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The use of the International Affective Picture System for the study of affective dysregulation in mental disorders

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Introduction. The International Affective Picture System (IAPS) uses a series of emotional, normative and internationally accessible pictorial stimuli and is considered to be the most reliable and valid system in the experimental study of emotions. The IAPS has been used in research on mental disorders such as schizophrenia, major depression, anxiety or psychopathic personality traits. Furthermore, it is frequently used as independent variable in neuroimaging studies. Some of the approaches to borderline personality disorder consider that the fundamental psychopathological element in these subjects is affective dysregulation, from which the principal symptoms such as intolerance to frustration, reactivity or dysphoria are derived. This review paper has aimed to gather and analyze the information on the study of emotional regulation and the use of the IAPS in the different mental disorders.

Methods. A review is made of the different data bases of the studies published in the general population and in the clinical populations as well as of the internal characteristics of the test.

Results. In agreement with the results described in the studies reviewed, the IAPS seems capable of defining specific responses to stimuli in different mental disorders, including mood disorders and schizophrenia.

Conclusions. In conclusion, the use of the IAPS in the study of borderline personality disorder could be of interest for the understanding and treatment of borderline personality disorder in which emotional dysregulation is a principal factor.

Key words:

International Affective Picture System. Borderline personality disorder. Affective dysregulation.

Actas Esp Psiquiatr 2008;36(3):177-182

Aplicaciones del *International Affective Picture System* en el estudio de la regulación emocional en los trastornos mentales

Introducción. El *International Affective Picture System* (IAPS)¹ cuenta con una serie de estímulos pictóricos emocionales, normativos e internacionalmente accesibles y está considerado el sistema más fiable y válido para el estudio experimental de las emociones. El IAPS se ha utilizado en la investigación sobre trastornos mentales como esquizofrenia, depresión mayor, ansiedad o rasgos psicopáticos de la personalidad. Asimismo es frecuente su uso como variable independiente en estudios de neuroimagen. Algunas de las aproximaciones al trastorno límite de la personalidad consideran que el elemento psicopatológico fundamental en estos sujetos es la disregulación afectiva, de la que se derivarían síntomas principales, tales como la intolerancia a la frustración, la reactividad o la disforia. El objetivo de este trabajo de revisión es reunir y analizar la información sobre el estudio de la regulación emocional y del uso del IAPS en los distintos trastornos mentales.

Métodos. Se realiza una revisión en las distintas bases de datos de los estudios publicados en población general y en poblaciones clínicas, así como de las características internas del test.

Resultados. De acuerdo a los resultados descritos en los estudios revisados el IAPS parece capaz de delimitar patrones específicos de respuesta emocional a estímulos en distintos trastornos mentales, incluyendo los trastornos del estado de ánimo y la esquizofrenia.

Conclusiones. El uso del IAPS en el estudio del trastorno límite de la personalidad podría ser de interés para la comprensión y el tratamiento de los trastornos límite de la personalidad en los que la disregulación emocional es un factor principal.

Palabras clave:

International Affective Picture System. Trastorno límite de la personalidad. Disregulación afectiva.

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INTRODUCTION

Investigators have been trying to experimentally study emotions for more than one century. However, there are

few sufficiently objective, valid and reliable methods for this purpose. On the other hand, due to the diversity of the procedures used, it is very difficult to compare the results of the different studies. The International Affective Picture System (IAPS)^{1,2} was designed in order to provide a combination of emotional, normative and internationally accessible pictorial elements to be used in the research that would allow for better experimental control in the selection of stimuli and better comparison and replication of the results of the different studies.

The IAPS fulfills the necessary requirements proposed for any emotional state induction method in the laboratory³. It is based on a theory that guides its construction (Lang's bioinformational model); it has objective, controllable and calibrated stimuli with known effect on each one of the three components of emotional response. It is relatively free of «demand effect» (according to which the experimental subjects tend to confirm the researcher's hypothesis). It is ethical, rapid to administer and has ecological validity⁴. This makes it a more useful, reliable and valid instrument for the experimental study of emotions.

The IAPS includes a series of photographs on daily life objects, violent scenes and scenes on sex or affectivity or faces. In the theory supported by the IAPS, it is assumed that the emotional states may be elicited both through real life events and by images. In fact, some studies have demonstrated that the affective pictorial information may match the stimulating properties of real situations, giving rise in the same way to the activation of cognitive-perceptual representations associated with emotional responses⁵. Previous laboratory research generally used aversive stimuli (for example noises or cramps) that cause primary reactions of orientation, startle or defense. On the contrary, the images making up the IAPS are in complex, symbolic stimuli that require some previous learning and cognitive elaboration for their emotional coding. Furthermore, they cover a wide range of affective states and represent cultural and social values, acting as potent generators of emotions⁶.

In order to measure emotional responses to the IAPS pictographic stimuli, a system called Self Assessment Manikin (SAM), developed by Lang⁷ is used. In this system, the subject scores each image in three dimensions: valence or pleasure, activation or arousal and dominance or control. Thus, a dimensional approach is assumed, according to which any emotion is made up of different values in certain basic dimensions. The affective valence, whose range goes from the most pleasant pole to the most unpleasant one, is related with the basic motivating systems: appetizing and aversive, and represents the value given to the experience. Activation or arousal is the intensity of the affective response, going from calm to excitation. Dominance refers to the interactive dimension between the one who perceives and that perceived, and represents the control level on the emotion experienced (from no control to absolute control).

The SAM format is graphic picture. This makes it possible to use it in persons having linguistic difficulties. It is made up of three groups of pictograms with the human figure, one for each stimulus presented. Each group has five drawings and four spaces between them. This allows the subject to move within a range of 9 points per dimension. The picture format makes it intuitive and universally understandable, since the drawings represent expressions and characteristics in accordance with that which is going to be evaluated. Thus, the drawings go from a smiling figure to one with an unhappy expression for the valence dimension. For the activation dimension, the group of pictograms ranges from a trembling figure to another one whose eyes are shut and who is drowsy. For the dominance dimension, the group goes from a very little man to a very big one, indicating the level of sensation of emotional control that the subject has toward the stimulus. There are normative data for men, women and children¹ and a version for the Spanish population⁴.

Furthermore, when it is used in addition to SAM, or as its complement, the emotional response induced by the IAPS stimuli can be evaluated with psychophysiological measures such as heart rate, conditioning force according to the Rescorla-Wagner rule, startle blink reflex, corrugator muscle activity, cardiac defense response or skin conductance response and with other self-reports and with the registry of activation of brain areas involved in emotion by different neuroimaging techniques.

THE IAPS IN STUDIES ON MENTAL DISORDERS

The alteration of any emotional aspect is a common characteristic in most mental disorders. Since the IAPS is the best instrument to induce and measure emotions in the laboratory, it is applied with increasing frequency in studies with clinical populations suffering different psychiatric diseases. In addition, it can be used to study the interaction of the emotions with other cognitive aspects or relevant behaviors ones to understand the different disorders and it is frequently used as an independent variable in neuroimaging studies aimed at investigating biological bases of the different diseases.

Schizophrenia

The emotional processing study is especially relevant in schizophrenia since many of its principal symptoms are affective ones. Although there is much literature regarding the emotional aspects of this disorder, the advantage of the studies we review in the following is that they used the IAPS as a measure of emotional response, thus making them universally comparable and replicable.

The nature of social anhedonia in subjects at risk of developing a psychotic spectrum disorder was studied in a

pioneer study with this test⁸, using images with interpersonal content from the IAPS as a stimulus. While the subjects observed the images, they underwent startle response tests with sounds. The physiological response to the stimuli was not differentiated in the individuals with social anhedonia. However, they showed significantly lower levels of positive affect and greater ones of negative affect in response to the emotional stimuli of IAPS.

Hempel, Tulen, van Beveren, van Steenis, Mulder and Hengeveld⁹ studied the psychophysiological response of the schizophrenic subjects to the emotional images, presenting IAPS stimuli and registering their valence and arousal scores as well as autonomic response such as heart rate, respiratory rate and skin conductance. The patients and controls were not differentiated in the subjective evaluations of the images, but the schizophrenics had a lower increase of the heart rate in response to pleasant images. This implies an altered psychophysiological response of these patients to positive emotions.

Sander, Koenig, Georgieff, Terra and Franck¹⁰ conducted a very complete study on emotional processing in schizophrenic subjects and concluded that their possible social content is especially important in the evaluation of these patients of the pleasure or displeasure produced by positive and negative images. That is, schizophrenic patients show a deficit in the evaluation of displeasure caused by negative stimuli only when these also have social content and in the evaluation of pleasure induced by positive stimuli viewing only when these have no social content.

Cognitive deterioration is frequent in this disease, so that the IAPS can be used to study emotional memory of patients with schizophrenia. In an interesting study with monozygotic twins discordant for schizophrenia¹¹, different neuroanatomic correlates were observed in the coding and recovery of emotional stimuli. This, according to the authors of the study, supports the hypothesis about the existence of cognitive markers of the genetic component of schizophrenia. More recently, another group¹² studied the influence of emotion in episodic and autobiographical memory in patients with schizophrenia and observed that these subjects remember images with negative valence (unpleasant) from the IAPS less than the control group and that they are less capable than the control subjects of recalling autobiographical memory associated to them. Furthermore, they have a lower grade of auto-noetic awareness, that is, less awareness of memory of emotional events from their own experience.

Due to its simple application and format, the IAPS is especially useful in neuroimaging studies. In a study with Functional Magnetic Resonance Imaging, Fahim, Stip, Mancini-Marie, Boualem, Malaspina and Beauregard¹³ compared schizophrenics with and without emotional blunting to study the cerebral bases of emotional resonance of these groups of patients. The patients with emotional blunting did not show a significant activation of the prefrontal cor-

tex while the subjects without this symptom did. The emotional resonance, caused by viewing negative images of the IAPS, is, according to these authors, due to the activity of the mirror neurons that provoke negative feelings through an experiential mechanism. The deficit observed in the schizophrenics with emotional blunting is due to a failure or distortion in the development of the mirror neuron system, probably due to genetic causes. These same authors¹⁴ compared two groups of schizophrenic patients with and without a background of substance abuse and observed that viewing the unpleasant images in the IAPS provoked greater subjective reactions of displeasure in the patients with substance abuse. Furthermore, neurally, this group showed greater brain activation of the bilateral medial prefrontal area, right orbitofrontal cortex area and left amygdala in response to these images. In the group with pre-morbid substance abuse, prefrontal cortex functioning was preserved to a greater degree, which means a deficit in patients with marked negative symptoms.

The facial expression of emotions and the hypomimia characteristic of some schizophrenic patients have also been studied. Wolf, Köppel, Mass and Naber¹⁵ compared the facial responses of schizophrenic subjects and controls while they observed images having erotic content from the IAPS, revealing that less emotional facial expression were recorded in subjects with schizophrenia during the electromyograph when they viewed pleasant images. This is interpreted as the mimic disintegration hypothesized in these patients. After, this group¹⁶ used the electromyograph to study emotional facial expression of schizophrenic subjects. They observed that the expression of joy (for example, a smile) was less in these subjects and that this mimic expression deficit also correlated with the presence of depressive symptoms and a lower number of positive symptoms.

Major depression

As occurs in the studies with schizophrenia, one of the principal applications of IAPS is its use as an independent variable in neuroimaging studies. It has been used in depression to study the brain processing characteristics of emotional stimuli. Thus, two recent studies, using IAPS images^{17,18}, have shown the existence of a special pattern of brain activation in depressive subjects during exposure to emotional images that would involve areas such as the prefrontal cortex, anterior cingulate and amygdala.

Psychophysiological measures of emotional responses have also been studied in the IAPS. Allen, Trinder and Brennan¹⁹ observed the startle response of depressive and control subjects during the presentation of emotional stimuli from the IAPS. In the control group, the startle response (blinking) had a significantly greater duration during viewing of unpleasant stimuli than during viewing of positive or neutral stimuli, an effect that was not observed in depressive patients. The subgroup of patients with severe

depression also shows an increase in the startle response during positive stimuli. This suggests that this group responds to pleasant stimuli as if they were aversive, possible because they are interpreted as reinforcer stimuli in which it was anticipated that achieving them would be unlikely.

Anxiety disorders

Even though the IAPS may be useful to induce anxiety responses in the laboratory²⁰, its use with anxiety disorders has been very limited. However, its stimuli have been useful in neuroimaging studies to demonstrate specific patterns of activation in subjects with high anxiety trait to threatening stimuli²¹ and in subjects with obsessive-compulsive disorder exposed to disgust inducers²².

Psychopathic personality traits

In the personality with psychopathic traits, a main characteristic is the relative difficulty to experience certain emotions. The IAPS is a very adequate instrument to observe up to what point this deficit may influence the emotion-cognition relationship. Thus, Mitchell, Richell, Leonard and Blair²³ demonstrated that subjects with psychopathic personality traits perform better than the control subjects in operant conditioning tasks since their execution, put into practice as reaction time, is not interfered with by the appearance of positive and negative valence images from the IAPS during the test performance. In a similar study²⁴, using a sequence repetition task, other authors observed an atypical activation of the amygdala and prefrontal regions in the functional magnetic resonance imaging parallel to the appearance of positive and negative IAPS stimuli during the cognitive task.

The IAPS stimuli have also been used in children to measure their subjective emotional reactivity to emotional images. Sharp, van Goozen and Goodyer²⁵ found that children with dissocial traits scored the unpleasant images with a lower grade of arousal and the pleasant ones with a higher grade of arousal.

APPLICABILITY OF IAPS IN BORDERLINE PERSONALITY DISORDER

The definition of borderline personality disorder (BPD) that appears in the last edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM IV TR)*²⁶ indicates that persons diagnosed of BPD show «a general pattern of instability of interpersonal relationships, self-image and affects, and marked impulsivity.» This pattern beings «at early adulthood» and may be observed in «a variety of contexts.»²⁶ This instability and impulsivity are manifested in these patients as «frantic efforts to avoid real or imagined abandonment», «unstable and intense personal relationships», «markedly and persistently unstable self-image or sense of self», «impulsivity in potentially self-damaging areas» such as sex and spending money «recurrent suicidal threats and attempts», «self-mutilating behavior», «marked reactivity of mood», «chronic feelings of emptiness» or «inappropriate intense anger». Furthermore, the BPD subject may develop a «transient paranoid ideation during periods of extreme stress or dissociative symptoms»²⁶.

The DSM definition of personality disorders is based on a categorical, statistical and clinical model that involves elaboration of the diagnostic groups by consensus, which would be the result of a sum of criteria. This perspective positions the personal disorders, as phenomenological entities, to basic problems of internal and external²⁷. Thus, and in spite of the utility of the categorical classification as clinical tool, the most fruitful and complete approaches in research are those that study the personality disorders based on dimensional models which also permit a biological approach to them in greater degree²⁷.

Specifically, one of the most useful proposals to study the BPD is that of Siever and Davis²⁸ who formulated a dimensional model of pathological personality based on clinical observation and biological research. These authors propose four psychobiological dimensions: cognitive-perceptive organization, affective regulation, impulse control, and anxiety. The discreet symptoms that would give rise to axis I disorder appear on one extreme of these dimensions while the alterations of one or more of these dimensions that would give rise to a generalized behavior pattern that would make up the axis II disorder appear on the other extreme.

According to this model, the subject with BPD would show serious alterations in several of these dimensions such as impulse control and anxiety, but the fundamental pathology would be found in affect regulation, more mildly altered in the Axis I mood disorders. Thus, in the behavior of the borderline patients, the fundamental characteristic would be instability or affective dysregulation, defined as a predisposition to rapid and marked mood changes and extreme sensitivity to events such as abandonment, criticism or frustration that would produce a less pronounced response in other individuals. As the development of the representation of ones-self or of the others may be influence by the affective state, affective instability may prevention the establishment of stable self-esteem in these individuals²⁸.

This model is supported by some authors²⁷ who state that the principal symptoms of subjects with BPD such as dysphoria, high reactivity, irritability or intolerance to frustration are consequences of this affective instability. In fact, authors, such as Klein²⁹, Akiskal³⁰ and Stone³¹ have already proposed that the basic psychopathology of this disorder involves the same emotional regularity problems as those observed in persons with affective disorders (such as de-

pression or bipolar II disorder) and cognitive-behavioral orientation therapists such as Linehan consider that the affective unbalance is the essential element of the borderline psychopathology, so that the behavioral symptoms are a consequence of the intense emotional reactions³².

In agreement with this idea of the BPD as a condition derived from emotional or affective dysregulation, research on emotions in borderline patients is profiled as a very promising field. Given that the IAPS is the best instrument available for the study of emotions, it is surprising that there are currently no studies that use this test in this type of patient. It could be hypothesized that when BPD subjects are faced with emotional stimuli, their response pattern will be different from that of the healthy subjects and other diagnostic groups in the dimensions of valence, arousal and control measured with the SAM. The analysis of the responses of these patients could help to understand which dimensions of the emotion are altered most, making up the base of affective instability. This could be useful to improve the psychotherapy approach to these patients. Furthermore, the emotional stimuli of the IAPS could help in the investigation of the biological bases of the affective dysregulation in neuroimaging studies, contributing to the improvement of drug treatment in these patients.

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