

# Factor structure of the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) in alcohol dependent outpatients

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## Abstract

**Objective:** The aim of this study was to investigate the reliability and factor structure of the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES), version 8,<sup>1</sup> a 19-item self-reported instrument developed to measure readiness to change in alcohol-dependent alcoholics.

**Methods:** A Confirmatory Factor analysis of the SOCRATES was performed based on the factor structures previously demonstrated by Miller & Tonigan<sup>2</sup> and Maisto et al.<sup>3</sup> in a sample with 326 alcohol-dependent outpatients.

The questionnaire was translated into Portuguese, cross-culturally adapted and back-translated into English. During this process SOCRATES underwent some modifications to simplify some complex question formats.

**Results:** The analysis showed that two correlated factors provided the best fit for the data and that these were similar to Maisto et al.'s<sup>3</sup> factors.

**Conclusions:** There was less evidence to support a three-factor structure. The results are compared to previous studies and the reasons for discrepancies are discussed.

**Keywords:** Alcoholism. Motivation. Factor analysis, statistical. Validation studies.

## Introduction

The Transtheoretical Model of Stages of Change, described by Prochaska and DiClemente,<sup>4</sup> proposes a general and comprehensive explanation of the way people change their addictive behaviours through progressive and sequential steps (from pre-contemplation, to contemplation, determination, action and, finally, maintenance). Within this framework motivation manifests itself through stage-specific behaviours displayed by that patients exhibit.

Miller<sup>5</sup> defined motivation as the “probability that a person will enter into, continue, and adhere to a specific change strategy”. Motivation is seen as a state of readiness or eagerness to change, which may fluctuate from one time or situation to another and can be understood as an internal state influenced by external factors. The concept of motivation has been extensively studied in the substance misuse field.<sup>6,7,8,5,9</sup> For alcohol misuse, the patient's stage allocation and readiness to change at the screening treatment entry have been shown to predict measures of treatment outcome, such as alcohol consumption and time for the first drink.<sup>10,11,12</sup>

Miller developed the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) with the aim of assessing motivation to change in problem drinkers. Initially a 32-item version was initially developed with the item content specifically focused on problem drinking. The aim was to measure the five principal stages of change: pre-contemplation, contemplation, determination, action and maintenance.<sup>13,14</sup> Since the initial draft, the questionnaire has undergone

extensive psychometric testing and has been substantially modified regarding in relation to item content and the total number of items. The latest version of the questionnaire has 19 items and has been shown to consist of three orthogonal factors, which have been named Taking Steps, Recognition and Ambivalence.<sup>2</sup>

Recently Maisto et al.,<sup>3</sup> has recently studied the factor structure of the 19-item SOCRATES in a sample of primary care patients and found only two factors. One factor was they called AMREC (a combination of ambivalence and recognition) and consisted of nine items and the second, Taking Steps, had six items and corresponded to the factor of the same name described by Miller and Tonigan.<sup>2</sup> A confirmatory factor analysis suggested that this two-factor structure fits the data better than the 3-factor structure proposed by Miller and Tonigan.<sup>2</sup> Another study with adolescents presenting for treatment of alcohol use disorder identified two factors called taking steps and recognition.<sup>15</sup>

The aim of the present study was to examine the reliability and factor structure of the Portuguese version of the SOCRATES<sup>8</sup> among alcohol-dependent patients and to investigate whether a two- or three-factor structure fits the data better.

## Method

### 1. Setting

The study was performed at the São Paulo Hospital São Paulo/Federal University of São Paulo, a federally funded public teaching hospital. Two clinics were used: a gastroenterology

clinic and a specialized alcohol abuse/dependence treatment clinic. We deemed it important to have patients in the sample who could display very different levels of motivation as in relation to seeking help for their alcohol problem, hence the choice of the two settings. The inclusion criteria were as follows:

1) At the specialist alcohol abuse/dependence treatment clinic: all patients who sought help for alcohol-related problems and who scored mild, moderate or severe on the Short-Form Alcohol Dependence Data Questionnaire (SADD).<sup>16</sup>

2) At the gastroenterology clinic: all patients were screened with the AUDIT<sup>17</sup> and those with scoring positive score (score  $\geq 8$ ) were interviewed with the Short-Form Alcohol Dependence Data Questionnaire (SADD).<sup>16</sup> Thereafter, the same criteria were applied.

During the 21-month study period, of the 336 patients who presented to the gastroenterology clinic, of whom 158 (47%) scored positive on the AUDIT.<sup>17</sup>

The exclusion criteria were: patients who abused other substances other than alcohol and patients who were confused. Women were also excluded from the study. As there were so few

women presenting to either service, it was thought better to exclude them as gender could have been a confounder in subsequent analyses.

**2. Subjects**

One hundred and fifty-one patients were interviewed from the gastroenterology clinic and 175 from the specialized alcohol abuse/dependence treatment clinic were interviewed, giving a total of 326 subjects. Five patients refused to take part in the study. The interviews were conducted at the outpatient clinics at the first appointment.

The demographic characteristics of the sample are shown in Table 1 and their patterns of alcohol consumption and biological markers are shown in Table 2.

**3. Measures:**

An experienced psychologist conducted the structured interviews. Structured interviews were conducted by an experienced psychologist. Cards with answer options were used to facilitate patients' responses. The interview consisted of the following:

**Table 1 – Sociodemographic data of 326 male alcoholics from two outpatient treatment settings**

Characteristic	Percentage (Number)
<b>Mean Age – years (SD)</b>	44 (11)
<b>Schooling level</b>	
Illiterate	5% (16)
Elementary school	57% (187)
High school	25% (82)
College/University	13% (41)
<b>Race</b>	
White	72% (235)
Non-white (Black and inter-racial)	28% (91)
<b>Occupation level</b>	
Blue collar	27% (89)
White collar	28% (90)
Unemployed	35% (114)
Other	10% (33)
<b>Family income*</b>	
1 to 5 m.w.	40% (129)
5 to 10 m.w.	32% (105)
10 to 20 m.w.	15% (51)
above 20 m.w.	9% (29)
Not known	4% (12)
<b>Employment status in the previous year</b>	
Full-time	49% (160)
Part-time	35% (114)
Unemployed	16% (52)

NOTE: \*m.w. = minimum wage = R\$151,00 (approximately US\$ 70,00) during the period of 1998 to 1999.

**Table 2 – Pattern of alcohol consumption and biological markers of alcohol dependence among men from two outpatient treatment settings**

Variable	Median (Interquartile Range)
Alcohol consumption in the previous 30 days – units	81.5 (0-281)
Duration of current alcohol use – weeks	20 (8-96)
Interval since last drink – days	12 (1-42)
Monthly alcohol consumption during the heaviest use* - units	630 (300-1020)
Duration of the heaviest period of alcohol consumption - weeks*	240 (88-480)
GGT** (normal: 11 up to 43 U/L)	87 (45-200)
AST*** (normal: until 37 U/L)	39 (25-68)
ALT**** (normal: until 40 U/L)	32 (20-59)
<b>Severity of Alcohol Dependence - %(n)</b>	
Mild	19 (62)
Moderate	34 (112)
Heavy	47 (152)

NOTE: Sample size \*n=283, \*\*n=229, \*\*\*n=280, \*\*\*\*n=279

1) Demographic data: age, gendersex, race, marital status, schoolingeducation, occupation, and family income.

2) The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) Version 8 :! to measure the stages of change in relation to Recognition, Ambivalence and Taking Steps. The version 8 has a different numbering system for the items. For the sake of clarity we have used the original numbering system described by Miller & Tonigan<sup>2</sup> for all three studies.

3) Short-Form Alcohol Dependence Data Questionnaire (SADD): this scale measures the severity of alcohol dependence (mild, moderate and severe). The Portuguese version was developed by Jorge and Masur.<sup>16</sup>

4) Pattern of alcohol consumption: it was documented using the interview schedule developed for the WHO/ISBRA Study on State and Trait Markers in Alcoholism.<sup>18</sup> The questions concern the pattern of alcohol consumption regardingin relation to the type of drink, the quantity and frequency of use in the previous-last 30 days as well as the heaviest period of lifetime alcohol consumption. One unit of alcohol was considered astaken to be equivalent to 10ml of pure alcohol.

5) Biological markers: aspartate aminotransferase (AST), alanine aminotransferase (ALT) and gamma glutamyltransferase (GGT). In the gastroenterology clinic these tests were routine, thusso most patients have results, however, in the specializedst alcohol abuse/dependence clinic fewer patients had these tests thusso there are more missing values.

### 3.1- Process of translation and cultural adaptation of the SOCRATES

The scale was translated by two researchers with a good command mastering of the English language, resulting in two translations that were each tested with a group of ten alcoholics, with the aiming to of discovering which form was most easily understood by subjects. This process resulted in a second draft which . This version was reapplied into another group of ten alcoholics, who were also asked to explain the meaning of the questions ands well as to answer them. The objectiveaim was to

check that both patient and interviewer agreed on what the questions actually meant. For each item respondents use a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

More complex questions had to be simplified as patients tended to answer only one part of the question without reference to the second half. For example, question 20: “I have made some changes in my drinking and I want some help to keep from going back to the way I used to drink.” Patients tended to answer this question either by agreeing or disagreeing that they had made changes to their drinking or agreeing or disagreeing that they wanted help to prevent returning keep them from going back tto the way how they used to drink. To further complicate the issuematters, if the patients had not made any changes into his or hertheir drinking, then by definition theyhe or she could not answer the question. Our solution to this problem was to split the question into its chronological and sequential components, first: “I have made changes to my drinking habit.” If the patients answeredsaid that they had not made any changes, then they were automatically assigned to the *strongly disagree* category. If they answered in the affirmatively, the second component of the question was put to them: “I want help to keep from going back to the way I used to drink”, to which they could chose respond from *strongly disagree* to *strongly agree*. It can be argued that this is not a satisfactory solution, as patients may still want help to stop drinking, even if they do not want the specific type of help stated in the question. Short of excluding these three questions altogether, we felt that it was the best compromise. The same procedure was followed for questions 14 and 15. On the other hand, it is important to note that this procedure can damage the comparison betweenof the results inobtained from theof original version and those from the Portuguese version.

The third version of the questionnaire was then submitted put before to an “*ad hoc* committee” composed byof a Brazilian psychologist working in the addiction field with a good understanding of English, a native Brazilian professionalersonnative wor-

king in addictions who did not speak English, an English psychiatrist working in addictions who was fluent in Portuguese and an English psychologist working in the addictions with some understanding of Portuguese. The committee studied each question in turn looking at both the original question in English, and at its various translations into Portuguese. Eventually a consensus was reached as to which version was most easily understood by the average Brazilian patient whilst maintaining the original concept of the question.

The *ad hoc* committee's version of the questionnaire was applied with another group of alcohol-dependent patients, such that each question was thus asked to five different patients. The aim was for the patients to give their understanding of what the questions meant and to answer them. These interviews were tape-recorded. Minor modifications were performed after each interview before the final draft<sup>19</sup>. The Portuguese version of this final draft is presented in Appendix 1. The back-translation was performed by an American English teacher without reference to the original version of the questionnaire.

**4. Ethical Considerations:**

The study had been approved by the Ethics Committee for Medical Research of the Federal University of São Paulo, Brazil. All subjects received research information on the research; they signed an informed consent form prior to participating and were assured guaranteed anonymity and confidentiality.

**5. Statistical Analysis:**

The first step was to investigate the factor structure and construct validity of the 19-item SOCRATES questionnaire. This was done using two first-order confirmatory factor analyses, the first modelled on the three independent factor structure described by Miller & Tonigan,<sup>2</sup> and the second on the two independent factors described by Maisto et al.<sup>3</sup> The reliability of the factors was measured by looking at their internal consistency, using Cronbach's alpha, and item analysis was based on the item to total score correlation. The correlation between the factors and the results of the item analyses suggested the existence of a factor structure based on two non-independent factors.

Using the statistical package SAS, the covariance generated by

**Table 3 – Confirmatory Factor Analysis of the SOCRATES with factor weight and Reliability analysis with Cronbach's alpha using the data from this study modelled on the proposed 3-factor structure of Miller & Tonigan (1996) and the 2-factor structure of Maisto et al. – 1999**

Items	Confirmatory Factorial Analysis (Factor Weights)					Items	Reliability Analysis (Cronbach's Alpha)				
	Miller & Tonigan's (1996) model			Maisto et al.'s (1999) model			Miller & Tonigan's (1996) model			Maisto et al.'s (1999) model	
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2		Factor 1	Factor 2	Factor 3	Factor 1	Factor 2
	Recognition	Ambivalence	Taking Steps	AMREC	Taking Steps	Recognition	Ambivalence	Taking Steps	AMREC	Taking Steps	
1	.212*			-		1	.214			-	
3	.574*			.592*		3	.551			.554	
8	.803*			.801*		8	.730			.720	
11	.863*			.845*		11	.747			.736	
13	.834*			.828*		13	.732			.738	
16	.663*			.667*		16	.610			.602	
18	.574*			.597*		18	.513			.564	
2		.648*		.600*		2		.509		.614	
7		.678*		.553*		7		.510		.539	
12		.239*		.214*		12		.211		.210	
17		.718*		-		17		.510		-	
4			.685*		.685*	4			.526	.574	
5			.507*		.528*	5			.326	.415	
9			.554*		.574*	9			.389	.424	
10			.721*		.724*	10			.524	.616	
14			.396*		.336*	14			.378	.282	
15			.169*		-	15			.174	-	
19			.646*		.646*	19			.503	.536	
20			.472*		-	20			.450	-	
						Alfa	.828	.646	.679	.856	.714

NOTE: \*The coefficient (factor weights) is significant at the 0.01 level (2-tailed test).

**Table 4 – Intra e Inter factor correlations of the SOCRATES for the models proposed by Miller & Tonigan (1996) and Maisto et al. – 1999**

		Miller & Tonigan (1996)			Maisto et al. (1999)	
		Recognition	Ambivalence	Taking Steps	AMREC	Taking Steps
<b>Miller &amp; Tonigan (1996)</b>	Recognition	1.00	.72*	.39*	.96*	.28*
	Ambivalence	.72*	1.00	.28*	.87*	.24*
	Taking Steps	.39*	.28*	1.00	.36*	.89*
<b>Maisto et al. (1999)</b>	AMREC	.96*	.87*	.36*	1.00	.26*
	Taking Steps	.28*	.24*	.89*	.26*	1.00

NOTE: \*Correlation is significant at the 0.01 level (2-tailed).

CALIS (Covariance Analysis of Linear Structural Equations) was used to test confirmatory factor analysis models, estimate parameters and test the appropriateness of structural equation models using covariance structural analysis and maximum likelihood estimation. The fit of the different models was assessed using four indices: 1) the Goodness Fit Index (GFI) which ranges from 0 to 1, with 0.90 or higher being evidence of a model with a good fit;<sup>20</sup> 2) the Adjusted Goodness-of-Fit Indices (AGFI) refers to an adjusted GFI for degrees of freedom in the model and also ranges from 0 to 1;<sup>21</sup> 3) a Chi-squared to degrees of freedom ratio ( $\chi^2/df$ ) of less than 2;<sup>22</sup> 4) a standardized root-mean-square residual (RMSR) less than 0.05;<sup>22</sup> and 5) a root-mean-square error of approximation (RMSEA) of less than 0.08.<sup>23</sup>

## Results

### Confirmatory factor analysis: The two- and three-factor models

To evaluate the 3-factor structure proposed by Miller & Tonigan<sup>2</sup> and the 2-factor structure shown by Maisto et al.<sup>3</sup> we used confirmatory factor analysis (CFA) based on these models with independent errors and factors.

For the 3-factor model all items had significant weight in the corresponding dimensions – as shown in Table 3. The chi-squared of this model was 850.25, d.f.=152,  $p < 0.0001$ . The indices of fit were: GFI=0.793, AGFI=0.7417, RMSR= 0.203, and RMSEA=0.1187, which show an less than ideal fit between the proposed 3-factor model and the current data.

For the 2-factor model (AMREC: Ambivalence – Recognition and Taking Steps) all items had significant weight in the correspon-

**Table 5 – Item to total score correlations and Cronbach's alpha analyses of the items for the SOCRATES 2-factor model proposed**

Items	Firts Analysis With All Items		Second Analysis After Excluding Items With Low Correlations	
	Factor 1	Factor 2	Corrected Factor 1	Corrected Factor 2
1	.259		–	
3	.574		.565	
8	.710		.724	
11	.723		.739	
13	.722		.747	
16	.609		.635	
18	.571		.595	
2	.617		.614	
7	.567		.554	
12	.227		–	
17	.659		.681	
4		.526		.562
5		.326		.369
9		.389		.383
10		.524		.598
14		.378		.420
15		.174		–
19		.503		.521
20		.450		.476
Alpha	.865	.679	.890	.738

**Table 6 – Confirmatory factor analysis of the proposed two non-independent SOCRATES factor structure showing relationship between observed and latent variables and factor weights**

Observed Variable Items	Factor 1 Corrected	Factor 2 Corrected
3	.601*	
8	.791*	
11	.826*	
13	.822*	
16	.682*	
18	.615*	
2	.609*	
7	.576*	
12	not analyzed	
17	.690*	
4		.694*
5		.514*
9		.568*
10		.698*
14		.360*
15		not analyzed
19		.669*
20		.454*

NOTE: \*The coefficient (factorial weights) is significant at the 0.01 level (2-tailed test).

ding dimensions (Table 3). The Gchi-square of this model was 335.72, df=90, p<0.0001). The indices of fit were: GFI=0.8866, AGFI=0.8488, RMSR= 0.1351, and RMSEA=0.0915. All these indices suggest a better fit for the 2-factor model as proposed by Maisto et al.<sup>3</sup>

**Reliability and item analysis of the 2- and 3-factor models**

For Miller & Tonigan’s<sup>2</sup> 3-factor model, the items making up factor 1 (Recognition) have good reliability with item-total correlations of over 0.51, with the exception of item 1. For factor 2 (Ambivalence), the correlations are higher than 0.50 with the exception of item 12. For factor 3 (Taking Steps) the correlations are lower still but still above 0.3, with the exception of item 15. For Maisto’s<sup>3</sup> 2-factor model, factor 1 (AMREC) has good reliability with item to total correlations higher than 0.54 except for item 12. The items on factor 2 (Taking Steps) have correlations higher than 0.41 with the exception of item 14. These results suggest that the items with low correlations should be excluded from the analysis – Table 3.

**Correlation of the factors**

To explore the relationship between the factors based on the two models, we studied the intra- and inter-factor correlations. The intra-factor correlations show whether the factors within each model are independent of one from the another. The inter-factor correlations show the relationship between the two models. For the 3-factor model there is a strong correlation

between Recognition and Ambivalence. For the 2-factor model the correlations are much lower (Table 4).

The inter-factor correlations between the two models show that Recognition and Ambivalence are both strongly correlated with AMREC as are the Taking Steps factors from each model.

These results suggest that the three factors described by Miller & Tonigan<sup>2</sup> and two factors (AMREC and Taking Steps) proposed by Maisto et al.<sup>3</sup> are not independent, indicating that a new factor structure should be investigated.

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**Item analysis, reliability and CFA for a model with two correlated factors**

An item analysis and Cronbach’s alpha were used with the data modelled on the combined first and second factors described by Maisto et al.<sup>3</sup> The Cronbach’s alpha was 0.846 and there were low correlations for items 1 (0.259) and 12 (0.2274), showing that these items do not form part of the factor. These items were excluded and the data were re-analyzed. This corrected factor 1 had 9 items and was very similar to Maisto et al.’s<sup>3</sup> AMREC factor, except for the fact that it incorporated item 17 and excluded item 12. It had item to total correlations greater than 0.55 and an alpha of 0.89. Item 15 was thus excluded from factor 2. This corrected factor 2 had 7 items and is similar to Maisto et al.’s<sup>3</sup> second factor, except for the fact that it incorporates item 20. We named our first factor AmRec and our second factor Taking Steps.

To evaluate the structure of these two non-independent factors a further CFA was performed. The hypothesis of the existence of this new two-factor structure is partially supported by the results of the analysis. All the items have significant weight (p<0.001) in the corresponding dimensions (as shown in Table 6). The chi-squared of this model was 407.22 (d.f.=103, p<0.0001), (X<sup>2</sup> to d.f. ratio = 407.22/103 > 2) which shows that there are differences between the proposed model and the data. The indices of fit were: GFI = 0.869, AGFI = 0.827, RMSR = 0.091 and RMSEA = 0.0856. These results show that the model displays a good but imperfect fit. The correlation between the factors was 0.364 (p<0.01), which is statistically significant.

**Correlation with total alcohol consumption in the previous last 30 days**

In order to examine the validity of the different models, we calculated the correlation between the scores obtained on each factor with total alcohol consumption in the previous last 30 days. As this measure had an asymmetric distribution, a logarithmic transformation was performed. With our data modelled on Miller & Tonigan’s<sup>2</sup> three-factor structure, the Pearson’s correlations were as follows: Ambivalence (r = 0.240, p<0.001), Recognition (r = 0.211, p<0.001) and Taking Steps (-0.178, p<0.001). For the model based on Maisto et al.’s<sup>3</sup> two-factor model the correlations were: AMREC (r = 0.219, p<0.001) and Taking Steps (r = -0.142, p<0.01).

## Discussion

The Transtheoretical Stages of Change Model has been questioned and attempts to measure the five stages as distinct entities have met with limited success.<sup>24,25,26,27</sup> The aim of this paper was to investigate the factor structure of the Portuguese version of SOCRATES. Miller & Tonigan<sup>2</sup> claim that SOCRATES has a 3-factor structure, consisting of Ambivalence, Recognition and Taking Steps. We found that a two non-independent factor structure fit the data better than a three-factor structure. The two factors were composed by items grouping around two distinct concepts that we named AmRec (a combination of Ambivalence and Recognition) and Taking Steps, similar to the results obtained by Maisto et al.<sup>3</sup>

One research with college students<sup>28</sup> gives modest support for the SOCRATES having a 3-factor structure. In this study the authors first used confirmatory factor analysis with the 19-item SOCRATES questionnaire and found that the 3-factor model fit the data moderately well. They then removed the 3 items with the weakest cross-loadings and repeated the analysis. The 16-item version performed better than the full version.

Maisto et al.<sup>3,15</sup> found two factors that were almost identical to ours. These authors cite unpublished work suggesting that the ambivalence factor found by Miller & Tonigan (1996) may be unstable. They quote that Dermen et al.<sup>29</sup> failed to find significant factor loadings for the ambivalence items of the SOCRATES in a sample of patients from an inpatient substance abuse treatment center and that Busby and Parker<sup>30</sup> found the ambivalence scale to have poor internal consistency.

The reasons for the discrepancy between the factor structure reported by Miller and Tonigan<sup>2</sup> and that found in subsequent studies are diverse. First, the instrument in its present format may be unable to distinguish between ambivalence and recognition because the item content of the questionnaire is inadequate to make such a distinction. Our translation process has identified ambiguity in several items and subjects reported that certain items were difficult to answer. With better and more precise questions to characterize ambivalence, it might be possible to refine and modify the instrument to make a clearer distinction between this factor and recognition.

A second explanation is that ambivalence and recognition are indeed part of the same phenomenon. From one's day-to-day clinical experience, it may be envisaged patients who recognize that they have a drink problem but are ambivalent about the need to stop drinking, to change their lifestyle or to follow a prescribed treatment package. At the early stages of treatment ambivalence and recognition are ordinarily commonly seen together. Our factor analysis suggests that there is substantially more similarity/commonality between these concepts than there is uniqueness, since the sets of questions designed to measure them do not vary independently but are actually in fact highly correlated on a single factor.

Maisto et al.<sup>3</sup> propose an alternative explanation for their failure to replicate Miller & Tonigan's<sup>2</sup> 3-factor solution, in particular their failure to find an ambivalence factor. In Miller & Tonigan's<sup>2</sup> study, the patients were from secondary care services and had considerably higher levels of alcohol use and problem severity of a nature and degree that would be easily re-

cognized by most observers. They suggest that if an individual is still uncertain about whether or not they have or she has a drinking problem including regarding the face of alcohol dependence and secondary complications, then other factors may be at play (e.g. pathological denial or cognitive impairment) which might be reflected in an ambivalence factor. However, our sample also came from secondary treatment services, most patients were moderately to severely dependent and those from the gastroenterology clinic had already developed physical complications of alcohol misuse, but we were still unable to find convincing evidence of a separate ambivalence factor.

It is possible that these different findings may in part be due to different factor analytic procedures. The study by Miller & Tonigan<sup>2</sup> used factor analysis with principal components analysis with orthogonal and non-orthogonal rotation and with a criterion of eigenvalues  $>1.0$ . Maisto et al.<sup>3</sup> used principal components analysis with orthogonal rotation to extract factors with eigenvalues  $\geq 1.0$  followed by a confirmatory factor analysis. They also used goodness of fit analysis to compare their 2-factor model with Miller & Tonigan's<sup>2</sup> 3-factor solution and found the 2-factor solution fit the data better.

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The removal of 3 items of low reliability (questions 1, 12 and 15) may have had some effect on our factor analysis. Miller & Tonigan<sup>2</sup> used the 20-item SOCRATES but eliminated one item (question 6) due to its low factor loading and difficulty in asking the question in a follow-up setting. Maisto<sup>3</sup> excluded item 17 due to a clerical error. They then excluded items 1, 15 and 20. The three items that we removed were from the Taking Steps and Recognition sections of the questionnaire.

Our study used a Portuguese version of the SOCRATES, therefore, the process of translating the questionnaire needs to be examined as this could also have affected the performance of the instrument. A poor translation may affect the internal consistency, reliability and validity of an instrument originally developed in another language and culture.<sup>31,32</sup> We followed a meticulous process to ensure that a semantically equivalent, reliable and valid version was produced. This involved alternative translations of the questionnaire being produced, a bilingual multi-professional committee that examined each question in turn, taped interviews with patients and extensive piloting. Patients were not only asked to answer the questions but also to say what they thought the questions meant. Psychometric analysis showed that our version had good internal consistency

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**Appendix 1 – Portuguese version of the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES)**

	<b>Discordo Muito</b>	<b>Discordo</b>	<b>Indeciso</b>	<b>Concordo</b>	<b>Concordo Muito</b>
1- Eu realmente gostaria de fazer mudanças na minha maneira de beber.	1	2	3	4	5
2- Às vezes, eu penso se sou um alcoólatra.	1	2	3	4	5
3- Se eu não mudar logo a minha maneira de beber, meus problemas vão ficar piores.	1	2	3	4	5
4- Eu já comecei a fazer algumas mudanças em relação à minha maneira de beber.	1	2	3	4	5
5- Estou tentando controlar a minha maneira de beber.	1	2	3	4	5
6- Às vezes, eu penso se o meu beber está prejudicando as outras pessoas.	1	2	3	4	5
7- Eu sou uma pessoa que tem problemas com bebidas alcoólicas.	1	2	3	4	5
8- Eu não estou pensando apenas nas mudanças da minha maneira de beber. Eu já estou fazendo alguma coisa sobre isso.	1	2	3	4	5
9- Eu já mudei o meu hábito de beber e estou buscando meios para não voltar a beber como bebia antes.	1	2	3	4	5
10- Eu tenho graves problemas com a bebida.	1	2	3	4	5
11- Às vezes, eu penso se tenho controle sobre a minha maneira de beber.	1	2	3	4	5
12- O meu hábito de beber está causando muitos transtornos.	1	2	3	4	5
13- Você parou ou diminui seu hábito de beber? ( ) <b>Não</b> – Coloque a resposta <i>Discordo Muito</i> e vá para Q14. ( ) <b>Sim</b> – Atualmente estou fazendo coisas para diminuir ou parar o meu beber.	1	2	3	4	5
14- Antes você tinha problemas com a bebida? ( ) <b>Não</b> – Coloque a resposta <i>Discordo Muito</i> e vá para Q15. ( ) <b>Sim</b> – Eu quero ajuda para evitar que eu volte a ter os problemas com a bebida que eu tinha antes.	1	2	3	4	5
15- Eu sei que tenho problemas com bebidas alcoólicas.	1	2	3	4	5
16- Às vezes, eu acho que bebo demais.	1	2	3	4	5
17- Eu sou um alcoólatra.	1	2	3	4	5
18- Eu estou me esforçando muito para mudar o meu hábito de beber.	1	2	3	4	5
19- Você fez mudanças no seu hábito de beber? ( ) <b>Não</b> – Coloque a resposta <i>Discordo Muito</i> . ( ) <b>Sim</b> – Eu quero alguma ajuda para não voltar a beber como antes.	1	2	3	4	5

and reliability. Our 2-factor model is consistent with the findings of other researchers, although of the three items that we excluded due to because of their low inter-item correlations, only one was also excluded by Maisto et al.<sup>3</sup> (item 1). We did resort to changing the structure of three questions, which may have altered the performance of the questionnaire. We felt these changes were necessary to enable all patients to answer all the questions, but our solution was not entirely satisfactory. Sutton<sup>26</sup> has questioned Miller & Tonigan's<sup>2</sup> findings and cri-

ticized them for not reporting the full correlation matrix. He noted that the pre-contemplation and determination subscales were negatively correlated (-0.70 in the outpatient sample and -0.62 in the aftercare sample) and that the Taking Steps and maintenance Maintenance subscales were positively correlated (0.69 and 0.56), and that other correlations were modest. He interpreted these results as suggesting a lack of distinction between precontemplation and determination and between action and maintenance.

## Conclusion

Further work is necessary to investigate the factor structure of the SOCRATES in different clinical and cultural populations, mainly outside Anglo Saxon countries. Future research is needed to understand the motivation aspects that the SOCRATES does measure and it will show how this scale could be improved.

Further work is necessary to investigate the factor structure of the SOCRATES in different clinical and cultural populations. But if neither the five stages of change nor the 3-factor solution could be consistently verified, then either the Stages of Change model, or the instruments designed to measure it, may need to be reconsidered.

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