Social capabilities in Alzheimer's patients

by

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Abstract

Patients with stage-I (very mild and mild) Alzheimer's disease were asked to participate in a Dictator Game, a type of game in which a subject has to decide how to allocate a certain amount of money between himself and another person. The game enables the experimenter to examine the influence of social norms and social preferences on the decision-making process. When the results of treatments involving Alzheimer's disease patients were compared with those of identical treatments involving patients with mild cognitive impairment or healthy control subjects, with similar ages and social backgrounds, no statistically significant difference was found. This finding suggests that stage-I Alzheimer's disease patients may be as capable of making decisions involving social norms and preferences as other individuals of their age. Whatever brain structures are affected by the disease, they do not appear to influence, at this early stage, the neural basis for cooperation-enhancing social interactions.

Keywords: Alzheimer patients, social behavior, dictator games

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Introduction

Alzheimer's disease (AD) is a neurodegenerative disorder that afflicts a growing part of our aging population. Progression from healthy aging to Alzheimer's dementia occurs in a subtle and graded fashion over perhaps a decade or longer. Consequently, individuals in the prodromal stage may often be inadvertently included in samples of apparently

normal elderly subjects [1]. However, behavioral measures of cognitive impairment can be used to evaluate progression from healthy aging to mild cognitive impairment (MCI) to Alzheimer's disease, such that individuals with MCI can be selectively excluded on the basis of their performance.[1] Much progress has been made in characterizing the behavioral and neural changes, particularly in memory systems that are associated with advancing age. The diagnosis of AD is mainly based on standardized neuropsychological tests that explore the preservation of higher functions. In particular, attention is given to the evaluation of consciousness, language, visuospatial function, memory, orientation, cognitive function, and thought. When properly applied, neuropsychological investigation provides a correct diagnosis in more than 80% of patients, as judged against necropsy findings. Neuroimaging is increasingly being used, and can provide correct diagnoses in as many as 92–94% [2].

Since Alzheimer's disease is a process that starts with mild cognitive impairments that are difficult to diagnose and progresses towards a broad generalized state in which it becomes hard to separate primary signs from secondary non-specific consequences, the early manifestations of AD provide a useful model for analyzing the selective weakening of higher functions. These early manifestations occur roughly during stage I (i.e., in the first 1–3 years) of the disease [3], [4], when learning deficits predominate and before other symptoms start to impair the patient's independence. In fact, it seems that the earliest neuropsychological deficits in AD are in short-term memory and in declarative episodic long-term memory [5]. These deficits form the background to the typical anterograde amnesia characteristic of early AD, which is

1 MCI refers to an early, but abnormal, state of cognitive impairment [6]. Phenomenologically, it is a transitional stage between normal aging and dementia in which the patient presents with complaints about poor memory task performance, but does not meet the diagnostic criteria for Alzheimer's disease. In a sample of normal older adults, some 3–5% will develop MCI each year. There is increasing evidence that individuals with MCI have a greatly increased likelihood of progression to Alzheimer's disease, with an annual rate of progression of 10–15% [1]. Nevertheless, MCI cannot be considered an early stage of AD.

characterized by clear limitations on the ability to learn new information while the capability of evoking old memories is retained.

Although early AD and MCI patients share similar memory deficits, they are classified differently because additional cognitive functions and functional performance are impaired in AD. It is possible, then, to distinguish three distinct groups of subjects, AD, MCI and control or healthy subjects, who may be expected to behave differently to the extent that their decision-making relies on mental structures that may be influenced in different ways by the two conditions.

Experience, beliefs, social norms, learning and memory all seem to be central to many aspects of decision-making. We were interested in determining experimentally whether AD patients in the first stage of their disease suffer from “social memory” loss, which is the loss of capabilities that help regulate social interactions, such as the ability to show fairness and altruism, and the ability to value one’s social standing, i.e., one’s reputation. Our findings could also contribute to clarify many legal tangles concerning the individual responsibility of AD patients in law suits involving money matters. They could also help link degeneration in specific brain structures in AD patients with structures that are engaged in cooperative social interactions, that is the neural correlates of such cooperation-enhancing social norms as a sense of fairness, altruism and reciprocity. In this way, our observations could add to our understanding of the neural basis of one distinguishing feature of the human species, namely cooperative collective action.

With this purpose, we invited stage-I AD patients to participate in a Dictator Game (see, e.g., [7] for references for this type of game). In this game, one player, called the dictator, who receives a specified amount of money from the experimenter, has to decide how much of this money goes to another player (typically an unknown

person). The other player, called the receiver, can only accept the money. This game involves the *simplest form of decision-making in two-person bargaining* since no strategic consideration of the receiver's reaction to the offer should influence the dictator's decision.[2] It is simple to understand and play, which makes it well suited to test subjects with cognitive impairments. It is also well documented. Thus, this game can provide useful tools for evaluating "self-interested" or "other-regarding" behavior in AD patients. Self-interest is key to explaining individual decision-making in economics. The naive assumption that individual economic behavior is guided by the maximization of own earnings is commonly accepted by orthodox economic thinking as a good first approximation. From this perspective, the dictator in a Dictator Game should give nothing to the other person. However, other-regarding behavior, which may itself evolve from maximizing behavior, must be invoked to explain human cooperation and the evolution of social norms that enhance cooperation. Other-regarding behavior may take different forms in different models, be it fairness [11], altruism [12], indirect reciprocity[13], or reputation building [14], to name a few. The Dictator Game, being devoid of any strategic element with respect to the other player, the receiver, who in fact plays no active role in the game, illustrates that the decision to give a non-zero amount is other-regarding or driven by cooperation-enhancing social norms and preferences (see [7] for references on social norms and preferences). Consequently, by comparing the amount given by stage-I AD patients with that given by MCI patients and healthy subjects, we can establish the degree to which patients with stage-I AD keep the memories of these social norms and social preferences intact.

[2] At the next level of complexity is the so-called Ultimatum Game, in which the receiver can accept or reject the offer made by the sender. If he accepts, he receives the offer. If he rejects, both receive nothing. In this game, a simplified reading of economic theory predicts that a self-interested player will offer the smallest amount of money that a self-interested receiver will accept. However, actual data from a large body of experimental studies shows that the modal response, when the game is played by humans, is near

Method

The subjects in our Dictator Game experiment were volunteers recruited by telephone by the staff of the Alzheimer Center from the Hospital San Vicente in Alicante, Spain. They were asked to participate in a session in which they would have to perform "some mental exercises". They were informed of the estimated duration of the exercises and told that no physical examination or medical procedure would be carried out. There was no indication of any reward.[3]

As mentioned above, subjects were classified as belonging to one of three groups depending on whether they had been diagnosed with AD or MCI, or had no diagnosed mental impairment. Diagnoses were made according to National Institute of Neurological and Communicative Disorders and Stroke (NINCDS, later NINDS) and Alzheimer's Disease and Related Disorders Association (ADRDA; [15]) criteria. Patients with other neurologic, metabolic or psychiatric conditions were excluded. All patients underwent full neurologic and neuropsychological evaluations. According to [9], "the primary distinction between control subjects and subjects with MCI [is] in the area of memory, while other cognitive functions [are] comparable. However, when subjects with MCI [are] compared with patients with very mild AD, memory performance [is] similar, but patients with AD [are] more impaired in other cognitive domains as well." The criteria established by NINCDS and ADRDA for labeling a

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or at the fifty-fifty split and that offers of little money are typically rejected (see [8], [9]). Interestingly, some non-human primates also respond negatively to unfair offers [10].

[3] The patients we contacted had already participated in tests in previous occasions. Had we mentioned that money was involved, we could have created an artificial chasm between AD subjects and controls, the former group, but most likely not the latter, having forgotten about this fact by the time of the experiment.

patient as having AD involve finding, in addition to impaired memory, at least one additional impairment in a so-called cognitive function, such as aphasia, apraxia, agnosia, or defective executive function. When only one of these functions is affected, the patient is classified as having mild or stage-I AD.

In detail the three groups of subjects were:

- *AD group:* hospital outpatients who had been diagnosed in the previous six months, and who were in the initial stage (stage I: very mild and mild stage)) of the disease [3], [4];
- *MCI group:* outpatients who had also been diagnosed in the previous six months; and
- *Control group:* invited subjects without mental impairments. The subjects in this group had a similar age and social background as members of the other two groups. This group comprised two types of subject: first, members of the hospital patients family or, for many AD outpatients, their home help; and, second, volunteers from a State center for old people.

Subjects were overwhelmingly working class and had completed only a few years of schooling. For detailed descriptions, see Table A1 in the Appendix. Table 1 provides a summary.

[insert table 1 here]

Groups of two to eight participants were taken to the experimental room, which was located in the hospital grounds[4]. In each treatment, they were seated behind

[4] The experiments took place on two separate occasions, in September 2003 and January 2004. In September 2003, sessions involved groups of two subjects with AD, groups of four subjects with MCI, and groups of eight control subjects. We decided to experiment with small groups of AD patients since we did not know if these patients would need more attention from the experimenters. As this was not the

cardboard screens to protect their privacy, provided with an envelope, and given a present of ten €1 coins.[5] Instructions were read aloud. These described the receiver and asked participants to place any coins they wanted to allocate to the receiver inside the envelope, while keeping their share in their pocket or purse. At the end of each treatment, an experimenter collected the envelopes. Importantly, the word dictator was never mentioned.

Subjects were told that their names would not be revealed. However, in order to avoid a degree of complexity that might not have been easily handled by AD subjects, we decided against using a full-anonymity procedure, such as Hoffman et al.'s double-anonymous procedure [16], or any other complex procedure.

Three sequential treatments were implemented:

- The anonymous treatment: the receiver was described as an anonymous person "like yourselves" who was located in another room in the building;
- The two-way identification treatment: to each dictator corresponded a receiver, who was of the same sex and of a similar age, who entered the room where the experiment was taking place and was personally introduced to the dictator as the person who would receive whatever money he/she allocated to the receiver. The intention of visual recognition was to turn the faceless receiver into full-fledged human being;
- The Red Cross treatment: the receiver was identified as the Red Cross (see [17] for a description of a Dictator Game with a Red Cross receiver).

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case, we decided to use larger groups in January 2004. In these sessions, the experimenters did not know which participants belonged to which group..

[5] In the double-blind version of the Dictator Game run in the US, in which participants are anonymous to other participants as well as to the experimenter, dollar bills are used [16], [17]. Unfortunately there are no paper €1 bills, which would have been much easier to conceal in an envelope. Bohnet and Frey [18] also used coins in their experiments.

Each subject participated in all three treatments. The anonymous treatment took place first. Once it was over, instructions for the two-way identification treatment were read out, the receivers were asked to enter the room and were introduced to the dictators without names being mentioned. Thereafter, the receivers were escorted out of the room and the dictators made their decisions. Finally, instructions for the Red Cross treatment were read out and, after the envelopes for this last treatment were collected, the participants were dismissed.

Results

As shown in the three graphs in Figure 1, our data indicate:

Observation 1: *the amounts given by the control, MCI and AD groups were indistinguishable in each of the three treatments* (see Figures 1a–1c).

No conventional statistical test (e.g., all three Kruskal Wallis tests for the between group comparison for each treatment show p-values above 0.23)[6] could reject the null hypothesis that the three different groups behaved identically in each treatment.

Observation 2: *visual contact with the receiver in the two-way identification treatment did not change the pattern of giving observed in the anonymous treatment in any of the three groups.*

To our subjects, it appeared that a stranger was a stranger whether or not he or she was seen (e.g. Wilcoxon test, p = 0.9). This may indicate that, like healthy

[6] We use non-parametric tests because normality assumptions are not met.

participants, stage-I AD patients can form abstract images of other individuals and can relate to them as they do with visually observed individuals.

Observation 3: *a significant increase in giving occurred in all three groups when the receiver was the Red Cross.*

The amount given to the Red Cross was found to be significantly greater (at $p < 0.0001$ level, using the Wilcoxon test for both pairwise comparison of anonymous and two-way identification, respectively, with Red cross) In particular, when the results of the two-way identification treatment are compared with those of the Red Cross treatment, it can be seen that 48% of subjects in the AD group, 58% in the MCI, and 44% in the control group increased the amount they gave. The more generous allocations to the Red Cross seem to indicate that all three groups were equally aware of the social context. In particular, the change in AD subjects' behavior that occurred as the "social distance" decreased, when moving from the first two treatments to the Red-Cross treatment, was indistinguishable from the change that occurred in both MCI patients and control subjects[7].

In summary, the decisions made by AD patients were indistinguishable from those made by MCI patients and healthy participants.

[insert figures 1a, 1b, and 1c here]

Discussion

It is well known that Dictator Game treatments are quite sensitive to design details. In our study, subjects gave on average more than has been reported in most previous Dictator Game experiments. The average amounts given by the three subject groups in our study are listed in Table 2.

[insert Table 2 here]

The amounts given by our subjects were greater on average than those observed by Bohnet and Frey [18], [20] and Eckel and Grossman [17]. See Table 3. In these previous experiments, subjects were recruited in the way normally used for economic experiments: i.e., by placing advertisements asking for student volunteers with the promise that a significant amount of money could be earned by participating.

But, as Eckel and Grossman reported in [21], subjects who are, instead, "corralled" for participation can behave very differently. In that study, the authors compared the results obtained in Dictator Games using student volunteers who were recruited in the usual manner with those obtained with pseudovolunteers.[8] In the latter group, contributions were 22–50% higher. In particular, in experiments involving volunteers, only 5.2% decided to give everything to charity, whereas in pseudovolunteer experiments, 28.7% decided to give everything to charity. It appears that subjects in the latter group were motivated by "something other than the incentive structure built into the experimental design", which is another way of saying that self-interest did not drive their decisions. Since the participants in our experiment were more like

[7] Social distance can be defined as the degree of reciprocity that subjects believe to exist in a social interaction[16]. For an early use of the term see [19].

[8] Pseudovolunteers were recruited from a class in which the experiment was to be conducted immediately during the class time. Participation was still voluntary as students were told they could choose not to participate and could leave without being penalized.

pseudovolunteers than genuine volunteers, Eckel and Grossman's observations could explain some of the differences between the amounts given away in our experiment compared to the amounts given away in other experiments.

Furthermore, in our study, there was no difference between the results of the anonymous treatment and those of the two-way identification treatment. This contrasts with Bohnet and Frey's results [18]. They found that the amount given increased significantly from one treatment to the other. In Table 3, it can be seen that the percentage of patients dividing their money equally increased from 25% to 71%. However, Frey and Bohnet used a between-group experimental design, whereas we used a within-group design. Another possible explanation for the similar level of giving in our two treatments may simply be that most of our subjects gave half or more of the full amount in the anonymous treatment, which was already very generous.

[insert table 3 here]

However, other factors may have led to the more generous level of giving. Age may be one of them.[9] Another may be social background. In addition, one should not disregard the effect of the participant's surprise that a procedure carried out in a hospital should result in money being earned. In fact, a number of subjects stated that they had no entitlement to the experimental money, that they had not earned it, and, therefore, that

[9] Fehr et al. [22], Bellemare and Kroeger [23] and Sutter and Kocher [24] found that the degree of reciprocity, as indicated by the returns in trust games, becomes significantly higher as age increases. On the other hand, Berg et al. [25] and Kovalchik et al. [26], who tested confidence, gambling, the endowment effect, and the theory of mind (i.e., strategic thinking) found that "older adults' decision behavior is similar to that of young adults, contrary to the notion that economic decision-making is impaired with age."

they did not deserve to take it with them. They felt they could not possibly justify accepting money as "manna from the experimental heaven" to their husband or wife.[10]

But the important point is that, whatever factors drove the participants' generosity, they did not influence the three subject groups *differently*. Since the three groups were recruited in an identical way, and participants shared similar social backgrounds and ages, were faced with an identical choice with the same reward and made their decisions in the same hospital environment, they only significantly differed in their cognitive abilities[11]. Consequently, the three subject groups in this study had an internal consistency and could be distinguished clinically from each other. Yet, in the experiment we could not show behavioral differences among the three groups.

These findings could be unexpected since AD patients can have significant cognitive deficits. For example, compared with control subjects, they achieve significantly lower scores in the Moral Judgment Interview and obtain significantly less earnings in the Card Test (Torralva et al. 2000). They also have significant difficulty with numerical tasks embedded in everyday contexts, such as handling money [28].

The finding that stage-I AD subjects could not be shown to perform differently from control and MCI subjects in our experiment suggests that, at this early stage of AD, functioning of the neural circuitry responsible for social capabilities appears to remain sufficiently well preserved and that the operational subset of this circuitry seems still capable of maintaining normal social behavior. This is consistent with the observation that a broad range of complex cognitive abilities is preserved in patients

[10] Some comments by two AD patients who refused to take the money with them were: "I don't want the money", "It is not mine", "I get enough with my pension", "I have enough to get by", "I make enough money", and "I'm not that kind of person". Another AD patient felt that she had to justify keeping some money. When talking to the experimenter after the session, she claimed that she needed the money, that she was "illiterate", and that the money would come in handy. She gave €5, €6 and €5, respectively, to the receivers. Finally, one participant in the control group insisted on returning the money earned during the experiment.

[11] Recall that the MCI patients met criteria that differentiated them from healthy control subjects and from patients with stage-I AD [5].

with dementia of the Alzheimer type who cannot perform simple actions [29], and in agreement with our present understanding of AD, which generally accepts that lesions begin to appear in the temporal region, mainly in the hippocampus. The involvement of the hippocampus in memory has been extensively checked [2]. In contrast, the structures involved in decision-making are mainly located in the prefrontal cortex, which is affected in more advanced stages of the disease but which remains apparently unaffected early on. Changes in the performance of decision-making tasks would be expected in subjects with frontal pathologies (e.g., frontotemporal dementia or orbitofrontal lesions). In fact, some studies have shown that patients with orbitofrontal cortical lesions are unable to anticipate the negative consequences of their choices [3], [30]. Clearly, a study of how patients with frontotemporal dementia perform in the Dictator Game would provide results that would complement our findings. However, even in the absence of such data, our results appear to indicate that decision-making in the Dictator Game is performed without the involvement of short-term memory.

To the need for refining the procedure that discriminates between stage-I AD patients, MCI patients and normal individuals our findings suggest that early tests should not be based on social capabilities, which appear to be identical in stage-I AD patients and normal individuals.

Conclusions

This study could not show any statistically significant difference in the way stage-I AD patients, MCI patients and control subjects perform in the Dictator Game, a game that involves the simplest form of decision making in two-person bargaining. While all three groups of subjects gave more than participants in most previous Dictator Game

experiments, the important point is that, whatever factors were involved in this more generous behavior, AD subjects appear to be affected by them in exactly the same way as control subjects and MCI patients. Moreover, like healthy subjects, AD subjects gave more generously as the receiver changed from being an anonymous or visually-observed individual to a well-known charity.

This experiment enables us to conclude that the memory deficit characteristic of stage-I AD patients appears not to affect their performances when deciding how generous they should be to a third party. Paraphrasing Hoffman et al. (1996, p. 655), we can say that, if it is past experiences that drive participants' decisions, then stage-I AD patients have not lost their memories of these experiences. If it is the future consequences of decisions that shape them, then stage-I AD patients have not lost their concern for how their decisions will be judged. Like healthy subjects, AD patients bring their experiences and their reputation from the outside world into the experimental environment. And, they do this in a same way that could not distinguish them from healthy patients.

To conclude, stage-I AD patients appear to be as capable of making decisions involving the social norms and social preferences that regulate altruism, fairness or reputation as any person of their age. Whatever brain structures are affected by the disease, it appears not to impinge, at this early stage, on the neural basis for cooperation-enhancing social interactions.

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Tables

Table 1: Characteristics of the three subject groups

Subject group	Number	Males	Average age (standard deviation)	
AD	23	14	75.7 (5.7)	
MCI	15	6	73.6 (6.4)	
Control	25 (12 related to patients)	15	70.6 (6.7)	

Table 2. Average amounts given out of 10 Euros (standard deviation) in parenthesis) by the different subject groups in the three treatments

	Anonymous receiver	Two-way identification	Red Cross
AD	€6.52 (€6.17)	€6.69 (€7.04)	€8.04 (€5.5)
MCI	€6.59 (€5.92)	€6.42 (€5.37)	€8.52 (€5.26)
Control	€6.44 (€8.02)	€6.48 (€5.81)	€8.24 (€7.58)

Table 3. Percentage of subjects giving specified proportions reported in the studies carried out by Frey and Bohnet (1995) and Bohnet and Frey (1999) Eckel and Grossman (1996) and in our three treatments (figures pooled over all three subject groups).

Amount offered	Anonymous receiver (Frey and Bohnet 1995, Bohnet and Frey 1999)	Two-way identification (Frey and Bohnet 1995, Bohnet and Frey 1999)	Red Cross (Eckel and Grossman 1996) (Double-blind)	**Anonymous receiver (this study)**	**Two-way identification (this study)**	**Red Cross (this study)**
No offer	28%	0%	27%	1%	0%	0%
Equal division	25%	71%	17%	45%	48%	22%
More than half	0%	11%	15%	41%	40%	71%
mean offer	26%	50%	31%	64%	64%	82%

Figures

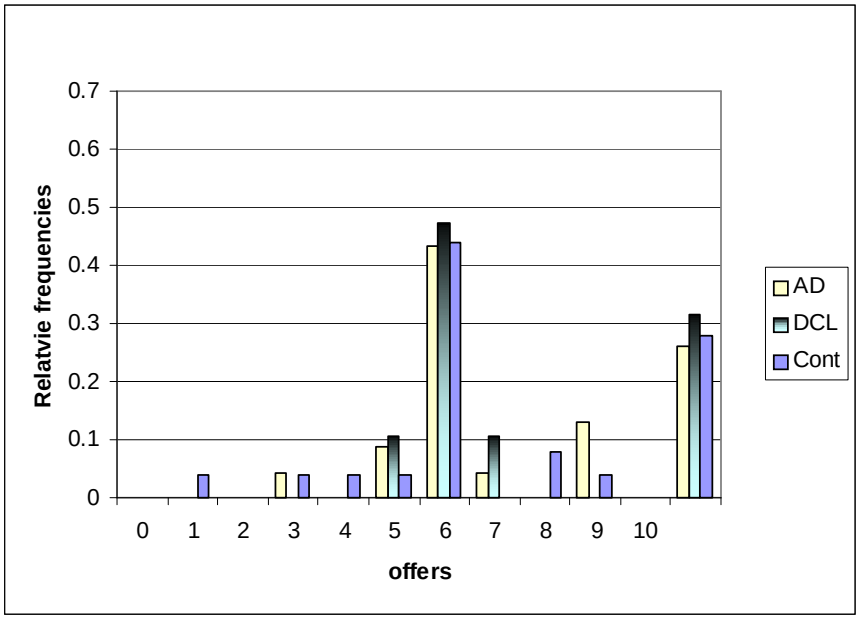

Figure 1a Relative frequencies of offers of a specific amount out of 10 Euros in the anonymous treatment, shown according to subject group.

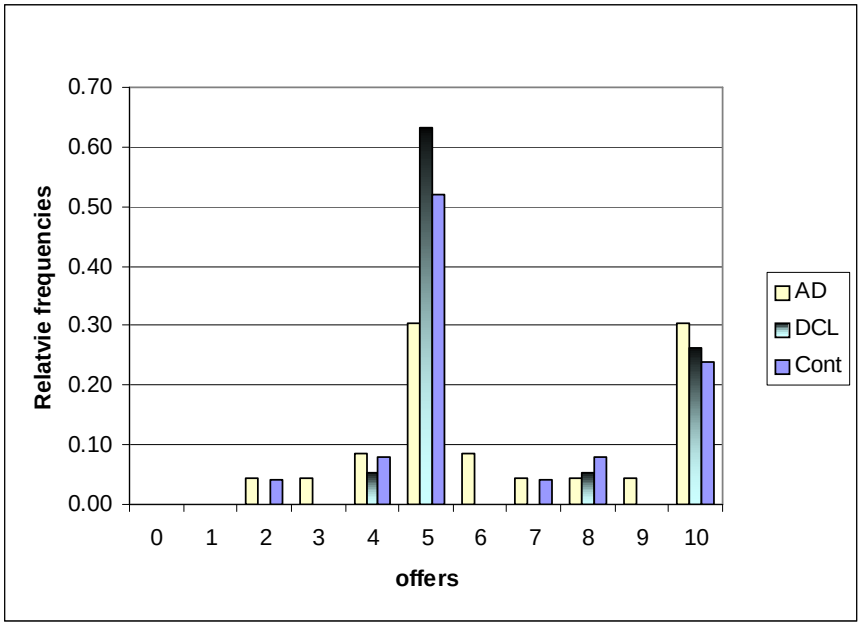

Figure 1b: Relative frequencies of offers of a specific amount out of 10 Euros in the two way identification treatment, shown according to subject group.

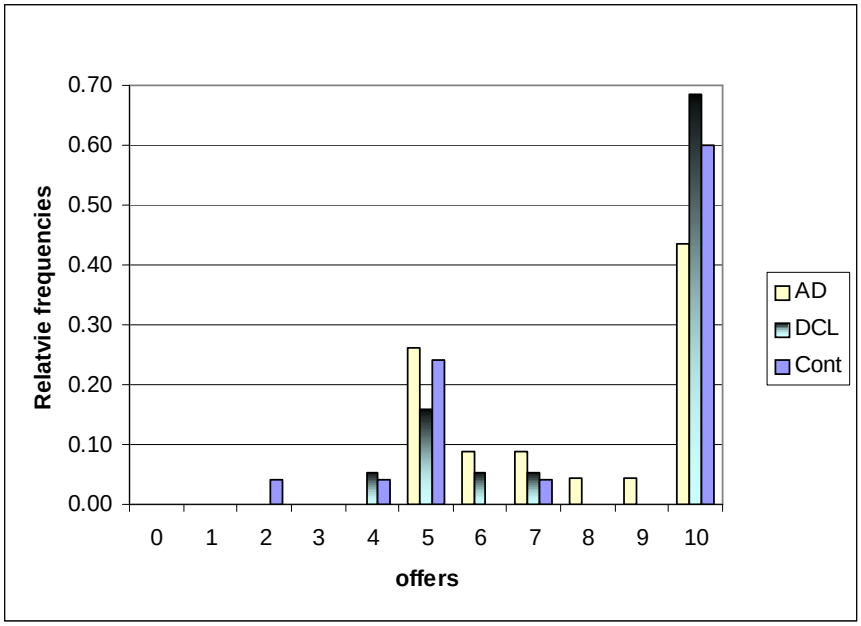

Figure 1c Relative frequencies of offers of a specific amount out of 10 Euros in the Red Cross treatment, shown according to subject group.

Appendix 1: Instructions

The following instructions were read aloud. The participants did not receive a written version as some were illiterate. These are the English translations of the original Spanish versions.

Instructions 1

Good morning. Thank you for participating in the exercise.

In this exercise, each person will be paired with another located in another room. You don't know this person and he or she doesn't know who you are either. In addition, you will not meet each other.

We will now give each of you 10 Euros and an envelope. You have to decide how much out of these 10 Euros you would like to give to the person you don't know and how much you want to keep for yourself.

Put the Euros you want to give to the other person (if any) inside the envelope. Keep the remaining Euros for yourself anywhere you want.

What you do is secret. Nobody will know your decision. For this reason, you are seated behind cardboard screens.

There is no hurry. You have five minutes to decide.

Are there any questions?

PAUSE

This part will be carried out separately after the previous experiment has finished. The persons who enter the room will be dressed conventionally, will be of the same sex as the patient, and will be not too dissimilar in age.

Instructions 2

In the following exercise, each of you will be paired with a person who will enter the room for a moment so that you can see him or her. (These persons enter and position themselves close to their paired subject's chair. The experimenter says "this is the person with whom you are matched" and invites the subjects to look at each other. After a few seconds, the experimenter says "thank you" and "you can go now", and the persons depart).

We will now give you ten Euros and an envelope. You have to decide how much out of these 10 Euros you would like to give to the person you just saw and how much you want to keep for yourself.

Put the Euros you want to give to the other person (if any) inside the envelope. Keep the remaining Euros for yourself anywhere you want.

What you do is secret. Nobody will know your decision. For this reason, you are seated behind cardboard screens.

There is no hurry. You have five minutes to decide.

Are there any questions?

PAUSE

Instructions 3

We will now give you an envelope and ten Euros to be shared with the Red Cross. You have to decide how much out of these 10 Euros you want to keep for yourself and how much you want to give to the Red Cross.

Put the Euros you want to give to the Red Cross (if any) inside the envelope. Keep the remaining Euros for yourself anywhere you want.

What you do is secret. Nobody will know your decision. For this reason, you are seated behind cardboard screens.

There is no hurry. You have five minutes to decide.

Are there any questions?

Appendix 2: Raw patient data.

	GROUP & TIME	CODE	DIAGNOSIS.	GENDER	AGE	SCHOOLING LEVEL	JOB TYPE	LABOR ACTIVITY	EXP 1	EXP 2	EXP 3
									Offers		
		CODE		GENDER F=female,			JOB TYPE	Labor activity			
Sept data	MCI I	A1	MCI I	F	69	Basic reading and writing		Housewife	6	5	10
	9:00	A2	MCI I	M	73	Elementary	CA	Baker	10	8	10
		A4	MCI I	M	78	Can read and write	CA	Building worker	5	5	10
	MCI II	A5	MCI I	M	66	High school	CA	Quality control at nuclear power plants	5	5	10
	9:45	A6	MCII later diagnosed with AD	F	72	Basic reading and writing		Housewife	5	5	5
		A7	MCI I	F	68	Can read and write	CA	Cleaner	5	5	10
		A8	MCI I	M	68	Elementary	CA	Unskilled worker, shoe making	5	5	10
		A9	MCI I	M	79	Can read and write	CA	Farmer	10	10	10
family A5	CONTROL	B1	Control	F	60	Elementary		Housewife	10	10	10
Family A6	10:30	B2	Control	M	79	Can read and write	CA	Farmer	5	5	5
Family C1		B3	Control	F	77	Can read and write		Housewife	5	5	10
Family A7		B4	Control	M	69	Can read and write	CA	Unskilled factory worker	5	5	10
Family		B5	Control	F	67	Can read and write		Housewife	5	10	10

A8											
Family C2		B6	Control	M	81	High school	CA	Accountant	10	10	10
Family C3		B7	Control	F	69	High school	CP	Small shop owner	5	5	5
		B8	Control	M	79	Can read and write	CP	Fisherman	7	7	7
	AD I	C1	AD	M	80	Can read and write	CA	Porter	10	10	10
	11:15	C2	AD	F	79	Elementary		Housewife	10	10	10
	AD II	C3	AD	M	71	Elementary	CP	Small shop owner	5	10	10
	12:00	C4	AD	F	79	Can read and write		Housewife	4	3	6
	AD IV	C7	AD	F	81	Illiterate		Housewife	5	6	5
	13:30	C8	AD	M	85	Elementary	CP	Porter	10	10	10
January data	**9:30**	1.1	MCI	F	73	Basic reading and writing	CA	Cleaner	10	10	10
		1.2	MCI	M	72	Can read and write	CA	Building worker	4	5	5
		1.3	AD	M	71	Elementary	CA	Porter	8	9	10
Family 1.3	**10:00**	2.1	Control	F	69	Can read and write	CA	Tailor	10	10	10
Family 1.2		2.2	Control	F	72	Illiterate	CA	Farm worker	10	8	12
		2.3	Control	M	65	Elementary	CA	Lorry driver	7	8	5
	10:30	3.1	Control	F	80	Can read and write	CP	Fishing entrepreneur (2)	3	4	4
WORKER'S RELATIVE		3.2	Control	F	77	Can read and write	CP	Food shop owner	10	10	10

	3.3	Control	F	67	Elementary	CA	Cleaner	4	4	5
	3.4	Control	M	64	Elementary	CA	Garage manager	2	2	2
	3.5	Control	F	57	Elementary	CP	Office materials entrepreneur (11employees)	0	5	10
11:00	4.1	MCI later AD	F	81	Can read and write	CA	Cleaner	5	4	5
	4.2	MCI later AD	M	78	Elementary	CA	Sound technician RNE	10	10	10
	4.3	MCI	M	70	Illiterate	CA	Building worker	10	10	10
	4.4	MCI later AD	M	78	High school	CA	Building worker	4	4	5
11:30	5.2	AD	F	72	Elementary	CA	Seller of ONCE coupons	5	5	10
	5.3	AD	F	59	Elementary	CP	Self-employed cleaner	10	10	10
	5.4	AD	F	73	Illiterate	CA	Unskilled worker, tobacco factory			
	5.5	AD	F	74	Can read and write	CA	Dressmaker	8	7	7
12:00	6.1	MCI	M	89	Elementary	CA	Docker	5	5	5
	6.2	MCI	F	70	Can read and write	CP	Self-employed dressmaker	6	5	7
	6.3	MCI	M	70	Can read and write	CA	Miner	5	5	10
	6.4	MCI	F	79	Elementary	CP	Painter	10	10	10
Family	**12:30**	7.1	Control	M	70	Elementary	CA	Hospital	10	10	10

8.3								attendant			
Family 8.2		7.2	Control	F	65	Elementary	CA	Bus company worker	5	5	10
Family 8.1		7.3	Control	F	73	Elementary	CA	Nurse assistant	5	5	5
Family 8.1		7.4	Control	M	73	High school	CP	Food comer-cialization entrepreneur (7 employees)	5	5	5
Family 8.4		7.5	Control	M	79	Elementary	CA	Railway worker	8	5	10
		7.6; 5.4	AD	F	73	Illiterate	CA	Unskilled worker, tobacco factory	5	5	5
	13:00	8.1	AD	F	80	High school	CA	Nurse	5	5	10
		8.2	AD	M	71	Elementary	CA	Accountant	10	10	10
		8.3	AD	F	69	Elementary	CA	Nurse assistant	6	6	9
		8.4	AD	F	78	Can read and write	CA	Tailor	5	5	6
	17:00	9.1	MCI	M	63	High school	CP	Electric material entrepreneur (25employees)	5	5	10
		9.2	MCI	M	83	Elementary	CP	Self-employed cobbler	5	5	6
		9.3	MCI	F	77	Can read and write	CA	Kitchen assistant	10	10	10
		9.4	MCI	M	79	Can read and write	CA	Farm worker	5	5	4
		9.5	MCI	M	73	Can read and write	CA	Lorry driver	4	4	5
	17:30	10.1	Control	F	67	Can read and write	CP	Self-employed	5	5	10

							embroiderer			
	10.2	Control	F	60	Can read and write	CP	Catering – hotel business entrepreneur	5	5	10
	10.3	Control	F	75	Can read and write	CA	Unskilled worker, aluminum factory	10	5	10
	10.5	Control	M	72	High school	CP	Decorator	5	5	10
18:00	11.1	AD	M	77	Elementary	CA	Wooden floor installer	8	8	12
	11.2	AD	F	84	Elementary	CP	Catering – hotel business entrepreneur (6 employees)	5	5	7
	11.3	AD	M	76	Elementary	CP	Garage entrepreneur (3 employees)	2	2	8
	11.4	AD	F	74	Can read and write	CP	Self-employed cleaner	5	5	5