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Emotional intelligence, risk perception in abstinent cocaine dependent individuals

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Cocaine is now responsible for the second-highest number of cessation intervention requests. In this study we analyze the different skills of emotional intelligence in cocaine-dependent patients maintaining abstinence. The Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) and the Balloon Analogue Risk Task (BART) were administered to 50 subjects (25 individuals with no history of drug use and 25 individuals in treatment at the Addictive Behaviors Unit in a state of withdrawal at the time of evaluation). The results showed differences between these groups in overall emotional intelligence quotient, strategic emotional intelligence, understanding emotions and emotional management. Cocaine-addicted participants showed difficulties in analyzing complex emotions and regulating their emotional response, aspects that can interfere with interactions in daily life.

Keywords: Cocaine, Emotional intelligence, Drug abuse, Emotional competencies, Risk perception

Actas Esp Psiquiatr 2016;44(2):72-8

Inteligencia emocional y percepción de riesgo en consumidores de cocaína

La cocaína se ha convertido en la segunda droga por la que se solicita intervención para la deshabituación. En este estudio se analizan las distintas destrezas de inteligencia emocional en pacientes adictos a cocaína en periodo de abstinencia. Se administró el Test de Inteligencia Emocional de Mayer-Salovey-Caruso (MSCEIT) y una tarea computarizada de percepción de riesgo (BART) a 50 sujetos (25 individuos sin historia de consumo de drogas y 25 individuos en tratamiento en una Unidad de Conductas Adictivas, en estado de abstinencia en el momento de evaluación). Los resultados mostraron diferencias entre ambos grupos en el cociente global de inteligencia emocional, en la inteligencia emocional estratégica, comprensión emocional y manejo emocional. Los pacientes dependientes de cocaína mostraron dificultades para el análisis de emociones complejas y para regular su respuesta emocional, aspectos que pueden dificultar las interacciones en la vida diaria.

Palabras clave: Cocaína, Inteligencia emocional, Abuso de drogas, Competencias emocionales, Percepción de riesgo

INTRODUCTION

Cocaine is the second most used illegal drug in the European population and rates of use have been increasing over recent years.[1,2] In Spain one in every four treatment requests is related to cocaine abuse. Furthermore, among first-time clients cocaine is the principal reason for entering drug treatment[3]. Recent studies report cocaine-related difficulties in emotional intelligence (EI) and their relationship with stress and impulse control[4-6]. Two different approaches exist to EI: as an array of emotional processing skills or as a personality trait[7,8]. The four-branch model of emotional intelligence proposed by Salovey and Mayer describes four areas of capacities[8]: perceiving emotions, emotional facilitation, understanding emotions and emotional management. This approach defines perceiving emotions as the ability to perceive emotions in oneself and others. Emotional facilitation is the ability to generate, use and feel emotions as necessary to communicate feelings or employ them in cognitive processes. It allows us to shift our point of view depending on mood state, facilitating higher mental flexibility, creativity and problem solving. The third component of this model is understanding emotions, which is the ability to understand emotional information, how emotions combine and progress through interpersonal relationships and the ability to reason about emotional meanings. The last factor is emotional regulation or management, which is the ability to be

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open to feelings, to modulate and regulate them in oneself, to manage the way they are expressed, to feel or block emotions and to promote personal understanding and growth. Recent research has supports the use of performance and ability measures to assess EI[8-12]. In this way, importance is given to one's performance on a specific task rather than just a personality trait or one's perception of their own ability. In order to create a reliable and valid measure in accordance with the ability model of EI set forth by Mayer, Salovey and Caruso[8,10], a number of studies have been conducted to assess the impact of drug abuse on perceiving emotions[4,5]. The results demonstrate that negative emotion-driven impulsivity predicts substance dependence problems. Impulse control is a major factor underlying addictive disorders and may reflect difficulties in emotional understanding and management[13]. This emotional dysregulation can be especially affected in situations of stress which may impact on risk perception related to certain behaviors[6]. Furthermore, several studies have related addictive behavior with risk perception and reward seeking. One of the most commonly used tasks for measuring risk-taking behavior is the Balloon Analogue Risk Task (BART)[14,15]. Most of the previously mentioned studies use the BART as an experimental measure to analyze risk potential from different perspectives[14,16,17]. Several studies use the BART as an assessment instrument to relate risk perception with substance abuse. However, few studies use the BART to analyze the relationship with cocaine use[18]. Excepting the study by Fox et al.[6], previous works fundamentally focus on perceiving emotions, underlining lack of knowledge of differences in the processes of emotional facilitation, understanding and management. Similarly, there are few studies which use the BART with cocaine-abstinent patients and which attempt to verify whether risk-taking and reward-seeking behaviors continue after stopping drug use[18-22]. Consequently, our objectives are to analyze the relationship between cocaine use and emotional intelligence, risk perception and reward seeking.

METHODOLOGY

Participants

The sample comprised 50 participants, divided into two groups: 25 participants with no history of drug use and 25 maintaining cocaine abstinence. In accordance with the criteria of the DSM-IV-R, these were patients with a diagnosis of cocaine dependence in early full remission (F14.20). Furthermore, some participants in the second group also used other substances, mainly alcohol (F10.1), cannabis (F12.1), amphetamines (F15.1) and/or were pathological gamblers (F63.0).

Inclusion criteria for the abstinence group were: 1) being of legal age (≥18 years); 2) being cocaine-abstinent for a minimum of three months; 3) following weekly tests for drug use and yielding negative results; 4) Main diagnosis: cocaine dependence in early full remission (F14.20); 5) receiving treatment at an addictive behaviors unit. Occasional cannabis use during the assessment period was not considered an exclusion criteria.

The group with no history of drug use comprised participants meeting the following inclusion criteria: 1) being of legal age (≥18 years); 2) not suffering from any mental or neurological disorder; 3) no personal history of cocaine use; and 4) no history of treatment at an addictive behaviors unit.

Table 1 shows the characteristics of the sample.

Procedure

Assessment was conducted in two sessions, a first one-hour session and a second 25-minute session. The sampling was intentional and non-probabilistic. In order to form the group of abstinent cocaine users, participants were contacted through the psychology clinic of an addictive behaviors unit. Participants with no history of cocaine use were recruited by placing public notices in the Health Sciences Institute and in three educational institutions. In both cases, participation was voluntary.

Once participants were recruited, the first individual sessions were scheduled in accordance with the availability of participants and researchers.

All participants were informed of the characteristics of the study and compliance with data protection legislation. All participants gave their written consent.

Instruments

The instruments used in this study formed part of a broader neuropsychological assessment. The two instruments used to analyze the two main variables of this study are:

- *The Mayer-Salovey-Caruso Emotional Intelligence Test* (MSCEIT)[8]. This is an instrument measuring the general level of emotional intelligence. It can also be used from a clinical perspective to improve self-awareness and to determine areas in which we need to develop our emotional knowledge and the strategies required to do so[23]. It is suitable for people aged 17 and over and takes 30-45 minutes to complete. The Spanish version has a reliability of 0.95 in the total score, 0.93 in the experiential area and 0.90 in the strategic area. Furthermore, the scores obtained with the Spanish correction system correlate strongly with those obtained with the original system (r=0.99). The factor analyses

Table 1 Characteristics of sample study

	Group of cocaine-dependent individuals		Group of individuals with no history of drug use	
	Mean (±SD)	n (%)	Mean (±SD)	n (%)
Age	27 (6.04)		30 (5.70)	
Years of drug use	9.8 (4.20)		0	
Gender				
Women		8 (32%)		15 (60%)
Men		17 (68%)		10 (40%)
Educational level				
No qualifications		3 (12%)		0
Primary		14 (56%)		1 (4%)
Secondary				
High School Diploma		8 (32%)		18 (72%)
University degree		0		6 (24%)
Other substances /addictions				
Cannabis		1(4%)		
Alcohol		18 (72%)		-
Alcohol and Cannabis		4 (16%)		-
Alcohol and Amphetamines		1 (4%)		-
Alcohol and Pathological Gambling		1(4%)		-

SD: Standard deviation

replicate the original structure of the tool, consisting of: a total emotional intelligence quotient score (EIQ); two areas, the experiential emotional intelligence quotient (EEIQ) and the strategic emotional intelligence quotient (SEIQ) and four basic abilities: 1) perceiving emotions (PEQ); 2) emotional facilitation (EIFQ); 3) understanding emotions (EIUQ) and, 4) emotional management (EIMQ). The test comprises eight tasks; faces, pictures, facilitation, sensations, changes, blends, emotion management and emotional relationships.

- *Balloon Analogue Risk Task* (BART). In the BART a computer screen displays a balloon (Figure 1), which the participant has to gradually pump up by using the mouse. The test comprises 20 trials. Every time the participant pumps up the balloon, they earn a financial reward. The greater the number of pumps, the greater the potential reward but the chance of the balloon bursting and all the earnings being lost is also greater with each pump. The test has no time limit and the participant receives constant feedback. As the test advances the screen shows the amount of money lost and the amount of money earned. The test measures risk perception related to impulsivity and reward seeking[14,15].

The cocaine-dependent patients from the addictive behaviors unit were receiving cognitive behavioral therapy. Cognitive behavioral therapy is based on the assumption that our emotions are not only activated by actions but by the thought processes we use to confront events. Our thoughts determine our emotions and our emotions determine our behavior. One of the most effective procedures in cognitive behavioral therapy is a technique of self-control to eliminate patterns of recurring unrealistic, unproductive and/or anxiety-producing thoughts, which may inhibit the execution of a desired behavior or avoid the initiation of a sequence of undesirable behaviors[24]. The self-control training used with this group of patients comprised: thought stopping, cognitive restructuring, rational emotive behavior therapy, different relaxation techniques, anger management techniques, dealing with stressful situations, problem solving, communication skills and time-management techniques[25,26]. These techniques are worked on at different stages of the treatment, taking into account the stages of change model of motivational interviewing[27]. The frequency of the sessions varied depending on progress (weekly, fortnightly, monthly, quarterly, biannual, annual) considering rehabilitation to be when the patient has been fully abstinent for two years.

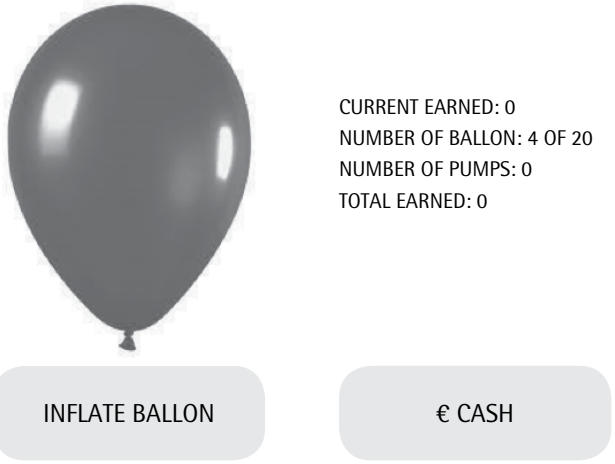

Figure 1 | *Balloon Analogue Risk Task*

Statistical analysis

To describe the sample, we used descriptive statistics for quantitative and qualitative variables. To analyze the differences in the main study variables we used the Student's t-test or the Mann-Whitney U-test, depending on whether or not they followed a normal distribution. We also used a chi-squared test to control for differences in distribution by gender, age and educational level. A covariance analysis (ANCOVA) was then conducted on all the variables of interest, using age, gender and educational level as adjustment variables. Statistical significance was set at $p<0.05$. Statistical analysis was conducted using the SPSS 19.0 software package.

RESULTS

After adjusting for age, gender and educational level, the MSCEIT results (Table 2) show differences between the two groups in the total emotional intelligence quotient, the strategic emotional intelligence quotient, the understanding emotions quotient, the emotional management quotient and in the blend and emotion management tasks. The results also show a greater spread of scores on the MSCEIT for the group of cocaine-dependent individuals, although this difference is not statistically significant.

The group with no history of drug use scored 21.69 points more on the total emotional intelligence quotient and performed better on strategic emotional intelligence than the group of cocaine-dependent individuals. Significant differences were also found in performance on emotional understanding, in both the blend and emotion management tasks, where scores were higher for the group with no history of drug use. This group also performed better in the emotional understanding tasks.

The results of the BART risk perception task (Table 2) show no significant differences between the two groups in either of the variables measured, risk perception or reward-taking. However, the group of cocaine-dependent patients tended to pump up the balloon more times.

DISCUSSION

The main objective of this study was to analyze the relationship between cocaine use and emotional intelligence, risk perception and reward-seeking.

The mean scores for the group of cocaine-dependent patients are lower in most of the indicators (emotional intelligence, strategic emotional intelligence, understanding emotions and emotional management). This group also performed worse on the blend and emotion management tasks.

The cocaine-dependent patients had more difficulties in the strategic emotional intelligence tasks in the dimensions of both emotional management and understanding emotions. They specifically found it more difficult to manage their own emotions and adapt to the emotions of others. These results are consistent with the findings of other studies which suggest that treatment should include therapy to improve emotional management, since cocaine-dependent individuals present a deficit in this area. It is worth noting that although the patients from the addictive behaviors unit were all receiving cognitive behavioral therapy, fundamentally aimed at emotional self-control and thought-stopping, the results still show lower performance in this type of emotional competencies.

The increase in the spread of scores in the cocaine-abstinent group could be explained by the difference in performance on strategic emotional intelligence and the experiential emotional intelligence tasks, which might suggest a selective deficit in both dimensions of strategic emotional intelligence: understanding emotions and emotional management. This coincides with the results of Fernández-Serrano et al.[4], who found no differences between types of emotions using the Ekman Faces Test, with the exception of the emotion of disgust. This difference could be due to the fact that the MSCEIT includes no stimulus using the facial expression of disgust. In a similar study using the Constructive Thinking Inventory, cocaine-dependent patients had lower total scores and also scored lower on the specific dimensions of emotionality, efficacy and rigidity[5]. However, the participants in the aforementioned study were all males and receiving treatment from *Proyecto Hombre* (a Spanish NGO specialized in the rehabilitation of

Table 2 Mean scores for the groups of individuals with no history of drug use and cocaine-dependent individuals for the variables adjusted for age, gender and educational level

		Group with no history of drug use (DT)	Group of abstinent cocaine-dependent individuals(DT)	Difference	F	p value	CI 95% Differences	
							Lower limit	Higher limit
MSCEIT	EIQ	106.51(6.93)	84.81(6.14)	21.69	5.32	0.026	2.72	40.66
	EEIQ	103.32(7.36)	89.53(6.52)	13.79	1.19	0.175	-6.36	33.95
	SEIQ	107.90(4.22)	91.24(3.74)	16.63	8.14	0.006	2.95	19.87
	PEQ	102.23(6.43)	96.43(5.70)	5.79	0.441	0.510	-11.82	23.41
	EIFQ	102.52(5.49)	91.00(4.86)	11.52	2.39	0.129	-3.50	26,55
	EIUQ	105.87(3.67)	92.58(3.25)	13.29	7.11	0.011	3.23	23.34
	EIMQ	107.54(4.91)	92.93(4.359	14.61	4.80	0.034	1.16	28.06
	Faces	101.58(6.03)	95.94(5.34)	5.64	0.475	0.562	-10.86	22.14
	Pictures	103.15(4.56)	102.24(4.04)	0.912	0.022	0.884	-11.58	13.40
	Sensations	110.22(5.88)	94.16(5.21)	16.06	4.04	0.050	-0.035	32.15
	Facilitation	93.72(3.17)	93.66(2.81)	0.062	0.001	0.989	-8.62	8.75
	Blends	105.33(3.50)	90.80(3.10)	14.52	9.36	0.004	4.95	24.10
	Changes	105.80(4.12)	95.04(3.65)	10.76	3.70	0.061	-0.518	22.03
	Emotion management	107.3(4.77)	93.41(4.23)	14.52	5.03	0.030	1.45	27.59
	Emotional relationships	103.89(4.62)	94.05(4.09)	9.83	2.45	0.124	-2.82	22.50
BART								
	Risk perception	597.28(64.71)	659.42(57.32)	-62.14	0.501	0.483	-239.23	114.94
	Reward	20.15(1.78)	20.97(1.58)	-0.826	0.131	0.719	-5.42	3.76

SD: Standard deviation; CI: Confidence interval; MSCEIT: Mayor-Salovey-Caruso Emotional Intelligence Test; EIQ: Total emotional intelligence; EEIQ: Experiential emotional intelligence; SEIQ: Strategic emotional intelligence; PEQ: Perceiving emotions; EIFQ: Facilitation; EIUQ: Understanding emotions; EIMQ: Emotional management; BART: Balloon Analogue Risk Task

drug-dependent individuals), which could explain some of the differences with our results. These authors suggest this deficit is related to inflexible thinking. In other words, cocaine-dependent patients find it more difficult to manage stressful situations (lack of decisiveness in uncontrollable situations) and to establish pleasant social relationships. This is supported by the theories of Epstein and Meier[29], suggesting that the results might explain the difficulties cocaine-dependent patients have to establish and maintain gratifying personal and social relationships and also their search for more constant and larger rewards without assessing the risk involved in obtaining them.

No significant statistical differences were found in the BART risk perception test although the cocaine-abstinent participants did click the mouse more times so as to inflate the balloon as much as possible and so obtain greater rewards. Although the number of pumps was higher in the cocaine-dependent group, both groups obtained similar rewards. Verdejo-García, et al.[30] suggest that substance-dependence problems are related to negative emotion-driven impulsivity. It is worth noting here that the BART results showed a greater tendency towards risk behavior or impulsivity and greater reward-seeking in the group of cocaine-dependent patients, which is similar to the findings of other studies[18,31,32]. The relationship between cocaine and impulsiveness is considered to be bidirectional. In other words, greater impulsiveness can promote risk behaviors such as cocaine use and vice versa. Cocaine can affect the prefrontal region of the brain, making cocaine-dependent patients more disinhibited and impulsive[13]. It has even been reported that 55% of cocaine-dependent patients have an executive deficit in inhibitory control, presenting impulsive behaviors. They specifically present a lack of premeditation

regarding the possible consequences of behaviors[33]. A possible explanation for the absence of significant differences in the risk perception task could be that the cognitive behavioral therapy helps the participants identify dangerous or undesirable situations and strengthens their inhibitory control.

Our study has a number of limitations. In the experimental analogue balloon task a short version with 20 balloons was used. Had we used other versions with a larger number of balloons, the results could have been different and the differences between the groups might have increased. However, previous research shows that the correlation between scores obtained using the 20-ballon version and the long versions is adequate for the first 10 balloons (~0.6) and good for the second 10 (~0.8), which would justify the choice of the 20-ballon version in order to shorten the assessment time[34]. Another limitation might be that the cocaine-dependent patients were receiving cognitive behavioral therapy, which could explain the lack of differences between the two groups in the experiential emotional intelligence scores.

Despite these limitations, we believe that the results of our study can help to understand the emotional functioning of cocaine-dependent patients and the skills which need to be stressed in treatment at addictive behaviors units. Furthermore, the study could help to guide or suggest new models of withdrawal treatment taking into account specific emotional intelligence processes or skills, as well as risk perception and reward seeking, which can be affected by cocaine use. Regarding the sample size, although it only comprised 50 participants, the results are similar to those of research using a larger number of participants[6].

A possible line of future research would be to conduct a longitudinal study to measure emotional intelligence from beginning to end of treatment, or a randomized clinical trial including a decision-making training program for high-risk situations of cocaine use, comparing pre-and post-therapy results so as to verify the effectiveness of this type of interventions. It could also be useful to conduct further research on the executive functioning of cocaine-dependent patients and the relationship with emotional control, especially the relationship between inhibitory control and its improvement after cognitive behavioral therapy treatment.

In conclusion, the group of abstinent cocaine-dependent patients presented lower emotional intelligence abilities, specifically in strategic emotional intelligence skills, emotional control and management, and blending and understanding emotions. Although there were no significant differences between the two groups in risk perception, the results show that the group of cocaine-dependent patients tend to seek a greater number of rewards despite the consequences of the behavior required to obtain them.

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