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Cognitive-behavioral therapy for the treatment of cocaine dependence

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The past two decades have been characterized by marked progress in the development of effective cognitive-behavioral therapies for cocaine dependence, for which no generally effective pharmacotherapies have been identified. The increasing literature on the efficacy of several types of cognitive-behavioral therapies (community reinforcement approach plus vouchers, cue exposure treatment, relapse prevention therapy and motivational interviewing) for cocaine use disorders is reviewed, followed by discussion of a number of issues that arise when integrating these cognitive-behavioral interventions into clinical practice. Overall, this review describes a vigorous area of research that has much to contribute to the treatment of cocaine use disorders.

Key words:
Cocaine dependence. Cognitive-behavioral therapy. Evidence-based psychological treatments. Narrative review.

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Técnicas de intervención cognitivo-conductuales para el tratamiento de la dependencia de la cocaína

Las dos últimas décadas se han caracterizado por un notable avance en el desarrollo de terapias cognitivo-conductuales efectivas para la dependencia de cocaína, trastorno para el cual aún no se han identificado tratamientos farmacológicos efectivos. Se revisa la creciente literatura sobre la eficacia de diferentes tipos de técnicas cognitivo-conductuales para el tratamiento de los trastornos por uso de cocaína (la integración del abordaje de refuerzo comunitario y las técnicas de manejo de contingencias, el tratamiento de exposición a estímulos, las técnicas de prevención de recaídas y la entrevista motivacional) y se comentan algunos de los desafíos y dificultades que surgen al transferir a la práctica clínica dichas intervenciones cognitivo-conductuales. En conjunto, la presente revisión describe un área pujante de investigación que todavía tiene mucho que aportar al tratamiento de los trastornos por uso de cocaína.

Palabras clave:
Dependencia de la cocaína. Terapia cognitivo-conductual. Tratamientos psicológicos basados en la evidencia. Revisión narrativa.

INTRODUCTION

The increasing prevalence of cocaine dependence disorder has stimulated the theoretical development and putting into practice of different therapeutic strategies having a psychological character. Most are contributions of intervention models or techniques used in the treatment of other chemical or behavioral addictions.

In spite of the variety of psychotherapeutic approaches existing for the treatment of cocaine dependence disorder, whether as an out-patient or in hospital regimen (hospital site or therapeutic community), individual or group, not only the number of control studies that evaluated the effectiveness of these intervention procedures were surprisingly limited up to the beginning of the 1990's but also even the number of studies that contributed data regarding the treatment results. The investigations of the Stephen T. Higgins group in the University of Vermont[1-4], of Anna R. Childress in the University of Pennsylvania[5-9] and of Kathleen M. Carroll in the University of Yale[10-13] are, up to now, the most outstanding exceptions to this non-evaluating tendency that seemed to predominate in the case of cocaine dependence treatment. These exceptions mostly come from, as can be verified in the following and in previous reviews[14-18], the behavioral therapy model or, more generically, from the cognitive-behavioral model of intervention in the scope of addictive behaviors. Thus, this present article narratively reviews the increasing literature on the efficacy of different types of cognitive-behavioral techniques in the treatment of cocaine use disorders.

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TECHNIQUES BASED ON OPERANT CONDITIONING

In the framework of behavioral approach of the cocaine dependence disorder, consumption of this substance may be conceptualized, following the paradigm of instrumental learning, as an operant behavior, that is as a reinforced or maintained behavior due to its consequences, when the cocaine acts - as the other psychoactive substances that can be abused - as a powerful reinforcer. Following these principles, the Higgins group[1-4,19] has developed and evaluated an out-patient program for cocaine dependent subjects. They integrate specific techniques of contingency management (obtaining vouchers exchangeable for reinforcers, when there are negative urine controls to cocaine) and the Community Reinforcement Approach (CRA), a wide spectrum behavioral approach that uses family, social, recreational and work reinforcers to facilitate the development of a drug free life style, originally developed by the Azrin group for the treatment of alcoholism[20-23]. The underlying logic to the integration of both procedures is the initial achievement of cocaine abstinence (by contingency management techniques) and the obtaining of significant changes in the style of life (by CRA). The objective is that when «artificial» contingencies are eliminated, the new behaviors can be maintained beyond the treatment period in the patient scope by «natural» contingencies and reinforcements[1].

In order to evaluate effectiveness of this behavioral approach, the Higgins group initially performed a pilot study[4] and two controlled studies[2,3]. Their findings confirm the utility of this approach on demonstrating both significantly superior results to those obtained by 12 step treatment[4] or counseling regarding addiction following the conceptualization of this disorder and of its recovery based on the disease model[3], as well as the superior efficacy of the joint approach (contingency management techniques and CRA) in relationship to CRA alone[2]. The design and result of this last controlled study are described in greater detail in the following.

Forty subjects who fulfill cocaine dependence disorder criteria (DSM-III-R) were randomly assigned to one of the two following treatment conditions: behavioral treatment (CRA) with or without contingency management techniques. Previously to such assignment, the patients were stratified by gender, availability of a significant person who could collaborate in the treatment, existence of pending lawsuits and work activity, consumption route, and score on the scale of psychiatric status of the structured interview Addiction Severity Index (ASI) with the objective of homogenizing both groups.

Duration of the treatment was 24 weeks for both groups, the initial 12 weeks being the main treatment period and the following ones a post-care period. Behavioral approach (CRA) was implemented for both groups in two times a week one hour long sessions for the first 12 weeks and once a week for the last 12 weeks. The sessions focused on the following four scopes: *a)* those patients with a non-consuming partner, family member or friend who could collaborate in the treatment were instructed, together with the person involved, in the negotiation of positive changes in their interpersonal relationship; *b)* identification and recognition of the background and consequences of the cocaine consumption with the double objective of finding alternatives to the positive consequences associated to consumption and make the negative consequences of this consumption explicit, and training in specific strategies (assertiveness, problem solving, among others); *c)* work, study and financial counseling and legal and social services based on the patient's need, and *d)* development of new recreational activities (or previous to consumption).

Contingency management techniques essentially consist in giving vouchers in which the points are written down (equivalent to dollars but exchangeable for objects or activities of that value) that have been obtained based on cocaine negative urine controls (four times a weeks the first 12 and twice a week each following week). The patients, and the person involved in the treatment, were informed of the urinalysis results immediately after it was done. The first negative urinalysis was equivalent to 10 points (and each point to 0.25 dollars). The value of each one of the following negative urinalyses increased by 5 in 5 points and, to increase the likelihood of maintained abstinence, for every three consecutive urinanalyses, 10 extra dollars were obtained. The positive results or lack of attendance to the control relocated the negative urinalysis value at its initial value, while the achievement of five consecutive negative urinalysis (after the last positive) made it possible to relocate the equivalence of the negative urinalysis in the value prior to the first positive one. The points could not be withdrawn once obtained. The patients and their therapists jointly decided the objects or activities that would be exchanged for the points, it always being a team member who acquired these objects or services (educational material, fishing license, among others). Patients not assigned to this treatment condition also received a card, but without monetary value, with the urinalysis result. After week number 13 and until week 24, all the urinalyses were dealt with in the same way in both treatment groups: both received a lottery ticket equivalent to one dollar.

The patient group treated with contingency management techniques in addition to CRA approach completed the 24 weeks of treatment in a significantly greater proportion than the group only treated with CRA (75% vs 40%). Equally, mean duration of uninterrupted cocaine abstinence time was statistically greater in the group treated with contingency management techniques (11.7 *vs* 6 weeks). At 24 weeks of intervention, the group treated with contingency management techniques showed a significantly greater improvement on the ASI drug consumption scale regarding the group only treated with CRA and it was the only group that had a significant improvement on the psychiatric state scale of the same structured interview.

The results obtained show how the contingent administration of incentives when there was negative urinanalysis significantly improved the therapeutic result in cocaine dependent patients in out-patient treatment having behavioral orientation (CRA), a consistent conclusion over multiple subsequent studies (see Higgins et al.[24-28], for a review). In addition, the effectiveness of this intervention is maintained at one year[29,30] and partially at 2 years[31] of having initiated treatment. It also can be generalized to the scope of methadone maintenance programs[32-34] and to patients with double diagnosis of schizophrenia and cocaine dependence[35].

A recent synthesis by metaanalysis on the effectiveness of treatment with contingency management techniques in addition to community reinforcement approach (CRA) on cocaine dependence has demonstrated a solid level of evidence and consistent superiority of this joint treatment over CRA without contingency management techniques[36].

EXPOSURE TECHNIQUES CUE

Cure exposure techniques are found in an experimental study phase, their real therapeutic efficacy in the setting of cocaine dependence not yet being totally defined. The study of these techniques began based on the interest to examine and define the role played by conditioned responses in the process of relapse of abstinent cocaine addicts[6]. From that time, the existence of an increase in physiological activation (increase of the heart rate and decrease of peripheral temperature and galvanic resistance of the skin) and levels of craving have been demonstrated in face of cues generally associated with cocaine consumption[6]. These cues are called, within the classical conditioning paradigm, conditioned cues.

The existence of this type of cue and their capacity to precipitate conditioned responses of *craving* and changes in physiological activation has been demonstrated in the cocaine dependence setting in different studies (see[5,8,37-39], for a review). The conclusions of the Childress et al. review[5] are illustrative in this regards. In relationship to the physiological responses, detoxicated cocaine addicts have a significantly greater reactivity (increase of heart rate and decrease of temperature and galvanic resistance of the skin) to cues related with cocaine consumption compared to that presented to neutral cues. This reactivity is attributable to the history of cocaine consumption since it has elevated specificity: cocaine addicts who have followed 30 day treatment have the same responses while this reactivity does not arise in the case of non-consuming subjects or in the case of detoxicated cocaine addicts in the presence of heroin consumption related cues. In relationship to the subjective responses, the increase of cocaine *craving* levels is clearly the most consistent and common response, and is relatively infrequently accompanied by mimetic symptoms or similar ones to the effects of cocaine consumption *(high)* and very rarely by *crash* or abstinence symptoms. However, physiological reactivity to cues related with cocaine consumption cannot be easily associated with a unitary state of *craving, high* or withdrawal[40]. Furthermore, both the physiological and self-reported responses are not related with the previous mood state nor with recent cocaine consumption[41] and do not show differences between genders[42].

Based on these results and following the therapeutic principles based on classic conditioning, the Childress group suggested the hypothesis that the continued presentation of these conditioned cues to the addict person, this person not being able to carry out the consumption behavior, would generate a decrease in the cognitive and physiological conditioned responses of craving through the extinction process. This procedure receives the name of passive techniques of cue exposure and is generally combined with other standardized psychosocial interventions[5]. The design and results of the only controlled study done up to now to evaluate the effectiveness of the cocaine addict cue exposure techniques are presented in the following[5,7,8].

Thirty seven subjects who had a cocaine dependence disorder, with an abstinence period ranging from 7 to 10 days, were randomly assigned to one of the four following treatment conditions: *a)* support psychotherapy + extinction (SP-E); *b)* support psychotherapy + activities to compensate extra attention received by the patients assigned to extinction condition (SP-C); *c)* counseling on addiction + extinction C-E), and *d)* counseling regarding addiction + activities to compensate the extra attention received by the patients assigned to the extinction condition (C-C). The activities to compensate the extra attention received by the patients assigned to the extinction condition consisted in sessions (with a duration equivalent to the extinction sessions) of self-help videos that presented suggestions to develop a healthier style of life or more satisfactory interpersonal relationships, among other subjects. The four treatment conditions were divided into two phases: an initial one in hospitalization regimen lasting two weeks (patients assigned to extinction condition received a daily session of exposure to conditioned cues to cocaine consumption, while the psychotherapy or counseling sessions took place three times a week), followed by a two month period in out-patient regimen (with a weekly session of extinction or control activities, and psychotherapy or counseling, according to the treatment condition).

Each extinction session consisted of three five minute sessions in which conditioned cues to cocaine consumption were presented auditively, after five minute exposures to a video with scenes related to cocaine consumption, and three simulated rituals of cocaine self-administration. Thus, during each session, the different cues that made up acquiring, preparation and administration of cocaine are presented in a hierarchical way through audio, video and ending with the practice of the preparation ritual of cocaine self-administration with the instruments generally used for its

consumption, repeating the sequence three times in each session. This procedure provides nine cue exposures related with cocaine consumption per session, and a total of 135 exposures during the fifteen session. Clearly, the cues used in each session were adapted to the cocaine administration route used by each patient.

The results of the controlled study of the Childress group show a statistically significant reduction of the three subjective responses evaluated *(craving,* mimetic symptoms or those similar to the effects of cocaine consumption *[high],* and crash or withdrawal symptoms), obtaining a practically total decrease of these responses, more gradual decrease in the case of *craving* levels, but faster in the case of the other two variables as values are obtained closer to the total extinction after the sixth session. In relationship with the physiological variables evaluated, both the temperature and the galvanic resistance of the skin also had a statistically significant variation during the exposure sessions. However, physiological reactivity indexes to the cues persist after the fifteenth exposure session.

Regarding the two month out-patient treatment period after the admission regimen, both groups treated with exposure techniques had a significantly greater retention rate and statistically greater number of negative urine controls than the two other groups. However, the patients treated with exposure techniques reported that they continued to experience elevated levels of *craving* with conditioned cues that cannot be easily simulated in hospitalization regimen in the paradigm of passive exposure to cues. The Childress group concluded that the generalization of the extinction to cues of the «real world» is incomplete[5].

A possible alternative to try to improve the generalization of extinction of a controlled setting to the street is the use of more real cues (for example, real cocaine), and contexts (for example, repeated in vivo exposures)[5,7,8]. A second alternative, active exposure techniques, entails the parallel practice of other techniques to counteract or reduce conditioned activation and craving, covert aversion, development of alternative and incompatible behaviors, or other cognitive techniques[5,7,8,43].

However, at present, there are no controlled studies that evaluate effectiveness of these alternatives to increase the effectiveness of cue exposure techniques in the cocaine dependence setting, although there are preliminary data that seem to suggest the clinical utility of the active exposure techniques[44] and even their superiority regarding passive exposure techniques[9].

RELAPSE PREVENTION TECHNIQUES

Treatment of relapse prevention developed by the Carroll group[10,12,13,45] is an adaptation for cocaine addict patients of the principles and strategies developed and described by Marlatt and Gordon[46] in their already classic work *Relapse prevention: maintenance strategies in the treatment of addictive behaviors.* The adaptation made by the Carroll group aims to convert the originally psychoeducative approach of Marlatt into a psychotherapeutic approach in order to increase its effectiveness in the treatment of cocaine addicts[13].

Although relapse presentation is generally considered as an intervention focused on facilitation of long term maintenance of abstinence, the adaptation made by the Carroll group faithfully follows the original work of Marlatt and also stresses the initial phase of abstinence and its short and middle term maintenance.

As Carroll states[10], her approach presents the principles of gradual relapse prevention, adapting the selection and timing of the interventions to the present situation of each addict in his change process. In the case of patients with an elevated level of ambivalence regarding giving up cocaine consumption, optimization and strengthening of commitment techniques regarding achieving abstinence are used (for example, decision matrix). When the decision to stop consumption is firm, techniques that facilitate the achievement of abstinence are applied (for example, training in strategies to face high risk situations). After a relatively stable period of abstinence, interventions that facilitate prevention of long term relapses are stressed (for example, change of life style).

Carroll et al.[10,13] present a short description of the techniques they use most frequently with cocaine addicts. All these techniques are widely developed and described by Marlatt and Gordon[46]. They stress some special factor to be considered in the treatment of cocaine dependence. These techniques are focused on the following sections:

- Approach to ambivalence.
- Reduction of cocaine availability.
- Situations of risk and coping strategies.
- Conditioned cues and *craving.*
- Apparently irrelevant decisions.
- Modification of life style.
- Effect of abstinence violation.

Carroll et al.[12] evaluated the effectiveness of their relapse prevention approach in a controlled trial whose study protocol deserves to be stressed for its exceptional methodological correction. It should also serve as a reference point for future investigations whose objective is to compare the effectiveness of two psychotherapeutic interventions in the addictive behavior setting. This trial is described in the following.

Forty two out-patients who fulfilled diagnostic criteria of cocaine abuse disorder (DSM-III) were randomly assigned to relapse prevention (RP) or interpersonal psychotherapy

(IP), a psychodynamic approach, for 12 weeks based on one weekly, one hour long session. Subjects treated with RP had superior likelihood of finishing the treatment period (67% *vs* 38%), of achieving three or more weeks of uninterrupted abstinence (57% *vs* 33%), of being classified as recovered at the end of the treatment (43% *vs* 19%). Although these differences do not reach statistical significance, there were statistically significant differences between the two treatment conditions when the subjects were stratified based on pretreatment scores on the ASI scales. Among the consumers with a greater cocaine consumption severity index (drug consumption scale), those subjects treated with RP had a significantly greater likelihood of achieving three or more weeks of uninterrupted abstinence (54% *vs* 9%) and of being classified as recovered at the end of the treatment (54% *vs* 0%) than consumers treated with IP. In the case of subjects with low cocaine consumption severity, the results were similar for both types of treatment. When the subjects were stratified based on psychopathological severity (psychiatric state scale of the ASI), a similar pattern of results was reproduced. The group with greater psychopathological severity treated with RP had a significantly greater likelihood of achieving three or more weeks of maintained abstinence (58% *vs* 14%).

The principal conclusions of the Carroll et al. study[12] is that at least a certain group of subjects who fulfill cocaine abuse disorder criteria may be treated as out-patients with psychological intervention techniques. Furthermore, response to this treatment is influenced by the psychopathological characteristics of cocaine consumers and the severity of this consumption. The RP techniques obtained superior results to the IP in the case of psychopathologically more serious patients and/or those with an elevated consumption severity index.

Subsequent works of the Carroll group have thoroughly studied the effectiveness of the RP techniques, confirming both the relationship between response to treatment with RP and cocaine consumption or psychopathological severity[47] and the superiority of this treatment over interpersonal psychotherapy[48]. In a one year follow-up study, they found that not only are the effects of treatment with RP maintained but also that there is even a «delayed effect» that the authors of the work themselves attribute to the subsequent implementation of the coping strategies acquired during the treatment period[49].

The relevance and empiric support of the relapse prevention approach in the treatment setting of cocaine dependence seems to thus be manifest (also see[50,51]). The only investigation that does not find statistically significant differences between the relapse prevention techniques and another type of non-pharmacological approach (12 step approach) is the Wells et al. study[52]. However, new controlled studies are needed to confirm the effectiveness of relapse prevention and, above all, consider its influence on the therapeutic result when dealing with integrated intervention programs in which the relapse prevention techniques are a central element of the treatment program, but not the only one.

MOTIVATIONAL INTERVIEWING

Motivational interviewing[53] is an approach of directive, non-confrontative communication and focused on the patient. Its objective is to facilitate and optimize attitude, willingness or motivation for change. Motivational interviewing is specifically designed for the examination and approach of ambivalence towards consumption of the psychoactive substance (abandoning vs maintenance) and the facilitation of the patient's progression during a motivational continuum. The five basic principles of motivational interviewing are: *a)* express empathy; *b)* help the patient perceive discrepancies in his/her own life; *c)* avoid argumentation and confrontation; *d)* roll with resistance, and *e)* support self-efficacy.

In spite of the contrasted evidence of the efficacy of the motivational interviewing in the approach to alcohol dependence, as an independent intervention or one forming part of an integrated program of cognitive-behavior treatment, the evidence of its effectiveness in the setting of approach to illegal psychoactive substance dependence is less important and can be considered as promising but not conclusive[54,55]. In fact, in the case of cocaine dependence or abuse, the heterogeneity of both the samples studied (e.g., cocaine consumers detected in the context of medical visits for other diseases *vs* cocaine dependent subjects under treatment for their addictive disorder) and the motivational interviewing format used (e.g., motivational interviewing *vs* different adaptations of this approach) could partially explain the lack of consistency of the results of the only four studies published up to date[56-59].

COROLLARY: COGNITIVE-BEHAVIOR THERAPY IN THE CLINICAL PRACTICE

Some of these techniques, in spite of their contrasted efficacy, are rarely used in the clinical practice for very different type reasons (ideological, economical and training, among others). The most paradigmatic case is that of the contingency management techniques. Implementation of contingency management programs, even those of low cost, is seriously limited outside the research setting because verification of abstinence requires a greater frequency of control of benzoylecgonine (cocaine metabolite) in urine than normal in most of the health care sites and the rarely available fastness in the retroaction of these results. Both these factors are essential to be able to contingently apply the reinforcers that strengthen this abstinence. Equally, the elevated cost of the incentives that the vouchers are exchanged for greatly limits its implementation in the clinical practice. However, at least in certain geographic settings,

being able to sustain these programs can be assured by original alternatives such as campaigns for request of community donations to maintain these programs[60].

In addition, in the clinical practice, the philosophy, style or spirit of the motivational interviewing is as or more important than its specific techniques, an empathic or egalitarian therapeutic style between patient and therapy being essential. Consequently, the theoretical orientation of the clinician and how he/she sees both the dependence of the psychoactive substance and its change process will play a facilitating role or, on the contrary, will be an obstacle for the practice of the motivational interviewing. Clinicians trained in the classical medical model of disease, who feel comfortable working under the prism of this model and/or who are used to the use of confrontation as a therapeutic technique may find serious difficulties in changing to a therapeutic style that specifically rejects the expression of direct disagreement and considers that the patients are free to choose to not modify their addictive behavior.

In relationship to the relapse prevention techniques, individual treatment seems to be the most optimal format to approach the individual needs of each patient. However, group therapy may favor better social support, provide opportunities for the practice of new skills and create a feeling of collective effort that may serve as stimulus for change. In fact, the group format is the most widely used for reasons that are essentially cost-effectiveness.

Beyond these considerations, as Schneider and Khantzian[61] state, any discussion on the psychotherapeutic approach of cocaine dependence (or of the other chemical or behavioral addictions) should consider the existence of a series of stages in the change process of this addictive behavior[62,67]. However, this variable (the stage of change that any cocaine addict may be found in the process of abandoning his/her addictive behavior) has only been implicitly considered in the development and application of some of the intervention techniques presented in the previous sections (the relapse prevention approach developed by the Carroll group seems to explicitly consider this variable in relationship to the timing of the different interventions, but does not specify the evaluation instruments or criteria used for its operativization). On rare occasions, it has been explicitly considered in the evaluation of the effectiveness of this intervention procedures, although it probably is a variable that influences the treatment response. That is what Margolin and Avants[68] suggest, for example, in the case of cue exposure techniques or that stated by Hettema et al.[55] in their systematic review on the effectiveness of the motivational interviewing. They even state that this technique could be contraindicated in the case of patients who are clearly motivated and prepared to abandon their addictive behavior.

In this sense, it is necessary to consider the variable stage of change when developing new techniques and, above all, integrated interview programs, and especially when trying to design studies in order to evaluate the effectiveness of these intervention procedures. In this way, it will probably be possible to optimize the matching process and consequently maximize the results of the therapeutic interventions in the cocaine dependence disorder setting.

In spite of the relatively short time since the initiation of the application of the cognitive-behavior model to analysis, evaluation and treatment of the cocaine dependence disorder, there are several and valuable contributions made. However, they are not essentially different from those made in the case of other psychoactive substance dependence disorders which, for different reasons, have appeared and have created socio-health care problems chronologically before the cocaine dependence in the Western countries.

However, an error is committed if influenced by a special orthodoxy, one considers that the cocaine dependence treatment can be solved based on the exclusive application of the cognitive-behavior model. The treatment of addictive behaviors and specifically that of cocaine dependence disorder is an area in which, given the multiple determining factors of the addictive behavior itself and the different variables involved in its change process, any attempt to find a reductionist solution (from a single prism, theoretical approach and even scientific discipline) is condemned to failure. In this sense, the progressive coming together between the two approaches that were originally antagonic such as cognitive-behavior therapy and biological psychiatry, is not strange at least to weigh the specific weight of each one of them, if not to achieve a joint and complementary intervention. The methodological contributions of the Carroll group[11,69-72] and their controlled studies regarding the effectiveness of the integration of both approaches[47-49,73-75], as well as the use of the paradigm of cue exposure to evaluate the effectiveness of different pharmacological treatments of cocaine dependence conducted by Margolin and Avants[68] and by the same Childress group[76] (see Modesto-Lowe and Kranzler[77] for a review) serve as examples. In addition, the growing number of studies that, eliciting conditioned responses of craving by cue exposure, use different functional neuroimaging techniques (PET, SPECT, fMRI) to try to define the functional neuroanatomy of conditioned craving of cocaine stand out[78-84].

It is within this line of overcoming false dichotomies, always under the unifying prism of scientific method, that the setting of the evaluation and treatment of the cocaine dependence disorder may reach its achievements since, as Massana[85] states «a biological psychiatry without behavioral science or systematic psychological observations not only is useless but even impossible.»

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