

Comparison of Brazilian and American norms for the International Affective Picture System (IAPS)

Comparação entre normas brasileiras e norte-americanas do International Affective Picture System (IAPS)

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Abstract

Objective: The present article compares Brazilian and American norms for the International Affective Picture System (IAPS), a set of normative emotional photographic slides for experimental investigations. **Methods:** Subjects were 1,062 Brazilian university students (364 men and 698 women) who rated 707 pictures from the IAPS in terms of pleasure, arousal, and dominance following the methodology of the original normative study in the US, enabling direct comparison of data from the two samples through Pearson product moment correlation and Student *t* test. **Results:** All correlations were highly significant with the highest level for the pleasure dimension, followed by dominance and arousal. However, contrary to the American normative values, our data showed that Brazilian subjects generally assigned higher arousal ratings overall. **Conclusion:** Our findings confirm that this set of stimuli can be used in Brazil as an affective rating tool due to the high correlations found across the two populations, despite differences on the arousal dimension, which are discussed in detail.

Keywords: Expressed emotion; Pattern recognition, visual; Recognition (Psychology); Visual perception; Form perception; Projective techniques/standards; Cross-cultural comparison; Sex characteristics

Resumo

Objetivo: O presente artigo compara as normas obtidas no Brasil e nos EUA para o "International Affective Picture System" (IAPS), um conjunto de fotografias emocionais amplamente utilizado na investigação experimental. **Métodos:** Os sujeitos foram 1.062 universitários brasileiros (364 homens e 698 mulheres) que avaliaram as 707 fotografias do IAPS nas dimensões prazer, alerta e dominância, utilizando o mesmo procedimento do estudo normativo original realizado nos EUA, permitindo uma comparação direta dos dados através de correlações lineares de Pearson e testes *t* de Student. **Resultados:** Todas as correlações entre as populações foram altamente significativas, sendo o maior coeficiente o da dimensão prazer, seguido da dimensão dominância e alerta. Entretanto, os brasileiros atribuíram maiores valores médios à dimensão alerta do que os norte-americanos. **Conclusão:** Os resultados confirmam que esse conjunto de estímulos pode ser usado no Brasil como um instrumento de medidas afetivas em função das altas correlações encontradas entre as duas populações, apesar das diferenças encontradas na dimensão alerta, que serão discutidas em detalhe.

Descritores: Emoções manifestas; Reconhecimento visual de modelos; Reconhecimento (psicologia); Percepção visual; Percepção de forma; Técnicas projetivas/normas; Comparação transcultural; Características sexuais

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Introduction

The study of emotion has attracted a considerable amount of research in the field of human cognition. Studies have been conducted on both normal subjects and patients with affective disorders. Methods that have been used to trigger emotions in laboratory settings include hypnosis,¹ autobiographical recall,² imagination,³ manipulation of facial expressions,⁴ listening to music⁵ and watching films.⁶ In general, all these procedures involve methodological problems: few are devised on the basis of a widely-accepted theoretical position, they are hard to standardize, and do not allow reliable subjective and/or objective measurements of emotions. Procedures appropriate for inducing emotional states should be characterized by being based on consistent theoretical constructs and by the use of standardized stimuli, such as words or images. The most extensive set of stimuli that satisfies these requirements is the "International Affective Picture System" (IAPS),⁷ which includes hundreds of high-resolution color photographs that include images such as natural landscapes, buildings, scenes of love or affection, children and mutilated individuals. These normatively rated affective stimuli allow better experimental control in the selection of adequate emotional stimuli and facilitate the comparison of results across different studies.

The affective rating used for self-reporting emotions triggered by the IAPS photographs consists of indicating emotional valence (pleasant-unpleasant) and arousal (aroused-relaxed) through the use of scales.⁸⁻¹⁰ A third dimension, dominance, highly correlated to valence, has also been used to characterize these stimuli.⁷ These three dimensions have long been described as crucial to the way humans organize their ratings of a wide range of perceptual stimuli.¹¹

The IAPS stimuli have been mainly evaluated using the "Self-Assessment Manikin" (SAM),¹² a rating scale system which includes 5 cartoon-like figures for each dimension. For instance, the pleasure scale varies from a smiling and happy figure at one extreme to one with an unhappy face at the other end, with figures with graded levels of happiness in between. Subjects respond by marking an "x" on one of the five figures on each scale, or by placing the "x" in between two figures, thus leading to a 9-point scale for each dimension. The value "nine" represents the largest score on each dimension (high levels of emotional valence, arousal or dominance), whereas "one" is the lowest score on each dimension.

The SAM may be used to rate emotional responses to a variety of stimuli for several types of experimental subjects, since it is an easy method of reporting affective experiences. In addition, it is considered a reliable and valid instrument because ratings of pleasure and arousal using these scales are highly correlated to measures of affective evaluations obtained on the basis of the Differential Semantic Scale, devised by Mehrabian and Russel's (1974), a verbal system for describing emotional stimuli.¹³

Emotional states triggered by a stimulus may be described by their location on a coordinated two-dimensional space ("affective space"), defined by the dimensions pleasure (ordinate) and arousal (abscissa) (see Figures 1, 2 and 3).¹⁴ ¹⁵ According to Lang et al, the stimuli of the IAPS are well distributed in this space, but there are few unpleasant photographs that trigger low arousal levels.⁷ Of note, however, IAPS also does not include representative photographs of pleasant figures that trigger low arousal states, although this point is not mentioned by Lang et al.⁷ Hence, attempts to find

photographs that fill all the quadrants of the affective space in order to force the appearance of a circumplex model have failed.¹⁴ This also applies to acoustic and verbal affective stimuli¹⁶ and probably reflects our real life experience: unpleasant stimuli or situations rarely induce people to relax, and neutral stimuli (pleasure-wise) rarely arouse us. Therefore, the affective space obtained in the American⁷ and Spanish¹⁷⁻¹⁸ normatizations of the IAPS is "boomerang-shaped", with two arms protruding from an affectively neutral and relaxing base, one reaching the pleasant and arousing extreme (upper right quadrant), and the other reaching the unpleasant end (lower right quadrant). This reflects the fact that the extreme representing low arousal is used to describe neutral photographs, whereas the opposite extreme (highly arousing) is used to describe both positive and negative photographs. As a consequence of this response pattern, there is only a slight linear correlation between these dimensions, so that the rating of pleasure and arousal is considered capable of describing our emotions in different situations in a non-redundant manner.¹³

Despite the overall similarity in the affective space of the IAPS standardizations in the US and Spain, the Spaniards rated stimuli as more arousing,¹⁷⁻¹⁸ even though the IAPS pictures were supposedly selected to trigger emotional responses independently of cultural characteristics.⁷ This difference shows that knowledge of how the populations to be investigated respond to IAPS stimuli is crucial should this set of photographs be used to study emotional responses both in normal subjects and in clinical populations.

The aim of the present study was to compare data obtained in Brazil to data from the standardization performed in the US.⁷ The role of culture in the affective judgments will be examined enabling researchers and clinicians in Brazil to select adequate affective stimuli to evaluate affective disorders.

Methods

1. Subjects

Brazilian sample: one thousand and sixty-two (1,062) Portuguese-speaking university students (364 men and 698 women), aged 18 to 35 years (average age 22.8 ± 4.6), selected from different courses (Psychology, Law, Pharmacy, Medicine, Industrial Design, Advertising and Marketing, Biomedicine, Dentistry, Civil Engineering) at public and private Universities in the Cities of Curitiba and São Paulo.

American sample: Florida University students of Psychology. The number and average age of subjects that rated each picture is neither specified in the normatization manual⁷ in which the US norms are published, nor the authors make this information available.

2. Material

Seven hundred and seven IAPS photographs divided by the authors of the instrument into 12 sets of approximately 60 photographs⁷ (total number of IAPS pictures available at the time the present study was conducted).

3. Procedure

The methodology, classification and analysis of the Brazilian norms can be found at the website www.unifesp.br/dpsicobio/adap/adapta.htm, including instructions of the original study, the translation of the instructions employed and some examples of photographs.¹⁹ They followed those of the original study⁷ but for the number of photographs tested per session, which was around 30 instead of approximately 60 as originally used

by Lang.⁷ These subsets of approximately 30 were obtained by randomly dividing each set of 60 in two. The use of fewer photographs was due to the short period of time subjects were available for testing (30 min).

The ethics committee approved the protocol. Informed consent was obtained from each participant.

In both studies volunteers rated photographs in terms of the three dimensions (pleasure, arousal and dominance) during class, using the ScanSAM version (paper-and-pencil version).⁷ In the present study subjects were students at Universities, thus enabling our evaluation of the IAPS through prior contacts. The data from subjects who did not have corrected vision at the time of the experiment or were not Portuguese native speakers were not included in the analysis and involved less than 1% of all data collected.

The ascending or descending order of these scales was

alternated for different experimental subjects. In addition to the IAPS photographs classified in each session, the same three photographs were used as examples and students rated their emotional content on a practice sheet. Each experimental session included the projection of instruction slides showing illustrated examples of SAM scores for each dimension.

Each rating began with a 5-second preparatory slide showing the number (1-30) of the next photograph to be presented. Then the photograph to be rated was individually projected on the screen for 5 seconds. During the remaining 10 seconds no slide was projected and subjects were asked to rate the image on the three dimensions (pleasure, arousal and dominance). The experimental sessions were held in classes containing 8-40 students with appropriate lighting to visualize the slides and the maximum size of the image projected was 1.20 x 1.50 m (approximately 4 x 5 ft).

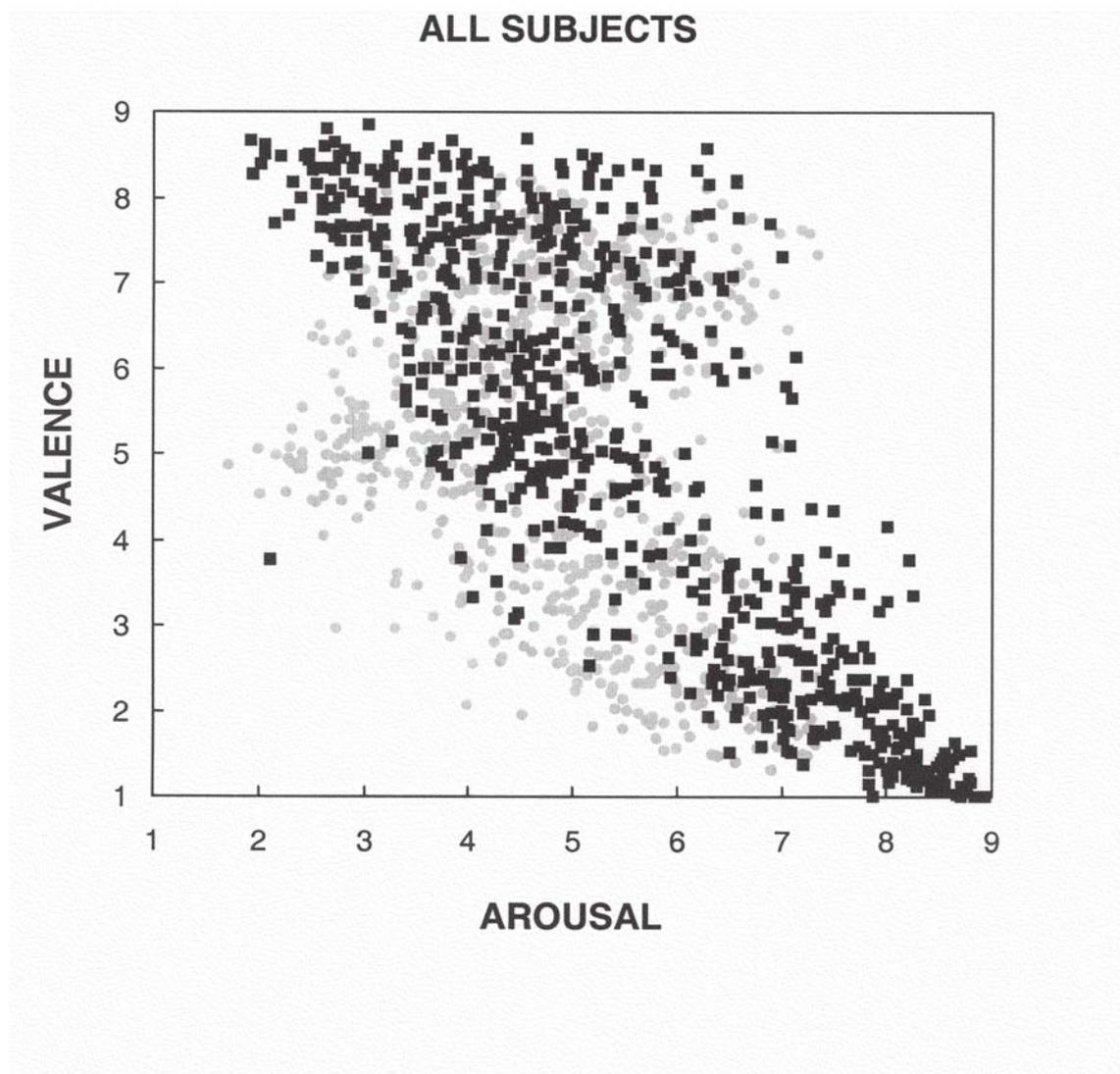


Figure 1 – Distribution of the 707 IAPS photographs (sets 1 to 12) by means for all Brazilian (■) (N = 1062) and American subjects (●) in the affective space determined by the dimensions pleasure and arousal. Linear correlation between pleasure and arousal dimensions for the Brazilian sample: $r = -0.82$ ($p < 0.05$) and for the American sample $r = -0.25$ ($p < 0.05$)⁷

4. Statistical analysis

Since the subjects in the Brazilian study were selected from a homogeneous group, the results of the two subsets of 30 stimuli from each set were combined in order to compare data to the American results for each set of 60 photographs.

In both the Brazilian and American studies, the mean and standard deviation of affective ratings by all subjects, and by men and women separately, for each picture, was determined in all three dimensions (pleasure, arousal, dominance). Measurement units used in the statistical analysis were the means of the mean ratings of all photographs in each set both for all subjects and by gender, as well as the means of the means of all the photographs in all sets, and also for all subjects and by gender. These variables for the Brazilian sample were

compared to those obtained in the US using Student t tests for independent samples and Pearson product moment correlation tests. The significance level adopted in all analyses was 5%.

Results

Figures 1, 2 and 3 provide graphic representations in the affective space (pleasure vs. arousals) of the classification of the 707 IAPS photographs for all subjects, men and women, respectively, for the data obtained in the US and Brazil.

The correlations between pleasure and arousal for all the Brazilian subjects, men and women, were negative and higher ($r = -0.82$; -0.63 and -0.84 , respectively; $p < 0.05$) than in the American sample ($r = -0.25^*$; 0.02 and -0.35^* , respectively; $*p < 0.05$).

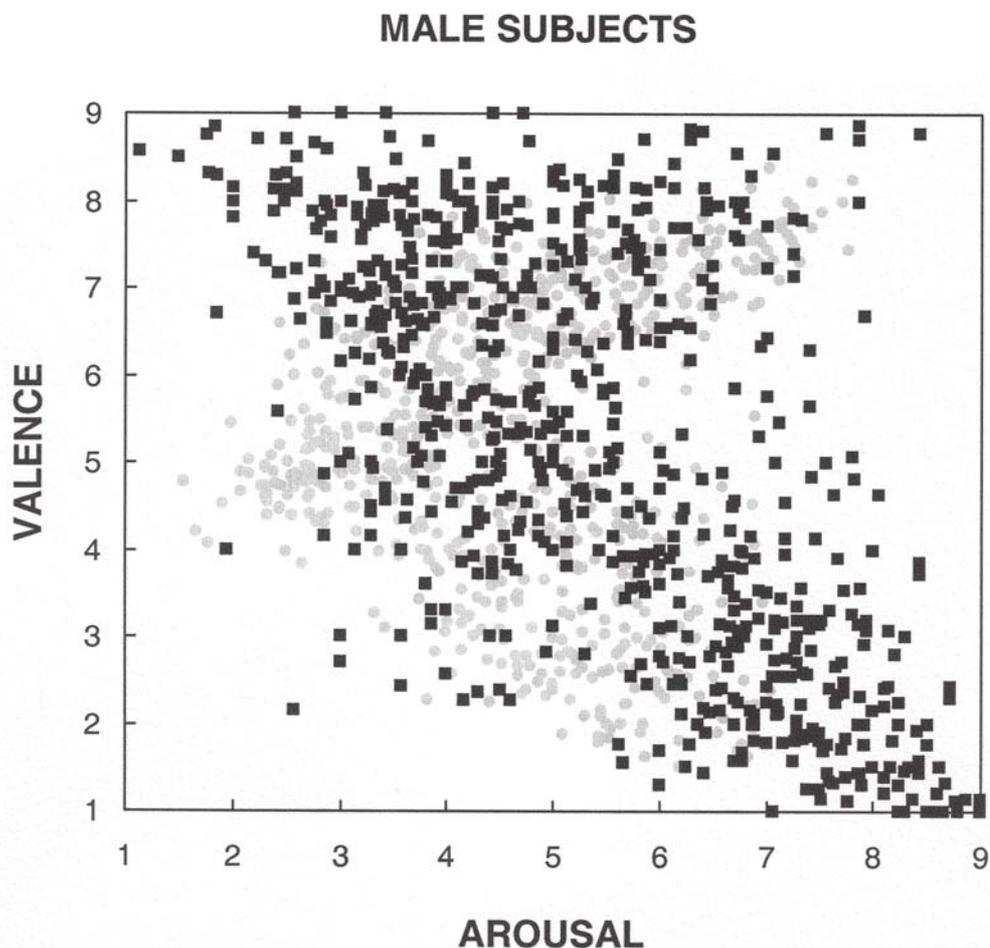


Figure 2 – Distribution of the 707 IAPS photographs (sets 1 to 12) by means for Brazilian (■) (N = 364) and American male subjects (●) in the affective space determined by the dimensions pleasure and arousal. Linear correlation between pleasure and arousal dimensions for the Brazilian sample: $r = -0.63$ ($p < 0.05$) and for the American sample $r = 0.02$ ($p = 0.33$)⁷

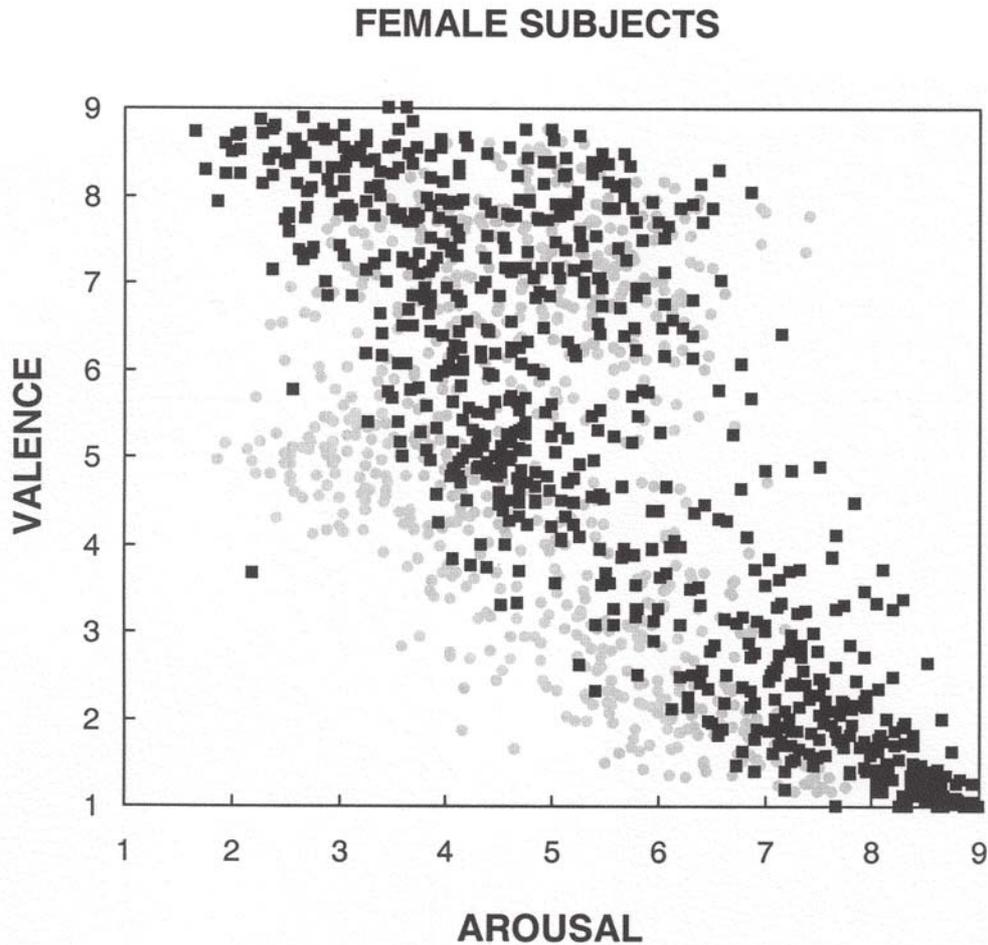


Figure 3 – Distribution of the 707 IAPS photographs (sets 1 to 12) by means for Brazilian (■) (N = 698) and American female subjects (●) in the affective space determined by the dimensions pleasure and arousal. Linear correlation between pleasure and arousal dimensions for the Brazilian sample: $r = -0.84$ ($p < 0.05$) and for the American sample $r = -0.35$ ($p < 0.05$)⁷

Regarding the analyses by sets of photographs (Table 1), no significant differences were found between the Brazilian and American samples for the means of the 12 sets on the pleasure dimension when men, women and all subjects were compared ($p > 0.20$). Similarly, no significant differences between samples were found for all subjects and for women ($p \geq 0.07$) in terms of dominance, although Brazilian men attributed lower mean dominance values to sets 1, 7 and 9 ($p \leq 0.01$) and higher mean dominance value to set 6 ($p \leq 0.05$). On the arousal dimension, however, the Brazilians attributed higher mean values to sets 1, 2, 4, 6, 8, 9, 10, 11 and 12 ($p \leq 0.05$), and these significant differences appeared in all sets except set 11 for all subjects, in all those mentioned except in set 6 for the male subjects, and only in sets 1, 2, 4, 6, 9 and 10 for the women ($p \leq 0.03$).

As to the comparison between samples for all the 707 photographs (Table 2), Brazilian men attributed lower dominance than American males ($p < 0.05$), whereas all Brazilian subjects, men and women, attributed higher mean values on the arousal dimension ($p \leq 0.05$).

All correlation between samples were significant ($p < 0.05$), both for results in each set analyzed separately, as for all sets combined, for all subjects, men and women (Table 3). The highest level of correlation between the Brazilian and American classifications was found on the pleasure dimension, followed by dominance and lastly by arousal for all subjects ($r = 0.93$; 0.87 and 0.65 , respectively), men ($r = 0.91$; 0.76 and 0.57 , respectively) and women ($r = 0.95$; 0.86 and 0.66 , respectively) ($p < 0.05$).

Table 1 – Means (standard deviations) for Brazilian and American classifications of photographs composing sets 1 to 12, for the dimensions pleasure, arousal and dominance for all subjects, men and women (BRAZIL, N = 1062)

		Set 1 N = 70		Set 2 N = 117		Set 3 N = 93		Set 4 N = 96		Set 5 N = 84		Set 6 N = 87	
		BR	USA	BR	USA	BR	USA	BR	USA	BR	USA	BR	USA
Pleasure	Total	5.13 (2.16)	5.15 (1.76)	5.09 (2.35)	5.25 (1.90)	5.42 (1.96)	5.46 (1.69)	4.48 (2.50)	4.90 (1.97)	4.96 (2.89)	5.04 (2.27)	5.22 (2.73)	5.07 (2.26)
	Men	5.37 (1.94)	5.44 (1.57)	5.14 (2.22)	5.16 (1.69)	5.55 (1.97)	5.55 (1.57)	4.70 (2.33)	5.16 (1.68)	5.05 (2.77)	5.16 (2.04)	5.30 (2.47)	5.20 (2.19)
	Women	5.04 (2.33)	5.30 (2.18)	5.08 (2.51)	5.17 (2.08)	5.33 (2.22)	5.40 (1.91)	4.34 (2.69)	4.73 (2.22)	4.91 (2.93)	4.92 (2.43)	5.19 (2.90)	4.93 (2.38)
Arousal	Total	5.30* (1.90)	4.48 (1.34)	5.50* (1.77)	4.92 (1.23)	5.14 (1.62)	5.05 (1.09)	6.00* (1.81)	4.81 (1.19)	5.74 (1.87)	5.22 (1.10)	5.82* (1.76)	5.27 (1.20)
	Men	5.04* (1.75)	4.28 (1.52)	5.48* (1.81)	4.78 (1.28)	5.18 (1.55)	5.19 (1.10)	5.78* (1.72)	4.63 (1.14)	5.67 (1.98)	5.11 (1.14)	5.56 (1.76)	5.35 (1.29)
	Women	5.40* (1.97)	4.68 (1.37)	5.52* (1.84)	4.87 (1.29)	5.14 (1.75)	4.94 (1.23)	6.14* (1.92)	4.93 (1.30)	5.63 (1.93)	5.32 (1.19)	5.98* (1.82)	5.20 (1.25)
Dominance	Total	5.18 (1.62)	5.64 (1.29)	5.09 (1.59)	4.93 (1.02)	5.21 (1.28)	4.99 (0.96)	4.81 (1.65)	5.17 (1.17)	4.77 (1.79)	4.71 (1.14)	5.21 (1.78)	4.77 (1.11)
	Men	5.24* (1.37)	6.09 (1.23)	5.37 (1.21)	5.05 (0.94)	5.25 (1.16)	5.14 (0.94)	4.87 (1.53)	5.20 (0.99)	4.76 (1.74)	4.88 (1.08)	5.50* (1.67)	4.86 (1.15)
	Women	5.15 (1.77)	5.18 (1.42)	5.00 (1.78)	4.82 (1.12)	5.17 (1.48)	4.87 (1.04)	5.79 (1.80)	5.14 (1.36)	4.80 (1.89)	4.55 (1.28)	5.07 (1.91)	4.68 (1.12)
		Set 7 N = 94		Set 8 N = 108		Set 9 N = 69		Set 10 N = 78		Set 11 N = 86		Set 12 N = 80	
		BR	USA	BR	USA	BR	USA	BR	USA	BR	USA	BR	USA
Pleasure	Total	5.00 (2.51)	4.93 (1.90)	5.39 (2.47)	5.13 (1.61)	5.00 (2.29)	4.95 (1.64)	5.02 (2.08)	4.91 (1.59)	5.10 (2.18)	5.13 (1.68)	5.21 (2.37)	4.95 (1.62)
	Men	5.00 (2.22)	5.08 (1.73)	5.49 (2.23)	5.23 (1.52)	5.02 (2.33)	5.06 (1.48)	5.08 (2.30)	4.96 (1.44)	5.36 (1.94)	5.25 (1.42)	5.30 (2.39)	5.10 (1.41)
	Women	4.99 (2.66)	4.81 (2.19)	5.35 (2.60)	5.04 (1.86)	5.00 (2.40)	4.87 (1.93)	5.17 (2.21)	4.85 (1.87)	4.95 (2.40)	5.05 (1.86)	5.23 (2.45)	4.84 (1.80)
Arousal	Total	5.69 (1.76)	5.20 (1.18)	5.31* (1.60)	4.80 (1.09)	5.18* (1.83)	4.18 (1.09)	5.13* (1.48)	4.20 (1.23)	5.25 (1.62)	4.83 (1.03)	5.55* (1.56)	5.06 (1.03)
	Men	5.54 (1.72)	5.04 (1.33)	5.17* (1.51)	4.65 (1.27)	5.09* (1.69)	4.10 (1.19)	5.01* (1.82)	4.04 (1.33)	5.11*(1.6 5)	4.53 (1.05)	5.80* (1.46)	4.87 (1.06)
	Women	5.80 (1.78)	5.34 (1.24)	5.36 (1.66)	4.95 (1.08)	5.21* (1.92)	4.25 (1.23)	5.09* (1.66)	4.35 (1.34)	5.32 (1.68)	5.01 (1.06)	5.52 (1.83)	5.19 (1.07)
Dominance	Total	4.97 (1.73)	5.22 (1.22)	5.34 (1.79)	5.46 (1.01)	5.01 (1.65)	5.45 (0.96)	5.52 (1.45)	5.33 (1.05)	5.20 (1.59)	5.37 (1.06)	4.99 (1.61)	5.07 (0.98)
	Men	4.90* (1.60)	5.51 (1.08)	5.64 (1.59)	5.57 (0.85)	5.09* (1.70)	5.79 (0.86)	5.45 (1.57)	5.65 (0.82)	5.48 (1.41)	5.86 (0.88)	5.13 (1.60)	5.37 (0.97)
	Women	5.00 (1.88)	5.26 (1.22)	5.25 (1.90)	5.34 (1.27)	4.99 (1.70)	5.20 (1.10)	5.36 (1.64)	5.04 (1.30)	5.05 (1.79)	5.07 (1.20)	4.88 (1.62)	4.88 (1.04)

Discussion

All coefficients of correlation between Brazilian and American norms were significant and, in most cases, high, a fact that has been considered evidence that stimuli are rated in a similar manner by subjects in different countries and are therefore appropriate for research in the different cultures under investigation.²⁰⁻²³ The Spanish IAPS normatization¹⁷⁻¹⁸ showed similar correlations to American data, but at higher levels. This may be due to the larger number of volunteers used in the former study (119-162 per set).

The Brazilian affective space figure shows that the emotional responses triggered by the IAPS photographs were distributed along each dimension, as was the case for the American⁷ and Spanish samples.¹⁷⁻¹⁸ Unpleasant photographs (those located in the lower half of the chart) were concentrated in the quadrant of affective space that indicates higher arousal, thus highlighting the fact that photographs with a lower level of pleasure cause greater arousal.²⁴ Of note as well, the almost total absence of photographs located in the unpleasant and low-arousal quadrant, and of neutral ones located in the arousal

quadrant, as previously observed.^{7,17-18} However, in the present sample the pleasant photographs (those located in the upper half of the chart) were distributed along almost the entire arousal dimension. Brazilians attributed less arousal to the more pleasant photographs and more arousal to neutral and negative ones. This led to a different, more linear, distribution of scores in the affective space when compared to the “boomerang distribution” observed in the American study. The

Table 2 – Means of the Brazilian and American classifications for all 707 photographs comprising IAPS (sets 1 to 12), for the dimensions pleasure, arousal and dominance for all subjects, men and women (N = 1062)

	Total		Men		Women	
	BR	USA	BR	USA	BR	USA
Pleasure	5.08	5.07	5.20	5.20	5.05	4.99
Arousal	5.47*	4.83	5.37*	4.71	5.51*	4.92
Dominance	5.11	5.17	5.22*	5.41	5.04	5.00

* $p \leq 0.05$

Table 3 – Linear correlations (r) between Brazilian and American classifications for dimensions pleasure, arousal and dominance for all subjects, men and women by set (1 to 12)

		Set 1	Set 2	Set 3	Set 4	Set 5	Set 6	Set 7	Set 8	Set 9	Set 10	Set 11	Set 12
Pleasure	Total	0.73	0.94	0.96	0.96	0.96	0.98	0.96	0.96	0.96	0.90	0.95	0.95
	Men	0.91	0.91	0.93	0.90	0.95	0.95	0.92	0.89	0.93	0.89	0.91	0.91
	Women	0.95	0.96	0.94	0.96	0.96	0.98	0.96	0.96	0.96	0.94	0.95	0.94
Arousal	Total	0.84	0.51	0.74	0.73	0.70	0.70	0.70	0.49	0.43	0.71	0.56	0.74
	Men	0.76	0.39	0.70	0.69	0.67	0.55	0.60	0.32	0.42	0.61	0.54	0.74
	Women	0.82	0.61	0.72	0.72	0.70	0.78	0.77	0.59	0.37	0.68	0.55	0.67
Dominance	Total	0.92	0.89	0.89	0.89	0.93	0.92	0.94	0.92	0.87	0.78	0.90	0.90
	Men	0.89	0.81	0.81	0.78	0.86	0.89	0.85	0.88	0.80	0.68	0.78	0.81
	Women	0.90	0.88	0.89	0.89	0.88	0.91	0.89	0.86	0.85	0.81	0.91	0.90

higher level of arousal attributed by Brazilians to the unpleasant photographs in relation to North-Americans was also observed in the Spanish study,¹⁷⁻¹⁸ although the “boomerang” shape was maintained in the latter. The authors of the Spanish standardization suggest that people of Latin background tend to express more emotional response than the American population, thus emphasizing the need for local standardization of these photographs. This, however, does not explain the difference between Brazilian and American norms in terms of the arousal attributed to neutral (in terms of valence) and pleasant stimuli.

We believe that the absence of a clearly defined concept of “arousal” may explain why the Brazilian sample did not behave in the same way as the American one in relation to the upper right quadrant of the affective space. The technical manual containing the instructions for the original standardization work,⁷ when describing one of the extremes of the arousal scale, uses the terms “relaxed, calm, sluggish”, translated into Portuguese as “*relaxado, calmo e lento*.” Apparently, however, the Americans and Spaniards view this extreme of the scale as referring to the absence of alteration of the subject’s normal state (“no reaction”*), which in fact explains the “boomerang” shape, since they chose this extreme of the scale only for neutral photographs, while the opposite extreme was used to describe both positive and negative photographs.

The reason for this different interpretation of the arousal scale is not clear; it does not seem to be due to the written instructions as these may be related to cultural differences in the interpretation of the translated words or again to implicit instructions given during the experimental session. The fact that the American sample was composed entirely of psychology students, as opposed to the diversity of students in the Brazilian sample, may have also had some influence on the results since arousal is a concept that is studied in psychology courses.

To consider one of the extremes of the arousal scale as “no reaction”, however, contradicts the conceptualization of the authors who conducted the standardization study in the US themselves, and who described it as being bipolar (with arousal at one end, neutral in the middle and relaxed at the other end), rather than unipolar (with arousal at one end and “no reaction” at the other): “*Bipolar scales defined this activity parameter, extending from an unaroused state (calm, relaxed, sleepy, etc.) to high arousal (excited, stimulated, wide awake, etc.)*.”²⁴ Other authors have also described this scale as bipolar: “*The visual scale that was used ranged from 1 (unhappy) to 9 (happy) for ratings of emotional valence and from 1 (calm)*

to 9 (excited) for ratings of emotional arousal, with 5 representing a neutral rating in both dimensions.”²⁵ It is also important to point out that the word “relaxed” is used both to describe one of the extremes of the arousal scale (low arousal) and one of the extremes of the pleasure scale (high level of pleasure),¹³ thus causing confusion.

In the case of the Brazilian sample, the pleasant photographs classified as highly arousing are those with sexual content, unlike those of landscapes, flowers or babies, which are classified as producing low arousal states, in other words, relaxing and calming. Therefore, the Brazilian IAPS norms for the arousal dimension are not incongruous with the notion of a bipolar scale, although they differ from ratings made by subjects in other experiments with these stimuli.^{7,17-18}

Comparisons of objective, physiological alterations in response to the photographs defined by the Brazilians as “relaxing and pleasant” and as “pleasant and arousing” may show whether the physical responses to them are comparable, as suggested by the American data, or not, as found in subjects in Brazil. In this context, it is noteworthy that studies in this field have used almost exclusively negative stimuli (e.g.²⁶), which most consistently cause a high state of arousal in all the studies from which norms have been obtained (US⁷ and Spain¹⁷⁻¹⁸). This may be the reason why this issue has not been previously raised in the literature.

Brazilian men attributed lower values to the dominance dimension in relation to Americans, suggesting that they have a lower level of self-control (dominance) over affective stimuli. The higher mean dominance value found for the Brazilians in set 6 possibly occurred by chance since inspection of the photographs of this set showed no cultural distinction. This difference in the lower dominance values as well as the one related to the arousal dimension for all subjects, men and women, seems to fit well with stereotyped clichés concerning the two countries (data corroborated by Moltó et al, Vila et al¹⁷⁻¹⁸).

Conclusion

The overall similarities between data obtained in Brazil, the US and Spain suggest that the IAPS is appropriate for use in Brazil as an instrument for inducing emotional states, particularly regarding the pleasure and dominance dimensions, and to photographs with aversive content located in the upper right quadrant of the affective space. The differences found in the subjective arousal levels induced by some positive photographs must be taken into

* Lang PJ. 2002. Personal communication.

account in studies that will employ the norms presented here and may lead to discussions about the meaning of the term "arousal" as employed by Lang et al, which should be more clearly defined.

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References

1. Bower GH. Mood and memory. *Am Psychol.* 1981;36(2):129-48.
2. Brewer D, Doughtie EB. Induction of mood and mood shift. *J Clin Psychol.* 1980;36(1):215-26.
3. Wright JE, Mischel W. Influence of affect on cognitive social learning variables. *J Pers Soc Psychol.* 1982;43:901-14.
4. Laird JD, Wagener JJ, Halal M, Szegda M. Remembering what you feel: Effects of emotion on memory. *J Pers Soc Psychol.* 1982;42:646-57.
5. Vaitl D, Vehrs W, Sternagel S. Prompts-Leitmotif-Emotion: play it again, Richard Wagner! In: Birbaumer N, Öhman A, editors. *The structure of emotion: psychophysiological, cognitive and clinical aspects.* Seattle: Hogrefe & Huber; 1993. p. 169-89.
6. Hagemann D, Naumann E, Maier S, Becker G, Lürken A, Bartussek D. The assessment of affective reactivity using films: validity, reliability and sex differences. *Pers Individ Dif.* 1999;26:627-39.
7. Lang PJ, Bradley MM, Cuthbert BN. *International Affective Picture System (IAPS): Technical Manual and Affective Ratings.* [text on the Internet]. [cited 2005 May 10]. University of Florida: Center for Research in Psychophysiology; 1999. Available from: <http://www.unifesp.br/dpsicobio/adap/instructions.pdf>
8. Osgood C, Suci G, Tannenbaum P. *The measurement of meaning.* Urbana, IL: University of Illinois; 1957.
9. Mehrabian A, Russel JA. *An approach to environmental psychology.* Cambridge, MA: MIT; 1974.
10. Smith CA, Ellsworth PC. Patterns of cognitive appraisal in emotion. *J Pers Soc Psychol.* 1985;48(4):813-38.
11. Wundt W. *Grundriss der Psychologie (Outlines of Psychology).* Leipzig: Entgelmann; 1896.
12. Lang PJ. Behavioral treatment and bio-behavioral assessment: computer applications. In: Sidowski JB, Johnson JH, Williams TA, editors. *Technology in mental health care delivery systems.* Norwood, NJ: Ablex, 1980. p. 119-37.
13. Bradley MM, Lang PJ. Measuring emotion: the self-assessment manikin and the semantic differential. *J Behav Ther Exp Psychiatry.* 1994;25(1):49-59.
14. Russel JA. A circumplex model of affect. *J Pers Soc Psychol.* 1980;39(6):1161-78.
15. Watson D, Tellegen A. Toward a consensual structure of mood. *Psychol Bull.* 1985;98(2):219-35.
16. Bradley MM, Zack J, Lang PJ. Cries, screams, and shouts of joy: Affective responses to environmental sounds [abstract]. *Psychophysiology.* 1994;31(Suppl 1):S29.
17. Moltó J, Montañés S, Poy R, Segarra P, Pastor MC, Tormo MP. Un nuevo método para el estudio experimental de las emociones: el Internacional Affective Picture System (IAPS). Adaptación española. *Rev Psicol Gen Aplicada.* 1999;52(1):55-87.
18. Vila S, Sánchez M, Ramírez I, Fernández MC, Cobos P, Rodríguez S, et al. El Sistema Internacional de Imágenes Afectivas (IAPS). Adaptación española. Segunda parte. *Rev Psicol Gen Aplicada.* 2001;54(4):635-57.
19. Ribeiro RL, Pompéia S, Bueno OFA. Normas brasileiras para o International Affective Picture System (IAPS): comunicação breve. *Rev Psiquiatr Rio Gd Sul.* 2004;26(2):190-4.
20. Alario FX, Ferrand L. A set of 400 pictures standardised for French: norms for name agreement, image agreement, familiarity, visual complexity, image variability, and age of acquisition. *Behav Res Methods Instrum Comput.* 1999;31(3):531-52.
21. Pind J, Jonsdottir H, Tryggvadottir HB, Jonsson F. Icelandic norms for the Snodgrass and Vanderwart (1980) pictures: name and image agreement, familiarity, and age of acquisition. *Scand J Psychol.* 2000;41(1):41-8. Erratum in: *Scand J Psychol* 2000;41(2).
22. Sanfeliu MC, Fernandez A. A set of 254 Snodgrass-Vanderwart pictures standardised for Spanish. *Behav Res Methods Instrum Comput.* 1996;28(4):537-55.
23. Pompéia S, Miranda MC, Bueno OF. A set of 400 pictures standardized for Portuguese: norms for name agreement, familiarity and visual complexity for children and adults. *Arq Neuropsiquiatr.* 2001;59(2-B):330-7.
24. Bradley MM, Lang PJ. Measuring emotion: behavior, feeling and physiology. In: Lane R, Nadel L, editors. *Cognitive neuroscience of emotion.* New York: Oxford University Press; 2000. p. 242-76.
25. Canli T, Desmond JE, Zhao Z, Glover G, Gabrieli JD. Hemispheric asymmetry for emotional stimuli detected with fMRI. *Neuroreport.* 1998;9(14):3233-9.
26. Canli T, Desmond JE, Zhao Z, Gabrieli DE. Sex differences in the neural basis of emotional memories. *Proc Natl Acad Sci U S A.* 2002;99(16):10789-94.