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Factor Structure and Invariance of the POMS Mood State Questionnaire in Spanish

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The purpose of this study was to examine the extent to which the Spanish POMS assesses the same factors as the original form of the questionnaire. We started from a version with 63 items, representing seven conceptual dimensions. This version was administered to a sample of 364 adult athletes. In the whole sample, exploratory factor analytic findings suggested a more parsimonious measurement model, with 44 items and 6 first-order factors. Then the data from said sample were randomly divided into two sets, each containing about 50% of the subjects. The fit of the first sample set (n = 166) to the proposed model was adequate. Four of the main goodness-of-fit indices exhibited the following values: CFI = .95, NNFI = .95, SRMR = .083, and RMSEA = .064. We tested the same model in the second data set (n = 198), in which the fit was also acceptable, with values of .95, .94, .088, and .066 for CFI, NNFI, SRMR, and RMSEA, respectively. In addition, we used multi-group confirmatory factor analysis to provide evidence on the invariance of the model.

Keywords: test adaptation, confirmatory factor analysis, invariance, mood states, athletes.

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Professionals and researchers working in the setting of sport have frequently voiced their interest in the relationships existing between exercise and mood state, as well as in the possibility of accounting for performance on the basis of psychological variables of an emotional nature (Berger & Motl, 2000; Terry, 2000). The most popular instrument for mood state evaluation in this context has been POMS (Profile of Mood States; McNair, Lorr, & Droppleman, 1971). This is a questionnaire which originally comprised 65 items, representing seven conceptual dimensions: Tension, Depression, Anger, Vigour, Fatigue, Confusion, and Friendliness.

The POMS was introduced into sports by Morgan and co-workers in the 1970s (Morgan, 1978; Morgan & Johnson, 1977, 1978; Morgan & Pollock, 1977; Nagle, Morgan, Hellickson, Serfass, & Alexander, 1975). Although its significance and the empirical support received have been equivocal (Rowley, Landers, Killo, & Etter, 1995), a number of qualitative reviews of the extant literature (Renger, 1993; Terry, 1995; Vanden Auweele, DeCuyper, Van Mele, & Rzewnicki, 1993), as well as two meta-analyses (Beddie, Terry, & Lane, 2000) and a study on the development of normative data (Terry & Lane, 2000), found that in the POMS, successful athletes show a characteristic pattern of scores, and that this test may be useful for predicting sports performance.

An additional advantage of using the POMS is the ease with which it can be applied. It is a practically self-administrable instrument which only takes 3-5 minutes to complete; hence, it may be administered effectively before, during or after competition. Nevertheless, this time is extended considerably with subjects under special conditions (e.g. stress or pain), which has led to the proposal of abridged versions (Fleming, Bourgeois, LeUnes, & Meyers, 1992; Fry et al., 1994; Grove & Prapavessis, 1992; Prapavessis, Berger, & Grove, 1992; Prapavessis & Grove, 1994a, 1994b).

The setting of sport and physical activity currently has one of the most highly valued abbreviated forms, and one which has undergone a more thorough preparation process. Terry, Lane, Lane and Keohane (1999) developed this form for the adolescent population, and subsequently proposed its use with adults – both athletes and university students not participating in sports (Terry, Lane, & Fogarty, 2003). This short version of POMS consists of 24 items, pertaining to six mood state dimensions: Tension, Depression, Anger, Vigour, Fatigue, and Confusion. Regarding the Friendliness factor, this seventh component has been eliminated from the majority of shortened alternatives, which has given rise to criticism concerning the inefficiency with which the POMS deals with the positive emotion domain (Berger & Motl, 2000; Watson & Clark, 1997).

The development of reduced versions, and even ones with a lower number of components, has also been the dominant trend in those studies adapting the POMS to other languages. Examples can be found in Dutch (De Groot, 1995; Wald & Mellenbergh, 1990), French (Fillion & Cagnon, 1999), Hebrew (Netz, Zeav, Arnon, & Daniel, 2005), Chinese (Chen, Snyder, & Krichbaum, 2002; Cheung & Lam, 2005), Korean (Shin & Colling, 2000; Yeun & Shin-Park, 2006), German (Albani et al., 2005; Bullinger, Heinisch, Ludvig, & Geier, 1990) and Arabic (Aroian, Kulwicki, Kaskiri, Templin, & Wells, 2007).

With respect to the Spanish setting, initially there was a forward translation of the POMS and the obtaining of norms for the population of Valencian students (Balaguer, Fuentes, Meliá, García, & Pérez, 1993; Balaguer, Fuentes, Meliá, García, & Pons, 1994). The ensuing steps consisted of performing multiple forward and backward translations of the 65 items in the questionnaire into Spanish (Arce, Andrade, & Seoane, 2000). This translation process was carried out by native Spanish and English language teachers in accordance with general good practice in test translation. Arce et al. applied the translated items to a sample made up of 374 university students. These authors used statistical and substantive criteria to eliminate two of the initial items, and to replace others with alternative terms, closer to the meaning proposed in the POMS manual. Thus they prepared a second list in Spanish, comprising 63 items referring to the states of Tension, Depression, Anger, Vigour, Fatigue, Confusion, and Friendliness. This new list was tested by Andrade, Arce and Seoane (2002) over a sample of 216 athletes.

In their article, Andrade et al. (2002) provided the results of the exploratory factor analysis and the analysis of the internal consistency of factors, and proposed the elimination of at least 15 items. Furthermore, they compared the scores of athletes with the scores obtained by a sample of 268 university students. They found significant differences between athletes and non-athletes on Tension, Anger, Vigour, and Friendliness. Their work, however, was conducted with a relatively small sample of subjects, and involved only an exploratory approximation to the factor structure of the POMS.

The present study takes up the theme of the previous investigations, offering new empirical evidence on the psychometric properties of the Spanish POMS with adult athletes. We employed a broader sample of subjects to propose a reduced, stable measurement model. We then used confirmatory factor analysis procedures to verify both the suitability of the proposed model in two different groups, and its invariance on different levels.

Method

Participants

The questionnaire was administered to 364 subjects; these were athletes from different sporting disciplines (athletics, basketball, football, handball, swimming, tennis,
karate, cycling, although team sports were predominant), and who were participating in regional and national championships. Given that the scores obtained in the questionnaire bore no significant relation with gender, the data for males and females have been analysed jointly. The entire sample was divided up randomly into two smaller samples, containing 48% and 52% of the participants. The first of these comprised 166 subjects: 120 males and 46 females. The age of subjects ranged from 17 to 33 ($M = 21.04, SD = 2.19$).

The second sample was made up of 198 subjects: 136 males and 62 females. The age of subjects ranged from 17 to 28 ($M = 21.01, SD = 2.18$).

**Instrument**

The version of the POMS questionnaire employed was the translation by Andrade et al. (2002, p. 710). This version comprised 63 items, and was designed to evaluate seven theoretical mood state dimensions: Tension (8 items), Depression (14), Anger (12), Vigour (8), Fatigue (7), Confusion (7) and Friendliness (7). The response format consisted of five ordered categories, which were assigned values between 0 (not at all) and 4 (extremely). All the items in the questionnaire were formulated in the same sense, with the exception of one item from the Tension dimension (number 21, relajado —relaxed in the original English version) and one from the Confusion dimension (number 52, eficiente —efficient). The responses to these two items were re-codified prior to their analysis.

**Procedure**

Data were gathered with the consent of trainers and athletes at their habitual training locations, and always before the beginning of a session. The questionnaire was applied in groups, for all of which a single researcher was responsible. A standard instruction protocol was established, ensuring the subjects as to the confidentiality of their responses. Moreover, they were asked to value each item in the questionnaire in accordance with the following expression: “How you have been feeling during the past week, including today.”

**Data Analyses**

Initially, exploratory factor analysis was used to indicate the most suitable number of factors and the pattern of item-factor relations, enabling the instrument to be refined by eliminating those indicators whose behavior was poor and/or different from that expected. More specifically, the following exclusion criteria were considered: (a) items which had a higher factor loading in the factor which theoretically did not correspond to them, (b) items which also had a high level of factor saturation in various factors, (c) factors with less than four items showing stable results. Whether the internal consistency value was equal to or higher than .70 was also taken into account. Confirmatory factor analysis was then used to verify both the suitability of the model in two samples and its invariance on five levels: structure, factor loadings, indicator intercepts, latent means, and inter-factor relations.

**Results**

**Exploratory Factor Analysis**

The first analysis consisted of factorising the responses of 364 subjects to the 63 initial items. This factor analysis was exploratory and was performed using the statistical software SPSS (version 15). During its implementation, different solutions regarding the number of factors were tried. In order to select a suitable number of factors, various statistical criteria were examined (eigen values greater than one, scree plot, percentage of explained variance); nevertheless, it was judged above all on its conceptual interpretation. Two extraction methods (principal axes and principal components) and two rotation methods (oblimin and varimax rotations) were also used as a test of the stability of these solutions. This served to corroborate that at least six of the seven theoretical factors were identified in all of the matrices obtained. Nevertheless, some items appeared systematically as indicators of a mood state other than that for which they had been designed. Listed by factors, we found one of these items in Anger (rebeldes —rebellious in the English version); three in Vigour (alegre, alerta, and libre de preocupaciones —cheerful, alert, and carefree), one in Fatigue (desatento —listless), one in Friendliness (confiado —trusting), one in Tension (ansioso —anxious) and five in Depression (arrepentido por cosas hechas, desanimado, inútile, aterrorizado, and culpable —which correspond to sorry for things done, discouraged, worthless, terrified, and guilty, respectively). Whereas, only two of the items in the Confusion factor (olvidadizo —forgetful, and indeciso —uncertain about things), exhibited stable operation in line with the predictions.

Up to 19 items were eliminated, and the analysis was repeated. The 44 most stable items grouped into six factors, which were easy to interpret from a substantive perspective. Adhering to the results obtained by means of the principal axis extraction method, followed by oblique rotation, the six factors explained 53.27% of the variance. On the basis of their meaning, these factors corresponded, in the following order, to Anger, Fatigue, Vigour, Friendliness, Tension, and Depression. All had a minimum of five items and factor loadings in the structure matrix ranging from .48 to .89 (with the exception of two items
from the Friendliness factor, clear-headed —sensato—, and friendly —amistoso—, which had saturations of .34 and .45, respectively.

The internal consistency values for the factors, calculated using Cronbach’s Alpha, were .92 for the Anger factor (11 items), .89 for Fatigue (6 items), .84 for Vigour (5 items), .77 for Friendliness (6 items), .87 for Tension (7 items) and .89 for Depression (9 items).

**Single-Sample Confirmatory Factor Analysis**

The fit between the model and data was verified by means of confirmatory factor analysis, employing LISREL (version 8.72). This analysis was first carried out on each sample separately. The correlation of each of the 44 items and their corresponding factors was specified with the variance of each factor having been set to 1. All error terms were assumed to be uncorrelated. On the basis of prior evidence with the questionnaire (Terry et al., 2003), relations between the six latent factors were permitted. The model was thus over-identified, with 990 items of information available and 103 parameters to be estimated.

The distributions of responses to the items exhibited deviations which did not differ greatly from normality, with a relative multivariate kurtosis of 1.110. Given that this was also a model with a certain degree of complexity, and that the sample size was relatively small, maximum likelihood was chosen as the estimation method.

Both global and individual fit indicators were interpreted. As evaluation criteria for the former, we adhered to the recommendations of Hu and Bentler (1999), who suggest that results should approach the following reference values: .95 for CFI (Comparative Fit Index) and for NNFI (Non-Normed Fit Index), .08 for SRMR (Standardized Root Mean Square Residual) and .06 for RMSEA (Root Mean Square Error of Approximation).

In the first sample, the values obtained for the most habitual global goodness-of-fit indicators were as follows: $\chi^2(887) = 1481.50, p < .01; \text{CFI} = .95; \text{NNFI} = .95; \text{SRMR} = .083; \text{RMSEA} = .064$ (with limits of .058 and .069 for the confidence interval at 90%).

Inspection of the standardised residuals and the modification indices revealed a number of relatively high values, which would require relations to be added.

Table 1

<p>| Parameters Estimated by Confirmatory Factor Analysis in the First Sample (n = 166) |
|-----------------------------------------------|----------------|----------------|----------------|
| <strong>Anger</strong> | <strong>Fatigue</strong> | <strong>Vigour</strong> |</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>$\lambda_1$</th>
<th>$\delta$</th>
<th>Item</th>
<th>$\lambda_1$</th>
<th>$\delta$</th>
<th>Item</th>
<th>$\lambda_1$</th>
<th>$\delta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad-tempered</td>
<td>.86</td>
<td>.27</td>
<td>Weary</td>
<td>.91</td>
<td>.17</td>
<td>Full of pep</td>
<td>.83</td>
<td>.31</td>
</tr>
<tr>
<td>Peeved</td>
<td>.83</td>
<td>.30</td>
<td>Bushed</td>
<td>.88</td>
<td>.22</td>
<td>Energetic</td>
<td>.75</td>
<td>.44</td>
</tr>
<tr>
<td>Angry</td>
<td>.81</td>
<td>.35</td>
<td>Fatigued</td>
<td>.88</td>
<td>.23</td>
<td>Vigorous</td>
<td>.72</td>
<td>.48</td>
</tr>
<tr>
<td>Furious</td>
<td>.76</td>
<td>.42</td>
<td>Exhausted</td>
<td>.75</td>
<td>.44</td>
<td>Active</td>
<td>.69</td>
<td>.52</td>
</tr>
<tr>
<td>Amused</td>
<td>.76</td>
<td>.42</td>
<td>Worn out</td>
<td>.74</td>
<td>.45</td>
<td>Lively</td>
<td>.65</td>
<td>.57</td>
</tr>
<tr>
<td>Grouchy</td>
<td>.74</td>
<td>.45</td>
<td>Sluggish</td>
<td>.57</td>
<td>.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ready to fight</td>
<td>.71</td>
<td>.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bitter</td>
<td>.64</td>
<td>.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resentful</td>
<td>.57</td>
<td>.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spiteful</td>
<td>.54</td>
<td>.71</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deceived</td>
<td>.53</td>
<td>.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Friendliness

<table>
<thead>
<tr>
<th>Item</th>
<th>$\lambda_1$</th>
<th>$\delta$</th>
<th>Tension</th>
<th>Item</th>
<th>$\lambda_1$</th>
<th>$\delta$</th>
<th>Depression</th>
<th>Item</th>
<th>$\lambda_1$</th>
<th>$\delta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good natured</td>
<td>.84</td>
<td>.30</td>
<td>Nervous</td>
<td>.79</td>
<td>.38</td>
<td>Miserable</td>
<td>.76</td>
<td>.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Considerate</td>
<td>.70</td>
<td>.51</td>
<td>Restless</td>
<td>.75</td>
<td>.44</td>
<td>Sad</td>
<td>.75</td>
<td>.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sympathetic</td>
<td>.69</td>
<td>.53</td>
<td>On edge</td>
<td>.75</td>
<td>.44</td>
<td>Hopeless</td>
<td>.74</td>
<td>.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helpful</td>
<td>.65</td>
<td>.58</td>
<td>Uneasy</td>
<td>.71</td>
<td>.49</td>
<td>Desperate</td>
<td>.74</td>
<td>.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friendly</td>
<td>.51</td>
<td>.74</td>
<td>Shaky</td>
<td>.65</td>
<td>.58</td>
<td>Unhappy</td>
<td>.69</td>
<td>.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear-headed</td>
<td>.34</td>
<td>.88</td>
<td>Tense</td>
<td>.65</td>
<td>.57</td>
<td>Blue</td>
<td>.65</td>
<td>.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Relaxed</td>
<td>.59</td>
<td>.65</td>
<td>Helpless</td>
<td>.65</td>
<td>.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gloomy</td>
<td>.62</td>
<td>.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lonely</td>
<td>.55</td>
<td>.70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
between the error terms of various items (e.g. between the malhumorado and furioso—peeved and furious—items of the Anger factor; and between the inquieto and intranquilo—restless and uneasy—items of the Tension factor).

The estimations for the parameters in this sample are summarised in Table 1.

Both the magnitude and the interpretability of the estimated parameters were considered to be adequate. All factor loadings were statistically significant, with completely standardised values between .34 and .91. The correlations between factors are shown in Table 2.

Table 2
Inter-Correlations of POMS Factors Among Two Samples

<table>
<thead>
<tr>
<th></th>
<th>Anger</th>
<th>Fatigue</th>
<th>Vigour</th>
<th>Friendliness</th>
<th>Tension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample 1</td>
<td>.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample 2</td>
<td>.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vigour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample 1</td>
<td>-.38</td>
<td>-.26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample 2</td>
<td>-.09*</td>
<td>-.09*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friendliness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample 1</td>
<td>-.37</td>
<td>.001*</td>
<td>.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample 2</td>
<td>-.29</td>
<td>-.02*</td>
<td>.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample 1</td>
<td>.60</td>
<td>.38</td>
<td>-.15*</td>
<td>-.17*</td>
<td>.58</td>
</tr>
<tr>
<td>Sample 2</td>
<td>.65</td>
<td>.49</td>
<td>-.06*</td>
<td>-.10*</td>
<td>.46</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample 1</td>
<td>.66</td>
<td>.36</td>
<td>-.46</td>
<td>-.17*</td>
<td>.58</td>
</tr>
<tr>
<td>Sample 2</td>
<td>.62</td>
<td>.30</td>
<td>-.39</td>
<td>-.05*</td>
<td>.46</td>
</tr>
</tbody>
</table>

Note. * Non-significant correlation

The lambda-x values for the items, along with the error terms, are shown in Table 3. All estimated parameters were significant. The values for factor loadings ranged from .33 to .90. As regards correlations between factors, they are also offered in Table 2.

Multi-Sample Confirmatory Factor Analysis

A simultaneous analysis was performed to verify, firstly, the equality in form of both samples; that is, to verify the equivalence of the number of factors and the pattern of items-factors relations in both samples. As it is shown in Table 4, this solution is suitably adjusted to the data, and it will be used as a baseline model for subsequent invariance tests.

The following analysis consisted in evaluating whether the factor loadings (non-standardised) for the items were comparable in both samples. The global fit of the factor loadings equality model to the data is acceptable, and does not suppose a significant reduction with regard to the equal structure solution. The value \( \chi^2(\hat{44}) = 53.71 \) was not significant. The difference in the degrees of freedom is due to the factor weights, which were estimated freely for both groups in previous analyses.

The third step consisted in incorporating indicator intercept equality. This specification assumes that for a given level of the latent factor, the scores observed for an indicator will be equivalent in both groups. The global fit of the factor loadings equality model to the data is acceptable, and does not suppose a significant reduction with regard to the equal structure solution. The value \( \chi^2(\hat{44}) = 53.71 \) was not significant. The difference in the degrees of freedom is due to the factor weights, which were estimated freely for both groups in previous analyses.

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significance degradation with regard to the factor loadings equality solution ($\chi^2_{df(15)} = 17.86, p > .05$).

Given that factor weights and the indicators intercepts are invariable in both samples, the difference in the latent means between them can be interpreted. In the second sample, the values for the non-standardised estimated parameters for the latent variables were .02 for Anger, -.14 for Vigour (which indicates that, on average, in this dimension the second sample has scores .14 units lower than the first one), -.18 for Fatigue, -.02 for Friendliness, -.01 for Tension, and -.05 for Depression. In no cases are these differences significant, as is also corroborated by the analysis of invariance of means for the factors, which is shown in the penultimate row of Table 4 ($\chi^2_{df(15)} = 7.9, p > .05$).

Lastly, the equality of co-variances between factors was verified, giving a value for $\chi^2_{df(15)}$ of 24.51, which is also non-significant.

**Discussion**

The results of this study, obtained on the basis of the scores of two samples in the POMS questionnaire, support a mood state measurement model with 44 items and six first-order factors (Anger, Fatigue, Vigour, Friendliness, Tension, and Depression).

This involves a number of changes with respect to the original structure. Firstly, it entails the elimination of between one and five indicators for each mood state, even going so far as to dispense with the factor of Confusion altogether. Secondly, the Friendliness factor, which appears in the work of McNair et al. (1971), is maintained. Thus, we propose a reduced, Spanish version of the POMS which measures only four negative mood state factors (Anger, Fatigue, Tension, and Depression) and up to two positive ones (Vigour and Friendliness).

Nonetheless, all these changes are coherent with those published in previous studies with the English questionnaire. On one hand, researchers such as LeUnes and Burger (2000) anticipated that the future of the POMS would entail the development and refinement of abbreviated versions. Some of the most salient efforts in this sense are referred to in the introduction to the present paper.

With reference to the elimination of the Confusion factor, McNair et al. (1971) reported that factor loadings and consistency values for the Confusion factor were
always among the lowest. Three of the seven items in Confusion were only included in their Studies 5 and 6; and a number of doubts were raised regarding the definition of this factor, which might represent a trait of cognitive inefficiency, a mood state, or both. In some posterior administrations of the POMS, Confusion did not appear as a factor independent of Depression and Tension. In fact, these three factors were treated as factorially complex dimensions with high correlations (Norcross et al., 1984). This tendency towards overlapping between negative factors has not only been found in the English version of the scale, but also in its adaptation to other languages (Arce et al., 2000; Aroian et al., 2007; Wald & Mellenbergh, 1990; Yeun & Shin-Park, 2006).

In terms of those items that have been discarded, it should be pointed out that a number of the adjectives appearing in POMS have a marked cultural character and are subject to the dynamics of English (Albrech & Ewing, 1988), and hence may be difficult to adapt. Moreover, expressions such as cheerful and carefree (from the Vigour factor), bewildered, forgetful, confused and unable to concentrate (from Confusion), listless (from Fatigue) and hopeless (from Depression) have previously been questioned as valid indicators for their respective factors (Grove & Prapavessis, 1992; O’Connor, 2004; Terry et al., 1999) and currently do not appear in a number of the abbreviated forms (McNair, Lorr, & Droppleman, 1992; Terry et al., 2003; Terry et al., 1999).

Regarding those items that have been maintained, it should be mentioned that the list proposed by Terry et al. (2003) shares 13 of its 24 items with this version in Spanish. Although the POMS proposed by the aforementioned authors was designed for adolescents, this item of data is important, as it is our immediate predecessor in English.

With particular regard to the estimated correlations between the latent factors, their values were lower than .70 in the case of more intense relations, and some were even non-significant. This could be considered as a criterion for the good discriminant validity of latent constructs. In the specific case of the Vigour-Fatigue relations, our findings point towards a higher degree of independence than in samples of British athletes and students (Terry et al., 2003).

Also worthy of mention was the fact that the correlation pattern for the Friendliness factor with all other factors differed from the profile exhibited by Vigour, which shows that they evaluate different aspects of the mood state. In accordance with our data, Friendliness is significantly related with Anger, and non-significantly with Depression.

The administration to new samples will provide further evidence of the validity of this Spanish version of the POMS for adults. In a similar manner to that of Terry et al., we expect it to be appropriate to both athletes at different competitive levels and the non-sporting population. Nevertheless, the application of this form of the POMS to research and work with adolescents will not be immediate, and it will need to be adapted to the characteristics of the younger population.

Finally, although the POMS has been shown to be a useful instrument with acceptable psychometric quality, even the staunchest proponents of this measurement concede that its development has been guided more by empirical findings than by theory. The same authors have recently provided a degree of clarity to definition of mood state, attempting to distinguish this construct from that of emotion (Beddie, Terry, & Lane, 2005). And they have endeavoured to propose a conceptual framework for explaining both the relation of the different mood stages between each other, and the link between these dimensions and sports performance, placing special emphasis on the modulating role supposedly played by the depressed mood state (Lane & Terry, 2000; Lane, Terry, Beedie, Curry, & Clark, 2001).

### Table 4
**Goodness-of-fit Values from Multi-Sample Confirmatory Factor Analysis**

<table>
<thead>
<tr>
<th>Model</th>
<th>Chi-square</th>
<th>df</th>
<th>CFI</th>
<th>NNFI</th>
<th>RMSEA</th>
<th>(CI 90%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>3123.76</td>
<td>1774</td>
<td>.95</td>
<td>.94</td>
<td>.065</td>
<td>(.061, .069)</td>
</tr>
<tr>
<td>Factor loadings</td>
<td>3177.47</td>
<td>1818</td>
<td>.95</td>
<td>.95</td>
<td>.064</td>
<td>(.061, .068)</td>
</tr>
<tr>
<td>Intercepts</td>
<td>3195.33</td>
<td>1856</td>
<td>.95</td>
<td>.95</td>
<td>.063</td>
<td>(.059, .067)</td>
</tr>
<tr>
<td>Latent means</td>
<td>3203.23</td>
<td>1862</td>
<td>.95</td>
<td>.95</td>
<td>.063</td>
<td>(.059, .067)</td>
</tr>
<tr>
<td>Co-variances</td>
<td>3227.74</td>
<td>1877</td>
<td>.95</td>
<td>.95</td>
<td>.063</td>
<td>(.059, .067)</td>
</tr>
</tbody>
</table>
References


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