

Rating of Affective Pictures of Low and High Arousal Domain among Malaysian Population

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Abstract

Affective pictures are being used in different neuropsychology and neurophysiology studies for the assessment of cognitive function including attention and emotion. This research aims to determine the arousal domain of normative affective pictures from International Affective Picture System (IAPS) with Malaysian population using Self-Assessment Manikin (SAM) then to develop and customize an additional set of affective picture database with Malaysian population using SAM. There were 72 completed data from Malaysian participants were selected to rate a total of 166 pictures in the arousal (low to high) domain of affective dimension using SAM. Rating of the arousal domain of normative affective pictures from IAPS with Malaysian population revealed Malaysian population showed higher score significantly ($p < 0.001$), 4.67 ± 0.62 than North American (NA) population, 2.78 ± 0.41 with significant correlation ($r = 0.254$, $p = 0.021$) between two sample means. The rating of arousal (low to high) domain of affective picture database with Malaysian population showed the overall mean differences among all low arousal pictures, 4.67 ± 0.62 and all high arousal pictures, 5.06 ± 0.54 with highly significant ($p < 0.001$). The study of affective picture rating revealed the rating of arousal value through SAM with the Malaysian population is probable and reliable, but the higher arousal value of affective pictures in Malaysian population compare to NA population which could be from large sample size in NA or could be from cross cultural variations suggesting special attention needed in using this IAPS affective pictures for research in Malaysian population.

Keywords: Arousal, Malaysian, Affective, IAPS, SAM

Introduction

IAPS refers to the International Affective Picture System which is database of pictures for studying attention and emotion (Bradley and Lang, 2007; Lang et al., 2005; Bradley, 1994), neurological measurements and physiological. Pictures were widely used as affective stimuli because pictures are static stimuli that can be of benefit for initial research or investigation of emotion (Schaaff, 2008). Other than that, pictures are able to evoke emotions. In fact, pictures are relatively easy to edit, catalogue and distribute stimuli. IAPS pictures have been used in accordance with a number of physiological and neurological measurements. IAPS was developed by National Institute of Mental Health Centre for Emotion and Attention at the

University of Florida. There were over 1000 coloured pictures in the database (Schaaff, 2008). The pictures represented daily life or experiences such as household furniture to mutilated body and the familiarity of the human experiences that evokes various kinds of emotions. The IAPS is widely used in research studying attention and emotion (Bradley and Lang, 2007). Besides, the IAPS images are not typically exposed or presented in any media social, outlet, publications and reports. This is very important in order to maintain the efficacy and novelty of the stimuli set within research works. Previous research about the effect of image size reduction and blurring on emotional engagement (De Cesarei and Codispoti, 2010) the study was conducted by collecting total of 100 pictures from various sources other than the IAPS (Lang et al., 2001) representing contents which different or varied from highly arousing pleasant to neutral and highly arousing unpleasant. In addition, a previous research was conducted by using five categories of different types of pictures such as erotic couples, romantic couples, neutral people, threat, and mutilated bodies (Cesarei and Codispoti, 2006). Additionally, there are ten additional neutral images or pictures selected for trial or practice block. Pictures were adjusted to the same level of contrast and brightness. The IAPS has been used in order to provide abundant vision into the dimensional aspects of emotion. For example, heart rate and facial electromyographic activity differentiate negative from positive valence, whereas skin conductance increases with increased arousal (Schaaff, 2008; Bradley and Lang 2000; Lang et al., 1998). Other than that, the IAPS has been used and proved to indicate that emotional stimuli undergo more extensive processing in the visual cortex rather than do neutral stimuli (Lang et al., 1998). Startle reflex has been proved to inhibit by the viewing of positive pictures and it can be elucidated by the viewing of negative arousing pictures, observing the expose of the differential role of positive versus negative effect in the modulation of attention and orienting. In studying the affective pictures processing, there are two major theories, first is the attention to more deeply engaged or involved by motivationally relevant stimuli that activate both appetitive and aversive systems and second, attention is more deeply engaged by the aversive stimuli described as the negativity bias (Briggs and Martin, 2009)

SAM refers to the "Self-Assessment Manikin" is a non-verbal pictorial assessment technique that directly measures the three rating dimensions/elements which are valence, arousal, and dominance associated with a person's affective reaction to a broad assortment of stimulations. SAM widely used as for the assessment and measurement of emotional responses (subjective) to the affective stimuli with a paper and pencil. Every dimension is illustrated as a nonverbal scale ranging from 1 which is lower value to 9 which is higher values which means the higher values representing more positive valence or pleasure, higher arousal and more feelings of dominance (Bradley and Lang, 1994). The SAM was the test used in affective studies which each picture that was presented was immediately rated. SAM contain three types of elements or dimensions arousal, valence and dominance/control (Lang et al., 2008)

Previous study about the effects of picture size reduction and blurring on emotional engagement also used SAM for rating (Cesarei and Codispoti, 2010). In the research, subjects were instructed to rate valence and arousal of their emotional state and the vividness of the picture. Vividness was defined as the amount of details in the pictures and was assessed using a modified SAM scale after each picture. In the vividness scale, the most neutral item of the SAM

valence scale was varied in contrast; producing pictures or images were progressively less visible (Cesarei and Codispoti, 2008). All ratings were collected on 9 points ordinal scales.

Many studies regarding the rating of affective pictures among various countries was identified as having different values of arousal elements because of cross culture differences such as in Brazilian, Bosnia and Herzegovina, Spanish, Belgium, Chilean, European Portuguese, German, Swedish, Italian and Indian samples. This study focused on arousal elements/domain in the rating of affective pictures among Malaysian population. Besides, the selection of new rating affective pictures based on guide from affective pictures from IAPS are comparable in order to develop and additional set of database that suited Malaysian population for further research regarding this affective studies. Cultural differences, people and way of life in Malaysia affect the level of one's memory. Therefore, this study may help in providing additional database among Malaysian population and to assist researchers in conducting studies related to rating of affective pictures.

Methodology

Study design, sampling method, subjects and sample size calculation

This research used cross-sectional design and purposive sampling, random method. Healthy volunteers aged between 18-65 years old and they were given consent. The $Z_{1-\alpha/2}$ is standard normal variate (at 5% type I error ($p < 0.05$) it is 1.96 at 1% type I error it is 2.58). As in majority of studies p values are considered significant below 0.05 hence 1.96 is used in formula. Standard deviation (SD) value of variable from previous study, 2.78 and d (absolute error or precision) = 0.6 and considering 12% dropouts, resulting in a grand total of 72 participants.

$$\text{Formula: Sample size} = \frac{Z_{1-\alpha/2}^2 SD^2}{d^2}$$

Inclusion criteria

Healthy volunteers' subjects of male and female of any races age from 18 to 65 years old (Solbakk et al., 2005)

Exclusion criteria

Participants with experience or history of neurologic disease, psychiatric disease, drug and alcohol abuse.

Collection of affective pictures

A set of 83 new affective pictures were collected from internet and another 83 pictures were selected from IAPS. Pictures from IAPS were selected based on their low arousal values. New pictures were selected randomly after internet search based on carrying load or physical exertion' assuming that these pictures would be in the high arousal category.

Stimuli and instruments

There were total of one hundred sixty six pictures used in this study. A set of eighty three picture was extracted from IAPS which were already rated and classified as low arousal picture and another eighty three picture were custom build collected from internet which were

assumed as high arousal picture that to be rating with the rated IAPS picture by using SAM. All the colored 166 pictures were bitmap image with the size of 1.97 MB and with the dimension (width x height) of 960 x 720 pixels.

Procedure

The experiment was divided into three sessions, for rating of the affective pictures, session one for picture 1 until 60, session two for picture 61 until 113 and session three for picture 114 until 166. Each participant was given different set of the picture. Participants were seated in front of white screen in a room on which the pictures and instructions of the same size were presented. Participants were informed that the aim of the current study was to investigate how subjects respond to pictures that represent different events occurring in life. The ratings procedure was explained to the participants (Bradley and Lang, 2000). Digitalized pictures were presented with PowerPoint 2007 using an Asus personal computer. Affective ratings were made using a paper-and-pencil version of the Self-Assessment Manikin (SAM; Lang, 1980), which utilizes sequences of humanoid figures to depict gradations along three bipolar affect dimensions: valence (low = *unhappy/unsatisfied*; high = *happy/pleased*), arousal (low = *calm, relaxed*; high = *excited, aroused*) and dominance (low = *submissive, controlled*; high = *dominant, in control*) (Figure 1). On each of the three SAM scales, participants were instructed to place an X over the constituent figure that best represented how they felt during the viewing of the last slide; rating values ranged from 1 to 9.

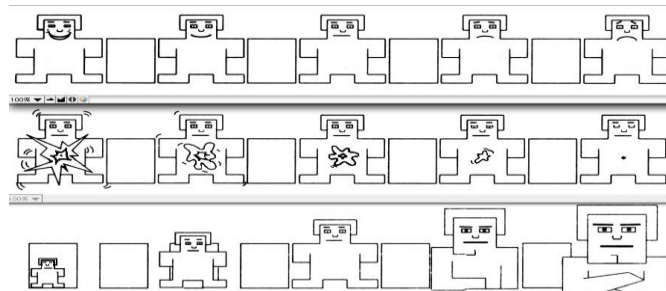


Figure 1: Paper-and-pencil SAM booklet used to obtain SAM ratings for IAPS pictures. Valence (top), Arousal (middle) and Dominance/Control (bottom), respectively (Lang et al., 2005)

Participants were instructed to rate how they actually felt while looking at each picture on these three scales. The images were presented in a random order and in each trial, an IAPS image was displayed on the whole screen. Participants were instructed to stare their eye at the pictures. A picture from the IAPS was presented for 6 sec and immediately, after the picture a 10 sec rating period began. Following the last pictures, the booklets were collected and participants were debriefed. Each session lasted about 30 minutes to 1 hr. for each session.

Statistical Analysis

Normative ratings for the 83 IAPS pictures from North America and 83 pictures unknown rating were used together among Malaysian population (n=72; for each session) in order to validate and rating all the 166 pictures. This study focused only on arousal (low and high) element along the three bipolar affect dimensions of SAM as stated in the procedure above. To address the

first research question which is rating of affective pictures among healthy Malaysian ratings, first of all the normality test was done for all of the 166 pictures (low and high arousal). Then, paired t-test was used in order to know the overall mean difference of low and high arousal picture for all pictures. The reliability test for low and high arousal pictures were then analyzed in order to know the internal consistency of each pictures. All the statistical analysis was done by using IBM SPSS Statistics version 22. Table 1 and table 2 showed the list of variables and test that were used in this study, respectively.

Table 1: List of variables for rating of affective pictures

List of variables	Variables
Dependent	Arousal
Independent	Affective pictures

Table 2: List of test and the purposes for rating of affective pictures

List of test	Purposes
Kolmogorov-Smirnov Z	Normality test (statistical method)
Histogram with normal distribution curve	Normality test (graphical method)
Reliability test	To test the reliability of the pictures among subjects involved
Paired t-test	To rate the low and high arousal pictures
Bivariate correlation	To test the correlation between Malaysian population with North American population

Results

Socio-demographic distribution

There were 216 subjects who fulfilled inclusion criteria. The mean and standard deviation (mean \pm SD) of age of subjects was 19.23 ± 1.68 . Majority of the subjects were female (64%) and male (36%). All subjects included in this study were Malay (86%), Chinese (19%), Indian (3%), Kadazan (1%) and Dusun (1%).

Normality test

Kolmogorov-Sminov Z test for high arousal pictures. There were total of 32 pictures that show $p < 0.05$ and 51 pictures with $p > 0.05$ for high arousal pictures. Meanwhile, there were total 23 pictures that show $p < 0.05$ and 60 pictures with $p > 0.05$ for low arousal pictures. From the histogram and normal distribution curve, the data shows that not all data were normally distributed.

Reliability Test

Internal consistency was performed on the total number of pictures rated by each participant. In order to know the internal consistency of the low and high arousal picture, the reliability test was done. Cronbach's alpha was 0.934 of all 166 pictures for the arousal dimension. The Cronbach's alpha for high arousal picture (1-83) was 0.924. Meanwhile the Cronbach's alpha for low arousal picture (84-166) was 0.950. As mentioned earlier, the high arousal pictures were new pictures that collected from internet sources and camera caption meanwhile the low arousal pictures were normative pictures that was selected from IAPS.

Rating of the arousal domain of normative affective pictures from IAPS with Malaysian population using SAM (Cross cultural rating of IAPS stimuli)

Comparison study between Malaysian and North American population revealed that Malaysian subjects have higher scored (4.67 ± 0.62) significantly than the North American sample (2.78 ± 0.41) in the arousal domain. There is significant correlation ($r = .254, p = .021$) between two sample means (Figure 2)

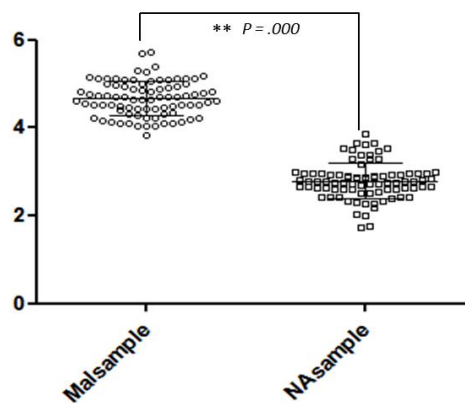


Figure 2: Overall mean for arousal of IAPS picture among Malaysian and North American population

Rating of arousal (low to high) domain and to develop and customize an additional set of affective picture database with Malaysian population by rating using SAM

Overall mean differences among all low arousal pictures ($4.67 \pm .62$) and all high arousal pictures ($5.06 \pm .54$) are highly significant ($p < 0.001$). We have also compared the normative data collected from the North American sample (2.78 ± 0.41) in the original IAPS database with the ratings from Malaysian population ($4.67 \pm .62$), Malaysian subjects showed higher score significantly ($p < 0.001$) than the North American sample in arousal domain and there is significant correlation ($r = .254, p = .021$) between two sample means.

The results of paired t-test (Figure 3) showed significant differences of overall mean difference for low and high arousal picture $p = 0.000$ ($p < 0.001$) with mean and standard deviation, respectively.

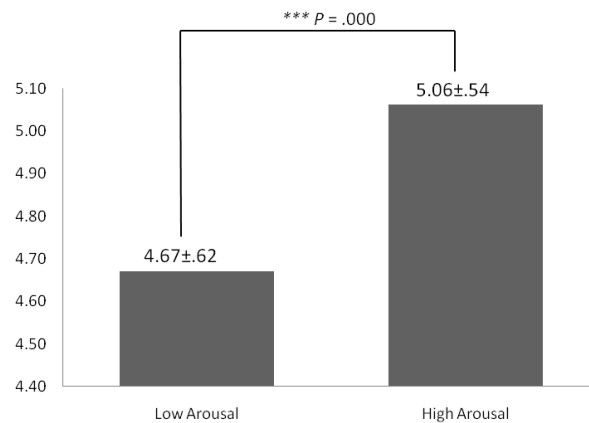


Figure 3: Overall mean differences of low and high arousal pictures

Previous research stated that the variation in affective rating of the pictures indicates that pictures can be used to elicit emotional reactions in participants (Verschuere et al., 2001).

In comparison to IAPS ratings, a correlation analysis between mean subjects' ratings and the IAPS ratings for Malaysian population subjects shows significant correlation between two sample mean ($r = 0.254$; $p < 0.021$). This allows the assumption, that the ratings from the Malaysian subjects in our study are not different to those from the IAPS.

Discussion

Kolmogorov-Smirnov Z test was conducted in order to test the normality for each picture. This was crucial to know about the distribution of data in this study. The normal distribution test indicated, among 83 high arousal pictures, 51 was normally distributed, among 83 low arousal pictures, 60 was normally distributed. Histogram with normal distribution curve with mean±SD for 166 pictures were analysed in order to know the roughly assess of probability distribution of a given variable by depicting the frequencies of observations occurring in certain ranges values for arousal elements.

Reliability analysis depicted the internal consistency (Cronbach’s alpha) of all pictures was 0.934 for the arousal dimension. The results show appropriate reliability of the selected pictures, indexed by high levels of internal consistencies for the arousal. Previous study suggested high levels of internal consistencies for the arousal such as 0.976 (Dufey et al., 2011), 0.94 (Verschuere et al., 2001) and 0.92 (Drače et al., 2013)

Comparison study between Malaysian and North American population revealed that Malaysian subjects have significantly higher scores (4.67 ± 0.62) compared to the North American sample (2.78 ± 0.41) in the arousal domain. There is significant correlation ($r = .254$, $p = .021$) between two sample means. The rating of the affective pictures in Kelantan area among Malaysian population provided different assumptions compared to normative of emotion and attention which is the mean (SD) rating was high compared to normative rating. The differences could be from the culture differences or variations and due to large sample size in North American sample. The findings in this thesis also showed that Malaysian subjective picture

ratings of the participants often different from the mean ratings from IAPS these differences were highly significant. However, Malaysian population shown higher value significantly than the North American sample in arousal domain with significant correlation between the two samples means. It might be helpful to perform a pre-study to analyses whether pictures show desired effect. This could help to reduce the number of ambiguous pictures. Moreover, it is absolutely essential to integrate the subjective ratings of a participant in the evaluation of the study if pictures are used to evoke a certain emotional state. Besides the choice of the right pictures, it is also important to carefully choose the participants of a study. Cultural background, age and sex can also have an influence on how the pictures are perceived. Nevertheless, the IAPS has been proven to be an efficient method for emotion induction. One of its major advantages can be seen in its reproducibility which also allows a comparison of studies from different laboratories. Besides that, this study also revealed that when comparing the arousal values, Malaysian had higher values than the North Americans with significant correlation. The data suggests that for Malaysian population, the same stimuli elicited higher arousal levels compared to North America population.

Hence, the stimuli might not have the range of effect of low vs. high arousal on the dependent measures of interest. Previous study was conducted among Brazilian (Lasaitis et al., 2008) also had higher arousal values than the North Americans. Besides, Chilean sample scores in the arousal dimension were significantly higher than US study as well (Dufey et al., 2011). In addition, mean of Bosnian sample has revealed that Bosnian arousal was significantly higher than mean North American ratings (Drače et al., 2013). These divergences in arousal ratings could be due to numerous reason including cultural differences in interpreting affective information. In addition, it is possible and reasonable that there may be cultural differences to some categories of images; for instance, people face (such as; medical worker, woman, secretary, man) that more western context. The IAPS provide a set of normative emotional stimuli for experimental investigations of emotion and attention. The goal is to develop a large set of standardized, emotionally-evocative, internationally accessible, colour photographs that includes contents across a wide range of semantic categories. The IAPS is being developed and distributed by the NIMH Center for Emotion and Attention (CSEA) at University of Florida in order to provide standardized materials that are available to researcher in the study of emotion and attention. The IAPS has shown to be a reliable method to assess affectivity in a variety of research, including psychiatric illness (Miltner et al., 2005; Quirk and Strauss, 2001) cognitive neuroscience (Dufey et al., 2011, Hot et al., 2006; Junghöfer et al., 2001; Schupp et al., 2006) and psychophysiology (Bradley et al., 2001a; Bradley et al., 2001b). Basically, the existence of these collections of normatively rated affective stimuli should allow better experimental control in the selection of emotional stimuli. Other than that, it also facilitates the comparison of results across different studies conducted in the same or different laboratory and encourages as well as allows exact replications within and across research labs that are assessing basic and applied problems in psychological science. Previous study stated that methodological differences in affective stimuli, task context and response measures across empirical studies on emotion, have led to major difficulties in comparing different studies (Bradley, 2007). Thus, the use of a set of standardized affective stimuli might enhance comparability. The IAPS is a

standardized set of emotion-eliciting, color photographs that is used worldwide in experimental investigation of emotion and attention (CSEA, 1995).

Comparison study among low and high arousal picture showed the overall mean of low arousal pictures was low (4.67 ± 0.62) and high arousal pictures was high (5.06 ± 0.54) and they are significantly different ($p < .001$). There were highly significant differences between subject's ratings (Malaysian) for pictures belonging to low arousal and high arousal pictures. The low arousal rating showed significant differences with high arousal rating by Malaysian population. These results indicated that the Malaysian had higher arousal values while seeing the high arousal pictures such as weightlifting-F, rock climbing, car lifting, luggage-carrying on back and car pushing. However, the Malaysian had lower arousal values while seeing the low arousal pictures such as gannet, chess, shadow, flower, rocks, boat and flower.

Demographic data for the rating of affective pictures showed the mean and standard deviation of age of subjects ($n = 72$) was 19.2 ± 1.68 , 64% subjects were female and 36% were male, and regarding race, Malay, Chinese, Indian, Kadazan and Dusun were 86%, 19%, 3%, 1% and 1% respectively. As stated above, in this study, subject's age were between 18 to 24 years old with the mean (SD), 19.23 ± 1.68 . Previous study among Flemish or Belgium has the average age, 19.16 years (SD= 1.87), with age range 18 to 32 years [16]. Besides, previous study was conducted among Indian samples had the average of age, 23.7 years (SD= 2.67) with age range 18 to 29 years (Lohani et al., 2013) and another study among Brazilian sample has the mean age, 24.2 (SD=7.8) (Lasaitis et al., 2008). The average of mean age among all of the studies as mentioned above was slightly same meaning the subjects was recruited among young generation.

Conclusion

Rating of the arousal domain of normative affective pictures from IAPS with Malaysian population was conducted to develop an additional set of affective picture database with Malaysian population; this research was done among students (age $19.2 \text{ y} \pm 1.68$) samples. Majority of subjects were female (64%) and Malay race (86%). The SAM was distributed to collect the affective rating of each IAPS and different high arousal pictures according to methods described. Finally 72 demonstrative sample of the students were the respondents and statistical analysis showed that the overall mean differences among all low arousal IAPS pictures (4.67 ± 0.62) and all high arousal pictures (5.06 ± 0.54) are highly significant ($p < 0.001$) in Malaysian population. In contrast to the comparison with normative rating from North American samples in which Malaysian population showed higher values of arousal elements (4.67 ± 0.62) compared to North American population (2.78 ± 0.41) with a significant correlation ($r = 0.254$, $p = 0.021$).

Malaysian cultures are different from western culture. Besides, there may be cultural differences to some categories of images; for instance, people face (such as; medical worker, woman, secretary, man) that more western context that are not familiar among Malaysian subjects.

Based on the findings of the study and the conclusions, several recommendations were made in order to improve the rating study in terms of the sample size for the further research

to obtain accurate measurement in data analysis. Besides, futures studies can be developed regarding the rating of affective pictures by choosing the other elements/domain of SAM which is Valence/ Pleasure and Dominance/Control elements.

In a nutshell, these findings documented that the affective pictures of arousal elements were different with the affective ratings of IAPS pictures among Malaysian population. The results also highlighted that the SAM is capable for rating the affective pictures with Malaysian population.

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