus Brazilian Portuguese-language version was employed in the subsequent studies regarding factor structure, reliability, and concurrent validity.

Blood donors reporting to have smoked at least one cigarette a day in the last week were invited to participate in the study. Subjects under 18 years of age, reporting clinical or psychiatric comorbidities, or having a history of illicit drug addiction/alcoholism were excluded, as were those who were illiterate individuals or

Table 2 – Factor analysis and loadings by items for the new scale.

Item	Factor									
	1	2	3	4	5	6	7	8	9	10[c]
1	0.020	0.764*	−0.058	−0.043	−0.039	0.015	−0.033	−0.064	0.100	0.015
2	0.044	0.000	0.012	0.074	0.025	0.004	0.060	−0.781*	0.038	−0.059
3[a]	0.339	0.004	0.023	−0.052	0.094	0.054	−0.041	−0.174	−0.121	−0.103
4	−0.023	0.028	0.860*	−0.012	0.046	−0.011	0.003	0.051	0.075	−0.059
5	0.039	−0.037	0.077	0.016	0.745*	0.028	0.030	−0.021	0.031	−0.013
6	0.406*	0.081	0.020	−0.100	0.161	0.056	−0.025	−0.063	−0.111	0.172
7	0.040	0.061	0.028	−0.864*	0.069	0.032	−0.017	−0.023	0.070	−0.090
8[b]	0.213	0.089	0.102	−0.050	−0.010	−0.009	0.060	−0.072	−0.333*	−0.135
9	−0.066	0.141	0.011	−0.022	0.028	−0.010	0.761*	−0.015	0.004	0.107
10[a]	0.109	0.002	0.029	−0.061	0.010	0.153	0.214	−0.016	−0.247	−0.028
11	0.022	0.762*	0.076	0.061	−0.019	−0.004	0.050	0.052	−0.128	−0.043
12	−0.061	0.016	−0.009	−0.047	0.033	−0.760	−0.033	−0.786*	−0.067	−0.028
13	−0.059	−0.034	0.866*	0.048	0.018	−0.032	−0.056	−0.046	−0.024	0.053
14[a]	0.108	−0.044	−0.007	0.029	0.117	−0.043	0.090	−0.011	−0.035	0.170
15	0.003	0.002	0.005	−0.036	0.850*	0.027	0.050	−0.070	−0.033	−0.010
16[a]	0.235	0.081	0.017	−0.016	0.051	−0.019	0.060	−0.041	−0.223	0.035
17	−0.148	−0.006	0.002	−0.010	−0.027	0.762*	−0.001	0.000	−0.041	−0.003
18	0.069	−0.036	−0.055	−0.009	0.072	−0.084	0.040	0.024	−0.607*	0.018
19	−0.154	−0.022	−0.046	−0.141	0.036	−0.013	0.695*	−0.060	−0.018	0.080
20	−0.001	0.612*	0.019	−0.080	0.072	−0.057	0.100	−0.022	−0.021	0.046
21	−0.029	0.060	−0.014	−0.838*	−0.005	−0.027	0.020	−0.023	−0.055	0.112
22[a]	0.021	0.062	0.074	−0.063	−0.033	0.150	0.030	−0.190	0.047	0.127
23[a]	0.233	−0.082	0.097	−0.103	−0.156	−0.019	0.090	−0.056	−0.043	0.150
24[c]	0.082	0.061	0.059	−0.024	0.043	0.031	0.020	0.056	−0.054	0.490*
25	−0.062	0.144	0.106	−0.184	0.421*	0.004	−0.085	0.017	−0.064	0.123
26	0.588*	0.079	0.057	−0.088	0.120	−0.018	−0.088	−0.006	0.022	0.136
27	−0.141	0.066	0.023	−0.004	−0.029	0.131	−0.089	−0.070	−0.565*	0.057
28	0.112	−0.028	−0.033	0.016	0.074	0.679*	0.007	0.044	0.009	0.014
29[a]	0.102	0.040	0.031	0.087	−0.009	0.072	0.292	−0.023	0.027	−0.138
30[a]	0.114	−0.041	0.062	−0.304	0.035	0.013	0.227	0.068	−0.084	−0.216

[a]Items excluded from the final version, due to low factor loading. [b]Despite the low factor loading, this item was retained in the final version in order to improve factor 9 internal consistency. [c]Factor/item excluded from the final version, because it was composed of a single question. *Above the cut-off value (0.4).
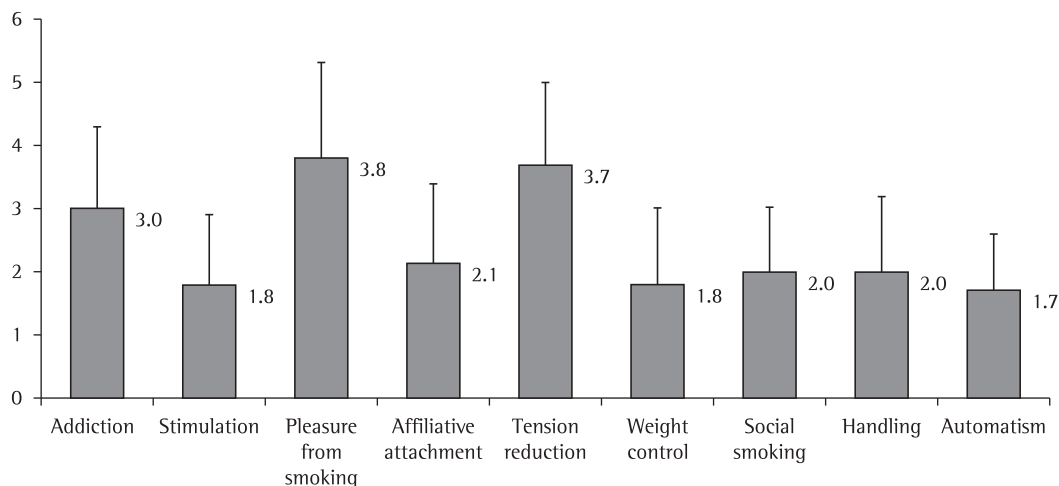
Figure 1 – Mean values and standard deviations of the factor scores in the sample comprising 311 smokers.

whose native language was not Portuguese. The data derived from this group of smokers were employed in the investigation of the factor structure and in the concurrent validation of the instrument.

Seated in a quiet environment, all of the volunteers completed a standardized questionnaire including the items of the new scale, together with the Fagerström Test for Nicotine Dependence (FTND), as well as providing information regarding their smoking history, marital status, and level of education.[14] The subjects were subsequently asked to exhale into a CO monitor (Micro CO, Micro Medical Ltd, Rochester, England).

A second group of smokers, recruited from among the employees of the University of São Paulo at Ribeirão Preto School of Medicine *Hospital das Clínicas*, in Ribeirão Preto, Brazil, were selected for the analysis of test-retest reliability and completed the same questionnaire twice, 15 days apart.

The project design was approved by the local ethics on research committee, and it followed, during its development, the principles set forth in the Declaration of Helsinki. All participating volunteers gave written informed consent.

The results were analyzed with the Statistical Package for the Social Sciences, version 13.0 (SPSS Inc., Chicago, IL, USA). Demographic data, smoking history data, and the scores obtained are expressed as means and standard deviations.

The scores on the 30 questions concerning smoking motivation were evaluated by exploratory factor analysis, using main component analysis and oblique rotation, aiming at the construct validation of the new scale.[15] The strategy used for factor extraction was principal axis factoring, because this method extracts most of the variance of the variables and has been traditionally used in order to reduce great amounts of data to smaller, concise sets of variables. The selection of the extracted factors was performed by applying the Kaiser criterion, which supposes that factors with eigenvalues < 1 should not be retained.[16] In addition, only the items with factor loadings > 0.4 were selected as components of the extracted factors. The internal consistency of the factors generated was assessed with Cronbach's alpha coefficient.[17] The test-retest reliability of the final version of the scale was evaluated using

Table 3 – Weighted kappa coefficients for the 21 items on the University of São Paulo Reasons for Smoking Scale.*

Item	Kappa coefficient	Item	Kappa coefficient
1	0.760	15	0.580
2	0.662	17	0.871
4	0.636	18	0.899
5	0.509	19	0.801
6	0.762	20	0.574
7	0.540	21	0.856
8	0.721	25	0.631
9	0.754	26	0.520
11	0.537	27	0.742
12	0.579	28	0.773
13	0.432		

*$p < 0.01$ for all.

Table 4 – Influence of clinical features on the domain scores of the University of São Paulo Reasons for Smoking Scale.

Feature	Addiction	Stimulation	Pleasure	Affiliative attachment	Tension reduction	Weight control	Social smoking	Handling	Automatism
Gender	M: 3.1 ± 1.4 F: 3.5 ± 1.4 p = 0.04	M: 1.8 ± 1.1 F: 1.9 ± 1.2 NS	M: 3.7 ± 1.5 F: 3.9 ± 1.5 NS	M: 2.4 ± 1.6 F: 2.8 ± 1.7 p = 0.03	M: 3.5 ± 1.4 F: 4.1 ± 1.1 p < 0.001	M: 1.7 ± 1.2 F: 2.1 ± 1.3 p = 0.008	M: 1.6 ± 1.0 F: 1.8 ± 1.3 p = 0.07	M: 2.0 ± 1.4 F: 2.4 ± 1.5 p = 0.02	M: 1.7 ± 0.8 F: 1.8 ± 0.9 NS
Age	r = −0.10 p = 0.09	NS	r = −0.10 p = 0.07	NS	r = −0.10 p = 0.07	NS	NS	NS	NS
Steady partner	Yes: 3.3 ± 1.4 No: 3.1 ± 1.4 NS	Yes: 1.8 ± 1.2 No: 1.8 ± 1.2 NS	Yes: 3.8 ± 1.5 No: 3.9 ± 1.4 NS	Yes: 2.5 ± 1.7 No: 2.4 ± 1.6 NS	Yes: 3.6 ± 1.4 No: 3.8 ± 1.2 NS	Yes: 1.8 ± 1.3 No: 1.8 ± 1.2 NS	Yes: 1.6 ± 1.0 No: 1.8 ± 1.2 NS	Yes: 2.2 ± 1.5 No: 2.0 ± 1.3 NS	Yes: 1.7 ± 0.9 No: 1.7 ± 0.8 NS
Level of education	NS	r = −0.11 p = 0.06	r = 0.11 p = 0.05	NS	NS	NS	NS	NS	NS
Smoking history	NS	NS	NS	r = 0.13 p = 0.02	NS	NS	NS	NS	r = 0.12 p = 0.04
Cigarettes smoked/day	r = 0.36 p < 0.001	r = 0.11 p = 0.05	NS	r = 0.15 p = 0.007	r = 0.13 p = 0.02	NS	NS	r = 0.12 p = 0.03	r = 0.33 p < 0.001
FTND score	r = 0.50 p < 0.001	r = 0.19 p = 0.001	NS	r = 0.28 p < 0.001	r = 0.25 p < 0.001	NS	r = 0.16 p = 0.005	NS	r = 0.34 p < 0.001
Exhaled CO level	r = 0.26 p < 0.001	NS	NS	r = 0.12 p = 0.04	NS	NS	NS	NS	r = 0.19 p = 0.001

NS: not significant; and FTND: Fagerström test of nicotine dependence.

weighted kappa statistics and by determination of intraclass correlation coefficients (ICCs).[18,19]

The influence of individual clinical features on the factor set as a whole was analyzed with multivariate ANOVA and Pearson's correlation coefficient.[20] The independent variables gender and marital status were classified as categories, and the variables age, years of schooling, smoking duration, cigarettes per day, FTND score, and exhaled CO level were considered continuous cofactors. When statistically significant differences were detected, univariate ANOVA was performed between each factor and the specific independent variable. The level of significance was set at $p \leq 0.05$.

Results

The study sample consisted of 311 smokers with a mean age of 37.6 ± 10.8 years. There was a predominance of males (214/68.8%), and the degree of nicotine addiction could be classified, on average, as low (FTND score = 3.7 ± 2.4; number of cigarettes smoked per day = 15.0 ± 9.2). Most of the subjects (56.6%) smoked < 20 cigarettes per day, 39.5% smoked 20-40 cigarettes per day, and 3.9% smoked > 40 cigarettes per day. The mean number of years of schooling was 9.0 ± 3.8, and 212 subjects (68.2%) reported having a steady partner.

The ratio between the number of subjects and the number of items in the scale was 10.37, which was considered acceptable for the factor analysis. The exploratory factor analysis assumptions were tested. The Kaiser-Meyer-Olkin index of sampling adequacy was 0.78, which can be described as being between meritorious and satisfactory. Bartlett's sphericity test rejected the hypothesis that the correlation matrix was an identity matrix ($p < 0.001$; $\chi^2 = 2,603.8$).

The total factor variance and the eigenvalues obtained by factor analysis are reported in Table 1. Ten factors explained 62.5% of the total variation. The composition of those ten factors and the loading values for each item are reported in Table 2. The application of 0.4 as the cut-off loading value for the inclusion of items into the factors led to the exclusion of 9 questions (numbers 3, 8, 10, 14, 16, 22, 23, 29, and 30). The initial composition of the factors and their respective items were as follows: Factor 1—items 6 and 26; Factor 2—items 1, 11, and 20; Factor 3—items 4 and 13; Factor 4—items

7 and 21; Factor 5—items 5, 15, and 25; Factor 6—items 17 and 28; Factor 7—items 9 and 19; Factor 8—items 2 and 12; Factor 9—items 18 and 27; and Factor 10—item 24.

Because factor 10 (cue exposure/associative processes) was composed of one item only, we decided to remove it from the new scale. The evaluation of the internal consistency for the remaining nine factors revealed the following Cronbach's alpha coefficient values: Factor 1—$\alpha = 0.65$; Factor 2—$\alpha = 0.77$; Factor 3—$\alpha = 0.82$; Factor 4—$\alpha = 0.88$; Factor 5—$\alpha = 0.75$; Factor 6—$\alpha = 0.64$; Factor 7—$\alpha = 0.72$; Factor 8—$\alpha = 0.76$; and Factor 9—$\alpha = 0.47$.

Because the Cronbach's alpha coefficient for factor 9 was low, a decision was made to reintroduce question 8, which had shown a factor weight of 0.333, into this factor, for the purpose of achieving better internal consistency. The Cronbach's alpha coefficients for this new factor 9 and for the overall scale were, respectively, 0.54 and 0.83. The final composition of the new scale, with the appropriate denominations for the factors and the selected items (questions), was as follows: Factor 1—addiction (questions 6 and 26); Factor 2—stimulation (questions 1, 11, and 20); Factor 3—pleasure from smoking (questions 4 and 13); Factor 4—affiliative attachment (questions 7 and 21); Factor 5—tension reduction (questions 5, 15, and 25); Factor 6—weight control (questions 17 and 28); Factor 7—social smoking (questions 9 and 19); Factor 8—handling (questions 2 and 12); and Factor 9—automatism (questions 8, 18, and 27). The mean values and the respective standard deviations of the scores observed in the sample of 311 volunteers are illustrated in Figure 1.

The test-retest reliability of the new scale was evaluated in a second group, composed of 54 smoking volunteers (mean age: 41.3 ± 10.9 years; FTND score: 4.3 ± 2.7; 19 males). The participants in this group completed the questionnaire twice, 15 days apart. The weighted kappa coefficients for the items in the final version of the scale were significant ($p < 0.01$ for all; Table 3).

The ICCs for the nine generated factors were as follows: addiction—ICC = 0.769; stimulation—ICC = 0.763; pleasure from smoking—ICC = 0.618; affiliative attachment—ICC = 0.796; tension reduction—ICC = 0.802; weight control—ICC =

0.864; social smoking—ICC = 0.823; handling—ICC = 0.798; and automatism—ICC = 0.851.

The influence of the clinical characteristics of the 311 smokers on the scores of the nine detected factors is demonstrated in Table 4. Females exhibited significantly higher scores for addiction, tension reduction, handling, weight control, and affiliative attachment. In addition, females showed a trend toward higher scores for social smoking.

All of the features related to smoking history were significantly associated with at least some of the motivational factors. The FTND scores correlated positively with addiction, tension reduction, stimulation, automatism, social smoking, and affiliative attachment. Among the motivational factors, addiction correlated most strongly with the FTND score ($r = 0.50$, $p < 0.001$). The number of cigarettes smoked per day correlated with addiction, tension reduction, stimulation, automatism, affiliative attachment, and handling. Smoking history was positively associated with automatism and affiliative attachment. The level of exhaled CO, measured just after the questionnaire had been completed, correlated positively with addiction, automatism, and affiliative attachment.

The level of education was positively associated with pleasure from smoking and was negatively associated, albeit weakly so, with stimulation. We observed a trend toward negative associations between the following: age and addiction; age and pleasure from smoking; and age and tension reduction. Marital status had no influence on any of the factor scores.

Discussion

This study reports the adaptation of a previously validated clinical instrument for the evaluation of smoking motivation, the MRSS. Our purpose was to obtain a new measurement tool that would provide adequate coverage of constructs while maintaining brevity in terms of its administration. The proposed modification was the introduction of three new domains derived from a comprehensive and more modern investigation. Among the intended changes, only two factors revealed well characterized properties that would justify their inclusion into the new tool. The instrument derived, designated the USP-RSS, exhibited satisfactory factor structure

and preliminary psychometric properties. The final Brazilian Portuguese-language version of the USP-RSS is available (as Appendix 2) in the online version of this article.

Since 1966, the RSS has been commonly used to measure the motivations for smoking. There is a substantial amount of data in the literature supporting this particular smoking typology.[4,8,21] One review of the literature concluded that the RSS has stable factor structure, internal consistency, and temporal stability.[8] However, according to the authors of that review, there is as yet insufficient evidence of its validity. The RSS motivational profile of smokers was developed more than four decades ago, and the reasons that led people to smoke might have changed during this time. The WISDM-68 was recently developed as the result of a distinct methodology and provides an updated solution with 13 motives for smoking. Nevertheless, a close observation of the results suggests that the WISDM-68 identifies a substantial number of factors already present, to some degree, in the traditional RSS and in its modified version, the MRSS. In view of this, the truly innovative motives of the WISDM-68 would be the following: affiliative attachment; cue exposure/associative processes; weight control; and behavioral choice/melioration.

In order to generate a more comprehensive tool, suitable for use in routine clinical practice, 9 questions related to 3 motives (affiliative attachment; cue exposure/associative processes; and weight control) were incorporated into the original 21-item version of the MRSS. An effort was made to develop a simple instrument, and the original scoring system of the MRSS was applied to all of the questions.

The factor analysis initially revealed a 10-item solution. In order to optimize the properties of the final scale, only nine factors comprising at least 2 questions with meaningful factor loadings were selected. The internal consistency for most of the defined factors was acceptable, the Cronbach's alpha coefficients being > 0.7 for six of them. Although the Cronbach's alpha coefficient for automatism was low, even with the inclusion of question 8, we opted to retain it as part of the instrument due to its potential clinical importance, as previously described.[9,22] In addition, the overall Cronbach's

alpha coefficient of 0.83 for the nine-factor scale can be considered satisfactory.

The test-retest reliability of the final version of the scale was evaluated in a distinct group of 54 smokers, all of whom completed the scale on two occasions, 15 days apart. The weighted kappa coefficients and the ICCs indicated that the USP-RSS exhibits good temporal consistency.

The motivation profile of the primary study group (311 smokers) featured high mean scores for addiction, pleasure from smoking, and tension reduction; intermediate scores for affiliative attachment, social smoking, and handling; and low scores for stimulation, weight control, and automatism (Figure 1). In a previous study, the scores for addiction, pleasure from smoking, and tension reduction were also high among smokers, although the degree of nicotine dependence was higher among the smokers evaluated in that study than among those in our sample.[9] These results strongly suggest that these three factors are central elements in the development and persistence of nicotine addiction.

Several factors of the USP-RSS showed significant associations with measurements of smoking intensity. For instance, addiction correlated positively with the number of cigarettes smoked per day, the FTND score, and the level of exhaled CO. These results indicate that addiction is also a satisfactory proxy for the physical dependence of smokers. The FTND score and the number of cigarettes smoked per day also correlated significantly with tension reduction, stimulation, automatism, and affiliative attachment. The finding that the level of exhaled CO correlated significantly with automatism and affiliative attachment is also noteworthy. These results indicate that the final version of the proposed instrument exhibits adequate concurrent validity.

Automatism and affiliative attachment were significantly associated with a greater number of measurements of smoking intensity than were any of the other motives. This suggests that these two motives play important roles in the persistence of smoking dependence.

Automatism is related to smoking without intention or awareness. This factor also correlated significantly with the number of cigarettes smoked per day, and its importance in smoking dependence has been highlighted by other authors.[8,9,22] In another study, multivariate

logistic regression revealed that higher automatism scores were predictive of failure to quit smoking.[9] Automatism may be secondary to conditioned behaviors and repetitive rewarding actions, as well as contributing to the lack of control of smoking.

Affiliative attachment can be defined as a strong emotional connection to smoking and cigarettes. Subjects with a history of long and heavy smoking exposure are most likely at the greatest risk of developing an emotional attachment to cigarettes. It is also possible that this dimension is more prevalent in smokers with psychosocial problems. High scores for this motivational domain might reflect nicotine dependence that is more complex. It remains to be seen if this factor is going to influence the results of smoking cessation interventions.

Apparently, handling and social smoking are only weakly connected with smoking intensity, whereas pleasure from smoking and weight control are not related to it at all. We found that gender exerted a significant influence on several motivational scores. In our study, females more often smoked due to physical dependence (addiction), tension reduction, handling, weight control, and affiliative attachment. These findings are relevant, because they might help to explain why female smokers find it more difficult to quit and feel more dependent on cigarettes than do men.[23] The high scores for addiction found here confirm previous reports of lower smoking cessation rates among women under nicotine replacement therapy.[23-25] In addition, weight control has been described as a strong motivation for women to smoke.[26,27] It has been shown that smoking initiation is higher among adolescent girls who report elevated perception of the importance of being thin.[27] It is also of note that, in the present study, there was a trend toward higher social smoking scores among women, social smoking having previously been described as a relevant motivator of female smoking.[9]

Among the limitations of this study, the mean degree of nicotine dependence in this group of smokers, as evaluated by the FTND, can be classified as low. This finding probably reflects the real smoking profile observed in the community, rather than that seen in specialized smoking cessation clinics. Indeed, the proportion of smokers in Brazil has been reported to have

decreased progressively over recent decades, and it would not be totally unexpected to observe a similar trend in the severity of the addiction. Because the results obtained strongly reflect the composition of the original elements of the MRSS and WISDM-68, it is unlikely that the application of the scale to a group of heavier smokers would produce a different factor solution. However, it is possible that the answers of heavy smokers could lead to different factor loadings, and the subsequent inclusion of additional items in some of the subscales. Another major limitation of this study is that the volunteers were neither enrolled in a smoking cessation program nor belonged to populations at high risk of heavy smoking, such as psychotic or drug-addicted subjects. Further studies will be needed in order to determine the applicability of this scale in such groups. The present study involved Brazilian Portuguese-speaking smokers, employing questions that had been translated from the language of the original instruments. Therefore, linguistic and cultural differences might have influenced the final results. Authors interested in employing this scale in speakers of languages other than Portuguese are advised to develop their own factor and psychometric analysis, on the basis of the model presented in Appendix 1.

In conclusion, the USP-RSS provides a distinct framework of motivational factors for smoking, with good reliability and some satisfactory psychometric properties. Additional studies are still needed in order to evaluate the full validity and the true usefulness of the USP-RSS in smoking cessation interventions.

The final Portuguese-language version of the USP-RSS is available on line at www.jornaldepneumologia.com.br

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Appendix 1 – Original questions (in English) that were evaluated in the present study.

1) I smoke cigarettes to keep myself from slowing down.[a]

2) Handling a cigarette is part of the enjoyment of smoking it.[a]

3) If I always smoke in a certain place it is hard to be there and not smoke.

4) Smoking cigarettes is pleasant and relaxing.*

5) I light up a cigarette when I feel angry about something.[a]

6) When I have run out of cigarettes, I find it almost unbearable until I can get one.[a]

7) Cigarettes keep me company like a close friend.*

8) I smoke cigarettes automatically without even being aware of it.[a]

9) It is easier to talk and get along with other people when smoking.

10) I rely upon smoking to control my hunger and eating.[a]

11) I smoke cigarettes to stimulate me, to perk myself up.[a]

12) Part of the enjoyment of smoking a cigarette comes from the steps I take to light up.[a]

13) I find cigarettes pleasurable.[a]

14) There are particular sights and smells that trigger strong urges to smoke.

15) When I feel uncomfortable or upset about something, I light up a cigarette.[a]

16) I am very much aware of the fact when I am not smoking a cigarette.

17) Weight control is a major reason that I smoke.[a]

18) I light up a cigarette without realizing I still have one burning in the ashtray.[a]

19) While smoking I feel more confident with other people.[a]

20) I smoke cigarettes to give me a « lift ».[a]

21) Sometimes I feel that cigarettes are my best friends.[a]

22) When I smoke a cigarette, part of the enjoyment is watching the smoke as I exhale.

23) I want a cigarette most when I am comfortable and relaxed.

24) When I do certain things I know I am going to smoke.

25) When I feel « blue » or want to take my mind off cares and worries, I smoke cigarettes.[a]

26) I get a real gnawing hunger for a cigarette when I haven't smoked in a while.[a]

27) I've found a cigarette in my mouth and did not remember putting it there.[a]

28) I am worried that if I quit smoking I will gain weight.[a]

29) I smoke much more when I am with other people.

30) Giving up cigarettes would be like losing a good friend.

Possible answers and scores:

( ) Never {1}, ( ) Seldom {2}, ( ) Occasionally {3}, ( ) Frequently {4}, ( ) Always {5}

[a]Selected questions.

Appendix 2 – Final Brazilian Portuguese-language version of the University of São Paulo Reasons for Smoking Scale.

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) Cigarros me fazem companhia, como um amigo íntimo.

7) Eu fumo cigarros automaticamente sem mesmo me dar conta disso.

8) É mais fácil conversar e me relacionar com outras pessoas quando estou fumando.

9) Eu fumo para me estimular, para me animar.

10) Parte do prazer de fumar um cigarro vem dos passos que eu tomo para acendê-lo.

11) Eu acho os cigarros prazerosos.

12) Quando eu me sinto desconfortável ou chateado com alguma coisa, eu acendo um cigarro.

13) Controlar meu peso é uma razão muito importante pela qual eu fumo.

14) Eu acendo um cigarro sem perceber que ainda tenho outro aceso no cinzeiro.

15) Enquanto estou fumando me sinto mais seguro com outras pessoas.

16) Eu fumo cigarros para me "pôr para cima".

17) Às vezes eu sinto que os cigarros são os meus melhores amigos.

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 me lembrar de tê-lo colocado lá.

21) Eu me preocupo em engordar se parar de fumar.

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

( ) Nunca {1}, ( ) Raramente {2}, ( ) Às vezes {3}, ( ) Frequentemente {4}, ( ) Sempre {5}

Fatores formados[a]

Fator 1. Dependência (*addiction*): itens 5, 19

Fator 2. Prazer de fumar (*pleasure*): itens 3, 11

Fator 3. Redução da Tensão (*tension reduction*): itens 4, 12, 18

Fator 4. Estimulação (*stimulation*): itens 1, 9, 16

Fator 5. Automatismo (*automatism*): itens 7, 14, 20

Fator 6. Manuseio (*handling*): itens 2, 10

Fator 7. Tabagismo Social (*social smoking*): itens 8, 15

Fator 8. Controle de peso (*weight control*): itens 13, 21

Fator 9. Associação Estreita (*affiliative attachment*): itens 6, 17

[a]O escore final de cada fator é a média simples dos escores individuais.