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Within-subjects Extinction and Renewal in Predictive Judgments

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Two experiments were conducted with the aim of exploring extinction and renewal in humans using a predictive judgments task. Experiment 1 found that pairing a fictitious medicine with a fictitious illness led the subjects to predict the illness in the presence of the medicine. When the medicine was subsequently presented without outcomes subjects learned to predict that the medicine was not followed by illness, though they continued predicting illness when a non-extinguished medicine was presented. In Experiment 2, after presenting medicine-illness pairings in a specific imaginary hospital (context X), subjects received the medicine alone in a different but equally familiar imaginary hospital (context Y). During a subsequent test, subjects predicted illness when the medicine was presented in context X (the acquisition context), while they predicted no illness when the medicine was presented in context Y (the extinction context). These results replicate those previously found with animals, and extent the ones found with humans using contingency judgment tasks. Different associative theories, particularly Bouton's (1993) retrieval model of learning, are considered for the explanation of these results.

Key words: extinction, renewal, predictive judgments, humans.

When a conditioned stimulus (CS) is followed by an unconditioned stimulus (US), the CS ends eliciting a conditioned response (CR). This CR diminishes, and even disappears when the CS is subsequently presented alone. This phenomenon is known as extinction, and has been widely studied since the beginning of the century. Pavlov (1927) already found that extinction did not mean unlearning of the previously learned CS-US association. When a extinguished CS is left untreated for a period of time, CR spontaneously recovers (v.g., Pavlov, 1927; Robbins, 1990, Rosas & Bouton,

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1996). In other words, it seems like extinction does not transfer well to a different time.

More recently, it has been found that extinction does not transfer well to a different context either. When the CS-US association is acquired in the presence of specific background cues (context), and extinction is run in the presence of different background cues, then CR recovers when the test is conducted in the original context of acquisition. This is known as *renewal effect*, and has received important empirical support using animals as subjects (v.g., Bouton & Bolles, 1979; Rosas & Bouton, 1997b; see Bouton, 1993 for a review). Renewal has been also found when acquisition and extinction are conducted in the same context, and the test is run in a different one (v.g., Bouton & Ricker, 1994), and also when acquisition, extinction and testing are conducted in different contexts (v.g., Bouton & Swartzentruber, 1986). The combined results of these experiments suggest that whenever a context change is conducted after extinction, extinction performance impairs while acquisition performance improves. Moreover, all of these studies find that a contextual change after acquisition has no effects upon acquisition performance.

Bouton (1993; 1994a, 1994b) explains these results by noting that the CS has two different meanings after extinction: it means the US, and its absence. Whenever a CS has contradictory outcomes, the subject is going to use the context to disambiguate the CS meaning. After acquisition, the CS has a single meaning so, according to Bouton (1994b) the context is not taken in account by the subject. However, when extinction starts the CS changes its meaning and the subject begins to pay attention to the context with the aim of disambiguate the meaning of the CS. Bouton (1993, 1994a; 1994b) considers that subjects learn a CS-US excitatory association during acquisition. When the CS is presented without the US during extinction the CS-US association is not unlearned, it remains stored in memory indefinitely, but a new inhibitory association between the CS and the US is established, counteracting the CS-US excitatory association learned during the acquisition. This inhibitory association is gated by the context, that is, whenever the extinction context is present, the inhibitory association is activated, but when the context changes the inhibitory association is deactivated and retrieval of the excitatory association improves.

The study of renewal in human beings has received comparatively little attention. First evidence of renewal in humans has been found in a pilot experiment reported by Baker, Murphy and Vallée-Tourangeau (1996) using imaginary planets as contexts, vehicles as CSs, and safety or danger as US and No-US, respectively. Similarly, Rosas, Vila, Lugo, and López (1999) have found evidence of renewal using a contingency judgment task where a medicine was initially presented paired to an outcome, and then presented paired to a different outcome during a second, counterconditioning, phase. When acquisition and counterconditioning were conducted in two different imaginary hospitals (context) the return to the acquisition context at testing led subjects to judge the medicine as causing the first outcome again. Moreover, Matute and Pineño (1998) report a renewal like effect in a situation where

training a cue with an outcome interferes with performance to a different cue that was previously paired with the same outcome.

The contingency judgments technique used in most of these experiments only allows for an evaluation of the final performance at the end of each phase. An important prediction of the model proposed by Bouton (1993) is that context changes do not affect acquisition performance because during acquisition there is not contradictory information to be disambiguated, so information is stored independently of the context. If context change were to affect acquisition, then renewal of the acquisition performance with the return to the acquisition context during the test can be due to mechanisms different from retrieval. For instance, if the context change affects acquisition then one could argue that the CS presented in the extinction context is perceived as a different CS. If that were the case, CR renewal with the return to the original context at testing would reflect performance to a non extinguished CS. Thus, presenting the final performance at the end of each phase leaves room for alternative explanations questioning whether what has been found can be interpreted as a renewal effect (v.g., Matute & Pineño, 1998; Rosas et al., 1999; but see Baker et al. 1996).

The main aim of the experiments presented in this paper was to test whether renewal can be found in human beings in a situation where the context change does not affect acquisition. We used a predictive judgments preparation where fictitious medicines are presented, and the subject has to predict whether they are related to an imaginary illness. Experiment 1 was conducted with the aim of testing our acquisition and extinction procedure. Experiment 2 looked for within subjects renewal, testing whether the return to the acquisition context after receiving extinction in a different but equally familiar context would renew the predicted probability of the medicine causing the illness.

EXPERIMENT 1

The aim of Experiment 1 was to test whether acquisition and extinction of an association between an imaginary medicine and illness can be found with a predictive judgments task. Subjects were exposed to a situation where two medicines (A and B) were associated to illness, while a third medicine (C) was never followed by outcomes. We expected subjects to predict illness in presence of medicines A and B, and absence of illness in presence of C. During subsequent extinction, medicine A was presented without consequences. Finally, during the test subjects were asked to predict the probability of medicines A, B and C causing the illness. If our method led to extinction of the association between medicine A and the illness then they should predict illness in the presence of medicine B (non extinguished) and absence of illness in the presence of medicines A (extinguished) and C (never paired with illness).

Subjects. Nine undergraduate students of the University of Jaén participated in the experiment. Subjects were between 18 and 25 years old and had no previous experience with this task. Approximately 65% were women, and 35% were men.

Apparatus. Subjects were run individually in two 5.5 x 3.5 meters rooms. Two identical IBM compatible personal computers (one in each office) were used to present the task. Procedure was implemented using the program SuperLab Pro (Cedrus Corporation). Stimuli used were the labels Tekaten, Barrizol, and Pristal presented on the computer screen, and fully counterbalanced as medicines A, B, and C. The outcome was always an invented illness labeled as «Polsky's disease».

Procedure. The subject entered the room and sat in front of the computer. The experimenter asked him or her to pay attention to the instructions in the computer screen. When the subject said that was ready to start the experiment, the experimenter left the room.

The following instructions where presented in Spanish in successive screens. The text was presented in white fonts against a red background except for the text written in italics or bold font, that was presented in yellow and violet fonts, respectively. At the bottom of each screen the sentence «press the space bar» indicated the subjects how to go to the following instructions screen.

> «(Screen 1) Welcome! Discovering the cause of illness. (2) In this game you are supposed to be a *healthcare inspector* in charge of investigating the following problem: (3) Some patients in *San Juan* and *Santa Clara* hospitals suffer an illness known as **Polsky's disease**.(4) *Your task* consists on checking a set of clinic files to find *the reason because patients suffer* **Polsky's disease**. (5) Each file indicates *the hospital where each patient was treated* and *the medicine he or she had received*. (6) You *will be asked about the probability* that a specific patient had developed **Polsky's disease**. (7) In most cases, *after giving your opinion, you will receive indication about* whether this patient *is ill or not.* (8) This information will allow you to improve your judgment until discovering what produces **Polsky's disease**. *Good Luck*! (10) Are you ready? *If you have any doubts ask the experimenter now*. If you do not, press the space bar to start.»

Following these instructions, a screen with the sentence «First set of files» appeared for 500-msec and the first trial was presented. In each trial, the name «Hospital Santa Clara» was presented in the upper left corner of the screen written in red against a dark green background. Though the instructions indicated that medicines could appear in any of two hospitals,

only one was used in this experiment. This was done so that the instructions were the same across experiments.

The name of the medicine was presented within a white square in the middle of the screen, written in red caps. Below the name of the medicine appeared the following instructions: «What is the probability for this patient to be suffering Polsky's Disease? Select a number of the next scale according to your opinion and hit it in the keyboard». A 0 to 9 scale was presented below with the labels None, Small, Big and All upon numbers 0, 2-3, 6-7, and 9, respectively. There was no time limit for the emision of the prediction by the subjects. Immediately after the subject emitted his or her prediction a feedback screen appeared for 1-sec where the sentence «It has **Polsky's disease**» or «It is **not** ill» appeared, centered in the screen, within the hospital background (bold font here represents yellow font in the trial). Intertrial interval (a white screen) was 1-sec. The experiment was run in three phases:

-Acquisition: Subjects received 12 acquisition trials with each medicine in a randomly intermixed schedule. Medicines A and B were followed by illness in 83% of the cases. Medicine C was never followed by illness. A screen with the sentence «Second set of files» appeared for 500-msec after subjects had received 6 trials of each kind.

-Extinction: After a screen with the sentence «Third set of files», 12 trials were run where A was never followed by illness. Medicines B and C were not presented during this phase. A screen with the sentence «Fourth set of files» was presented for 500-msec between extinction trials 6 and 7.

-Test: It started with a screen that read «Fifth set of files». After that, two trials with each medicine were presented. Feedback screens were substituted by a screen where only the name of the hospital appeared. To counterbalance trial order, three trial sequences were used in different subjects (ACBABC, BACBCA, or CBACAB).

Dependent variable and statistical analysis. Predictive judgments in each trial were registered, and evaluated by analysis of variance (ANOVA). Planned comparisons were conducted using t-tests. The standard error of the mean was derived by pooling the appropriate error terms from the overall ANOVA and the degrees of freedom were determined following the procedures of Welch and Satterthwait (see Howell, 1987, pp. 431-443 for further discussion). Rejection criterion was set at $p < 0.05$.

Results and Discussion. Subjects acquired the association between medicines A and B, and the illness uneventfully. Extinction of A reduced response to A but not to B. Response to C was low throughout the experiment.

Figure 1 presents the mean predictive judgment to medicines A, B and C in the 12 trials of acquisition (left panel) and to medicine A in the 12 trials of extinction (right panel). As we can see in the figure, predictions to the medicines paired with illness (A and B) were high during acquisition, while

they were low to C, as it was never paired with illness. During extinction, predictions of the relationship between A and the illness were progressively smaller. These results were confirmed by statistical analysis. A 3 (stimulus) x 12 (trial) ANOVA found significant main effects of stimulus, $F(2, 176) = 51.72$, and trial $F(11, 176) = 3.05$. The stimulus by trial interaction was also significant, $F(22, 176) = 2.90$.

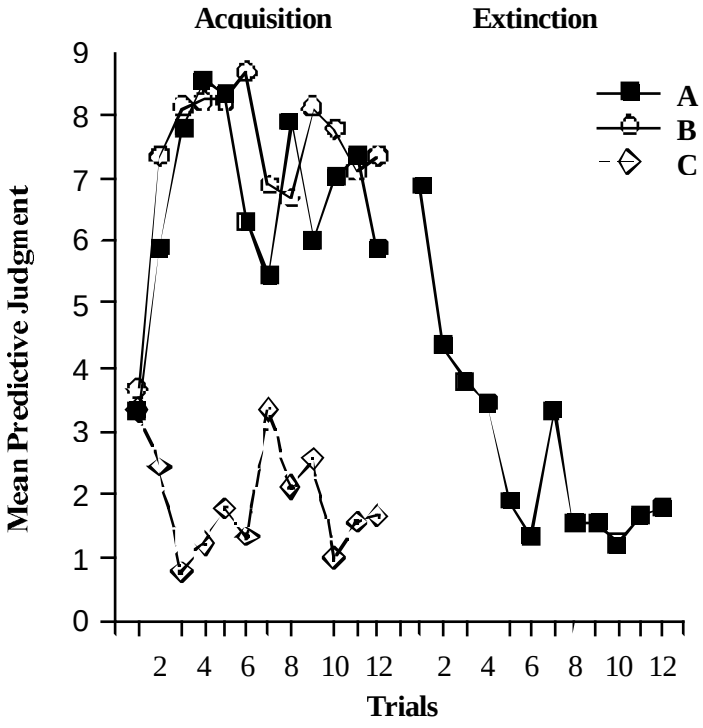

Figure 1. Mean predictive judgment to medicines A, B and C in the 12 trials of acquisition (left panel), and in the 12 trials of extinction with A (right panel).

Planned comparisons run to explore the stimulus by trial interaction found that the simple effect of stimulus was not significant in trial 1, $F<1$, but it was significant in trial 12, $F(2, 142) = 12.67$, reflecting a lower predictive judgment to stimulus C than to stimuli A and B, $Fs(1,142) \geq 13.02$.

A oneway ANOVA conducted with extinction data found a significant effect of trial, $F(11, 88) = 5.53$**,** reflecting that the predictive judgment is getting smaller as extinction progresses.

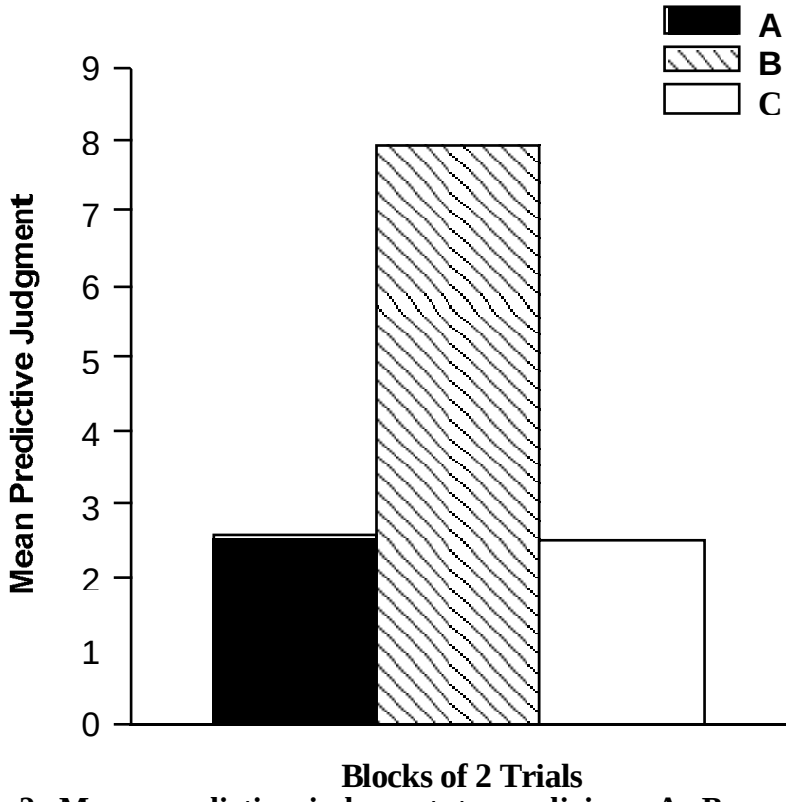

Figure 2. Mean predictive judgment to medicines A, B, and C in blocks of 2 trials during the test.

Figure 2 presents mean responses to medicine A, B and C in 2-trial blocks during the test. The figure shows that subjects predicted illness in presence of B, but absence of illness in presence of A or C. Effectively, a oneway ANOVA found a significant main effect of stimulus, $F(2, 16) = 14.65$, reflecting that predictive judgments were lower to A and C than to B, $F(1, 16) = 21.75$, with no differences between A and C, $F<1$.

The results of this experiment show that this procedure brings about acquisition and extinction of the association between a medicine and an illness. Subjects identified the specific medicines that produced the illness and, following the extinction treatment, they learned that the effect of the medicine that had been paired with the illness during acquisition disappeared when the illness was associated subsequently with no outcome. This result replicates those found by Vila and Rosas (1999) using a within-subject design in predictive judgments that will allow for a better evaluation of the effects of contextual change upon acquisition and extinction. This design also allows for the evaluation of learning on a trial-by-trial basis.

EXPERIMENT 2

Experiment 1 found that our technique can be used to detect acquisition and extinction of the relationship between a medicine and an illness. The aim of Experiment 2 was to test the effects of a context change upon acquisition and extinction. Counting with a procedure that allows for a registration of performance trial by trial will eliminate the interpretation problems about the effects of the context change reported in previous experiments (v.g., Rosas et al., 1999). Subjects were trained in a situation where a medicine A produced illness in a specific hospital (context X), while other medicine (B) was presented without illness in an alternate hospital (context Y). After acquisition, medicines were presented in extinction in the alternate contexts (X:B-, and Y:A-). Finally, a test was conducted in which subjects were asked to predict the illness in presence of medicine A in both hospitals.

Subjects and Apparatus. Sixteen subjects with similar characteristics to those in Experiment 1 participated in the experiment. Apparatus were the same used in Experiment 1.

Procedure. Procedure was identical to the one used in Experiment 1 except for what follows. Tekaten and Barrizol were used as medicines A and B, counterbalanced. «Hospital Santa Clara» and «Hospital San Juan» (the name was presented in a pink font against a dark blue background) were used as contexts X and Y, counterbalanced. The experiment was run in three phases:

- Acquisition: Medicines A and B were presented in contexts X and Y respectively. Patients who received medicine A in hospital X suffered Polsky's disease, while patients who received medicine B in hospital Y did not become ill. Twelve trials with each medicine were run.

- Extinction: Medicines A and B were presented unreinforced in contexts Y and X, respectively. That is, some patients received medicine A in hospital Y, and some others received medicine B in hospital X, both without illness. Again, twelve trials in each hospital were run. Note that there was a context change between acquisition and extinction for both medicines.

- Test: Subjects were asked to predict the effects of A in hospitals X (acquisition context) and Y (extinction context). Four trials within each hospital were run. To counterbalance trial order, each subject received one of these two trial sequences (XYYXYXXY, YXXYXYYX).

Results and Discussion. Acquisition and extinction proceeded uneventfully. Subjects first learned that medicine A produced the disease in hospital X and that medicine B did not produce the disease in hospital Y, and then that medicine A did not produce illness in hospital Y, while B continued without causing illness in hospital X. The change in the context between acquisition and extinction had no effects. However, the return to the

acquisition context at testing led subjects to judge that A caused the illness again.

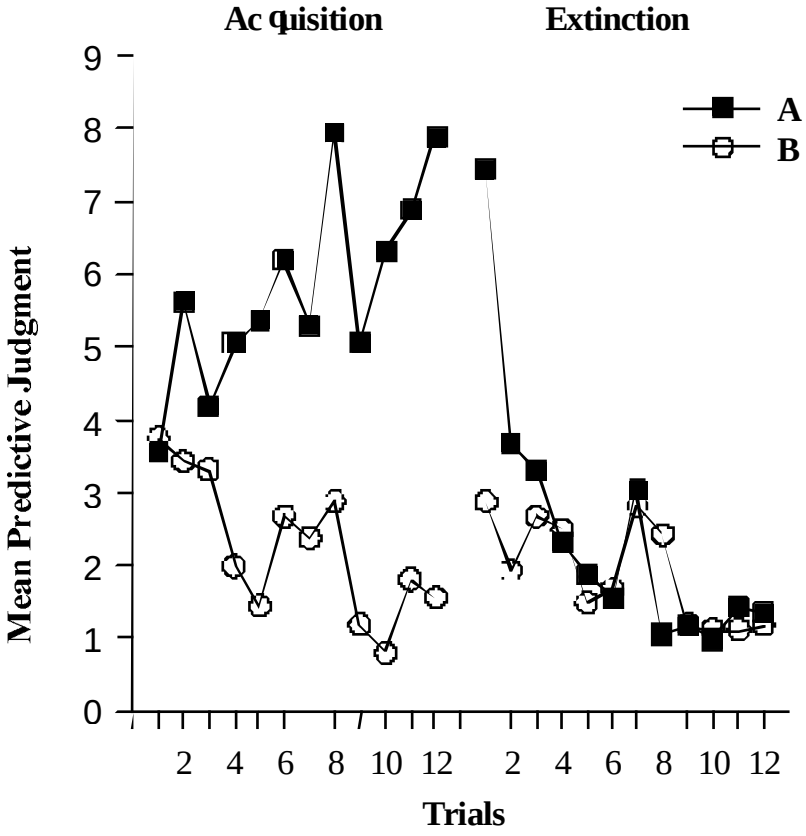

Figure 3. Mean predictive judgment to medicines A and B in contexts X and Y respectively during acquisition (left panel), and in contexts Y and X during extinction (right panel). There was a context change between acquisition and extinction for both medicines.

Figure 3 presents the mean predictive judgment to medicines A and B in contexts X and Y respectively during acquisition (left panel), and in contexts Y and X during extinction (right panel). Predictions of A causing the illness increased progressively along acquisition, while predictions of B were kept low. The context change during extinction did not seem to have effects, but then predictions of A causing the illness decreased rapidly equating predictions of B by the end of extinction. These observations were confirmed by statistical analysis. A 2 (stimulus) x 12 (trial) ANOVA run with the

acquisition data yielded significant main effects of stimulus, $F(1, 165) = 61.94$, and trial, $F(11, 165) = 2.54$. The stimulus x trial interaction was also significant, $F(11, 165) = 4.94$. Subsequent analyses run to explore the Stimulus by Trial interaction found that the simple effect of stimulus was not significant at the beginning of acquisition, $F < 1$, but it was significant at the end $F(1, 141) = 45.73$. Thus, these results reflect the gradual learning of the different effects of medicines A and B in hospitals X and Y.

During extinction, a 2 (Stimulus) x 12 (Trial) ANOVA found a significant main effect of Trial, $F(11, 165) = 10.20$. The Stimulus main effect was not significant, $F(1,165) = 2.70$. There was a significant Stimulus by Trial interaction, $F(11,165) = 4.63$, reflecting that differences between stimulus, higher at the beginning of the extinction, $F(1, 155) = 40.05$, disappeared at the end, $F < 1$. Most importantly, planned comparisons found no differences between the end of acquisition and the beginning of the extinction in either stimulus A, $F < 1$, or B, $F(1, 15) = 3.84$. Thus, the change in the context between acquisition and extinction did not affect performance.

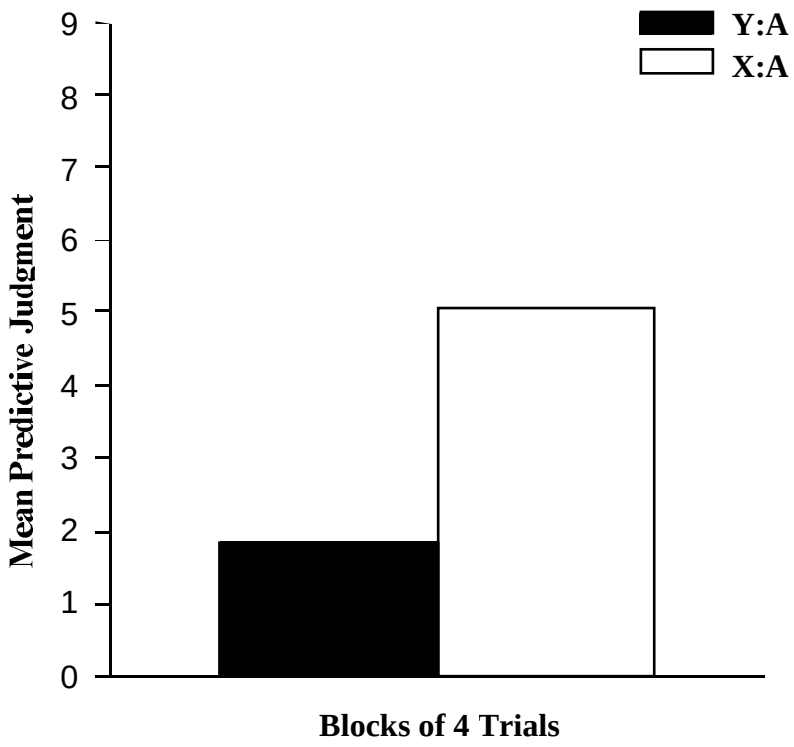

Figure 4. Mean predictive judgment to medicine A in contexts X and Y in blocks of 4 trials during the test.

Figure 4 shows the mean predictive judgment about medicine A in contexts X and Y during the test in 4-trial blocks. A oneway ANOVA found a significant main effect of context, $F(1, 15)=14.86$, reflecting a higher prediction of A causing the illness in the acquisition context (X) than in the extinction context (Y).

These results replicate the acquisition and extinction effects found in Experiment 1. Most importantly, they replicate the renewal effect previously reported by Rosas et al. (1999; see also Baker et al., 1996; Matute & Pineño, 1998) in a situation where the change in the context during acquisition does not affect retrieval of the information.

GENERAL DISCUSSION

The aim of these experiments was to test whether extinction and renewal can be found in human predictive judgments. Experiment 1 found that the presentation of a medicine without illness after previous pairings of the medicine and the illness led to a decrease in the predictive judgment of the positive relationship between the medicine and the illness. This decrease was specific to the extinguished stimulus. Experiment 2 found that the return to the acquisition context after receiving extinction in a different but equally familiar context renews acquisition performance.

These results replicate the ones found previously in animal literature (v.g., Bouton & Bolles, 1979; Bouton & Ricker, 1994; Rosas & Bouton, 1997b), adding evidence to reports suggesting that judgment tasks produce some parallel results to those obtained with behavioral tasks in animal classical conditioning (see for instance, Shanks & Dickinson, 1987).

The context effect found in this experiment also replicates and extends previous results using either contingency judgment tasks (v.g., Baker et al., 1996; Rosas et al. 1999), or behavioral tasks in humans (Matute & Pineño, 1998). The advantage of the experiments presented here is that they were run with a procedure that allowed for a trial by trial registration of judgments, and a within-subjects design. To the control advantages of within-subjects designs, the trial by trial registration of performance is crucial for an unequivocal interpretation of the context change effects upon extinction because it will allow for a detection of any potential changes in the contexts associative strength that should affect performance when the stimuli are presented in the alternate context.

Perhaps the simplest explanation for the results of Experiment 2 will be a perceptual one. It is possible that during acquisition subjects form a configure of contexts and stimuli, so that the change in the context during extinction acts actually as a change in the stimulus associated to the outcome. This assumption underlies Pearce's associative model of Pavlovian conditioning (1987, 1994). According to this model, the change in the context during extinction would act as a change in the stimulus itself, so that the configure presented during extinction would be considered different by the subject from the one that was associated to the outcome during acquisition.

Then, response recovery to XA during the test would reflect responding to a stimulus that was never extinguished.

Note that this approach predicts a change in performance between acquisition and extinction. During the first extinction trial, responding to stimulus A in context Y should decrease as the configure YA only receives generalized excitatory associative strength from the trained configure XA. Conversely, responding to stimulus B should increase in context X, as it receives generalized excitatory associative strength from the trained compound XA because both configures share the element X. None of these results were found in Experiment 2, suggesting that Pearce's generalization model is not able to explain our findings. Subjects seem to have considered the medicine as the same independently of the hospital (context) where it was presented.

Rescorla and Wagner (1972) model makes similar predictions but based on different assumptions. If we treat contexts X and Y as CSs, this model predicts that X and A will both become excitatory during acquisition, while Y and B will remain neutral. During extinction, the pairing of an excitor (A) with the neutral context (Y) without reinforcement would make Y an inhibitor, and the same would occur with B because of its pairing with the excitatory context X in the absence of reinforcement. If subjects were to integrate both phases, by the end of extinction Y would be an inhibitor, while X and A both would be excitatory. During the test, the observed low response to A in Y would be caused by the summation of the inhibitory strength of Y to the excitatory strength of A. Conversely, the high response to A in X would be due to the summation of the excitatory strength of A and X.

Although this model could explain the results of the test, the same underlying principles cannot explain the results obtained at the beginning of the extinction. As noted, at that point X and A share excitatory associative strength, and Y and B are neutral. The model predicts that the change of the context between acquisition and extinction should produce a decrease in responding to the combination of Y and A, because part of the stimuli (X) supporting performance are not present. It also predicts some response to the combination of X and B, because X context is supposely an excitor. However, the change in the context between acquisition and extinction did not produce any detectable effects on performance (see Fig. 3) so that we can conclude that either contexts did not acquire associative strength, or this strength was so weak that did not affect performance.

It is still the case that Y could have become inhibitory during extinction. Though there is nothing in our results to rule out this explanation, it should be noted that Y was presented unreinforced during acquisition, and that the unreinforced presentation of a stimulus retards both, excitatory and inhibitory conditioning (v.g., Baker & Mackintosh, 1979) in a phenomenon known as latent inhibition (v.g., Lubow, 1989). Given that there is no evidence of X acquiring excitatory properties during acquisition, it seems difficult to expect that Y acquired inhibitory properties during extinction, where the developing of conditioned inhibition should have been retarded by latent

inhibition. Nevertheless, additional research would be necessary to rule out this possibility.

Both, associative and perceptual explanations of the role of the context in these experiments seem to fit poorly the results obtained. An alternative view of the role of contexts in conditioning is to consider them as occasion setters (v.g., Holland, 1992), so that they do not enter in direct associations with the outcome, but *set the occasion* in wich a stimulus is going to be reinforced (v.g., Bouton, 1993; Bouton & Swartzentruber, 1986). Experiments conducted with animals in situations similar to the one presented in this paper suggest that contexts are coded as occasion setters rather than being associated directly with the US (v.g., Bouton & King, 1986; Bouton & Swartzentruber, 1986; Swartzentruber & Bouton, 1988). Following this interpretation of the role of context in conditioning, the retrieval model proposed by Bouton (1993) has no trouble to fit these results. According to this model, while the medicine had only one meaning (illness), it would be coded independently of the context, so that subjects will predict that the medicine is going to cause the illness in any context where it is presented. However, when the outcome of the medicine changes during extinction, subjects start to code information about the context, as it allows them to disambiguate the meaning of the medicine (Bouton, 1994b). According to this model extinction is context dependent, so that any change in the context after extinction would reduce extinction performance and, subsequently, increase acquisition performance, as it seems to have happened here in Experiment 2.

An interesting feature of Bouton's model is that allows for an integration of renewal and spontaneous recovery effects as it considers they are caused by the same underlying mechanism (Bouton, 1993). This model explains the spontaneous recovery that occurs with the simple passage of time after extinction by assuming that time is a context (Bouton, 1993). The idea that time may act as a context to regulate retrieval of the information has been proposed by some models of memory (Bouton, 1993; McGeoch, 1942; Mensik & Raaijmakers, 1988; Spear, 1978). Bouton (1993) notes that there is a parallel between context change and retention interval effects that may justify this idea (v.g., Brooks & Bouton, 1993; 1994). The model predicts that context change and retention interval should have additive effects, as the contextual change produced by a *physical* and a *temporal* context change should be bigger that the contextual change produced by either a physical or temporal manipulation alone. This prediction has been recently confirmed with animals (Rosas & Bouton, 1997a; 1998; see Bouton, Nelson, & Rosas, 1999a; 1999b for a review of the implications of this finding). The procedure presented in this paper allows for a clean testing of this prediction in human beings that will need of new experiments to be tested.

In summary, the results found in these experiments seem to be better explained by a retrieval framework of learning (Bouton, 1993) than by standard associative models. They add to the effects largely studied in non-human animal literature that have been replicated in humans, such the effects of time and context changes upon retrieval of the information (v.g., Rosas et al., 1999), generalization (see Bouton et al., 1999a; 1999b; Riccio, Richardson

& Ebner, 1984; 1999), blocking (v.g., Arcediano, Matute & Miller, 1997; Miller & Matute, 1996), and learned helplessness (v.g., Matute, 1994; Maldonado, Martos & Ramírez, 1989; Ramírez, Maldonado & Martos, 1992) among many others.

RESUMEN

Se realizaron dos experimentos con el objetivo de explorar la extinción y renovación en seres humanos utilizando una tarea de juicios predictivos. El Experimento 1 encontró que los emparejamientos de una medicina ficticia con una enfermedad inventada llevaba a los sujetos a predecir la enfermedad en presencia de la medicina. Cuando posteriormente se presentó la medicina sin consecuencias los sujetos aprendieron a predecir que la medicina no iba seguida por enfermedad, aunque continuaron prediciendo enfermedad en presencia de otra medicina que no había sido extinguida. En el Experimento 2, después de presentar emparejamientos de la medicina y la enfermedad en un hospital imaginario determinado (contexto X), se presentó la medicina sola en un hospital imaginario distinto pero igualmente familiar (contexto Y). Durante la prueba posterior se encontró que los sujetos predecían la enfermedad en presencia de la medicina cuando ésta se presentaba en el contexto X (el contexto de adquisición), mientras predecían ausencia de enfermedad cuando la medicina se presentaba en el contexto Y (el contexto de extinción). Estos resultados replican otros previamente encontrados con animales y extienden aquellos encontrados usando juicios de contingencia con seres humanos. Se barajan distintas teorías asociativas para la explicación de estos resultados, particularmente el modelo de recuperación de la información de Bouton (1993).

Palabras clave: extinción, renovación, juicios predictivos, humanos

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