

## **Effect of the availability of economic resources on cognitive functions and social preferences**

### **Efecto de la disponibilidad de recursos económicos sobre funciones cognitivas y preferencias sociales**

### **O efeito da disponibilidade de recursos econômicos sobre as funções cognitivas e preferências sociais**

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**Abstract:** The objective of this research was to analyze experimentally the effect of the availability of economic resources on cognitive functions and social preferences in university students. A study with inter-subject experimental design was conducted. 60 university students participated. The performance of participants exposed to conditions of high and low economic resources was compared in tasks of cognitive performance (fluid intelligence and inhibitory control) and social preferences (Ultimatum Game, with offers of different degrees of justice). In general, the results showed that there were no significant differences between the participants of the conditions of low and high economic resources in cognitive functions and social preferences. In contrast, there were differences according to sex in the cognitive domain. The results are discussed in light of previous research and the main limitations are recognized.

**Keywords:** economic resources, cognitive function, social decision making, experiment

**Resumen:** El objetivo de esta investigación fue analizar de manera experimental el efecto de la disponibilidad de recursos económicos sobre funciones cognitivas y preferencias sociales en estudiantes universitarios. Se condujo un estudio con diseño experimental inter-sujetos en el que participaron 60 estudiantes universitarios. Se comparó el desempeño de participantes expuestos a condiciones de altos y bajos recursos económicos en tareas de desempeño cognitivo (inteligencia fluida y control inhibitorio) y de preferencias sociales (Juego del Ultimátum, con ofertas de distinto grado de justicia). En general, los resultados indicaron que no hubo diferencias significativas entre los participantes de las condiciones de bajos y altos recursos económicos en las funciones cognitivas y preferencias sociales. En cambio, hubo diferencias según sexo en el dominio cognitivo. Se discuten los resultados a la luz de investigaciones previas y se reconocen las principales limitaciones.

**Palabras clave:** recursos económicos, funcionamiento cognitivo, decisiones sociales, experimento

**Resumo:** Resumo: O objetivo desta pesquisa foi analisar de maneira experimental o efeito da disponibilidade de recursos econômicos sobre as funções cognitivas e preferências sociais de estudantes universitários. Foi realizado um estudo com desenho experimental intra-sujeitos, no qual participaram 60 estudantes universitários. Comparou-se o desempenho dos participantes expostos a condições de altos e baixos recursos econômicos em tarefas de desempenho cognitivo (inteligência fluida e controle inibitório) e de preferências sociais (Jogo do Ultimato, com ofertas de diferentes graus de justiça). Em geral, os resultados não indicaram diferenças significativas entre os participantes de condições de baixa e alta renda nas funções cognitivas e preferências sociais. Por outro lado, houve diferenças segundo o sexo no domínio cognitivo. Se discutem os resultados à luz de investigações anteriores e se reconhecem as principais limitações.



**Palabras-chave:** recursos económicos, funcionamiento cognitivo, decisiones sociales, experimento

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## Introduction

In Argentina, during the first semester of 2018, 27.3% of the population were living in poverty and 4.9% in indigence (National Institute of Statistics and Census [INDEC], 2018). Against this background different scientific disciplines have contributed to generating knowledge in order to reduce poverty. Specifically, within psychology different studies have analyzed the impact of economical contexts of scarcity on cognitive performance and social preferences (e.g., Ding, Wu, Ji, Chen, & Van Lange, 2017; Graves 2015; Mani, Mullainathan, Shafir, & Zhao, 2013; Shah, Mullainathan, & Shafir, 2012). However, no existing studies have analyzed that impact in a young-adult population in the local context. Thus, we proposed to analyze the effects of scarcity of economic resources in cognitive functions and social preferences using a sample of university students from 18 to 25 years old.

Poverty implies a dynamic and multidimensional condition (Alkire & Foster, 2011; Victor, Fischer, Cooil, Vergara, Mukolo, & Brevins, 2013). Studying this complexity is not easy; thus, traditional economic indicators have measured poverty as implemented in this study.

In experimental contexts, conditions of poverty and wealth have been conceptualized and manipulated in different ways. One way to understand poverty and wealth is in terms of the availability of economic resources. This conceptualization has generated financial scenarios that were easy or difficult to face depending on the abundance or scarcity of money. For example, an easy scenario implies “The economy is going through hard moments, imagine that you are a worker and your boss needs to reduce the budget; thus, your income will decrease by 5%” while a difficult scenario implies “The economy is going through hard moments; imagine that you are a worker and your boss needs to reduce the budget; thus, your income will decrease by 20%”. Mani et al. (2013) exposed participants with different income levels (low/high) to these scenarios and found that the participants with low-income levels have worse performance in cognitive tasks compared to participants that have a high-income level in a hard scenario. Instead, in easy scenarios, the performance was similar between participants with low and high-income levels. The proposal by Mani et al., Grigorieff, Haushofer, and Roth (2015) implies a manipulation of poverty/wealth conditions using difficult and easy financial scenarios, respectively.

Another conceptualization emphasizes the effects of scarcity/abundance of economic resources on different situations of daily life. In laboratory studies, this perspective has been translated to the manipulation of poverty/wealth using priming technique. Bratanova, Loughnan, Klein, Claassen, and Wood (2016) used this technique and found that the participants in the

condition of poverty consumed more calories, concluding that there is a relation between scarcity and obesity.

In addition, Vohs, Mead, and Goode (2006) used priming technique about money for generated poverty/wealth conditions and evaluated the effect on self-sufficiency behavior. The participants have to read a story about a university student. In the condition of “low-money,” the student has to help with the economy of his family due to the fact that they do not have much money. He has grown up in a modest house; he does not have the chance to travel because his family does not have enough money, and so on. While in the condition of “high-money”, the student comes from a rich family, without worries about the availability of money. He has the chance to travel around the world, he can do everything that he wants, and so on.

In line with the above, in previous research (Correa & Reyna, 2017), we analyzed the effectiveness of the three manipulations about poverty/wealth previously exposed (Mani et al. 2013; Bratanova et al. 2016; Vohs et al. 2006). The results demonstrated that the manipulation by Vohs et al. (2006) is the most effective in our context, which was used in this research.

In the last years, the effects of poverty/wealth on cognitive functions have been investigated, specifically on fluid intelligence and inhibitory control (e.g., Graves, 2015; Mani et al. 2013; Spears, 2010). The fluid intelligence refers to the ability to solve novel problems and to adapt to new situations while the inhibitory control is a top-down mental process that blocks out distractions, controls impulsive urges, and overrides prepotent responses (Dean, Schilbach, & Schofield, 2017). Due to the advance that researchers have made on the topic it is possible to affirm that although people have limited cognitive processing (Dean et al., 2017), in contexts of a scarcity of economic resources, this limitation is more pernicious.

Different authors evaluated whether the scarcity of economic resources affects inhibitory control. Mani et al. (2013) and Shah et al. (2012) have used the Dots Task of Diamond to evaluate the cognitive control whereas Graves (2015) and Spears (2010) used a numeric version of the Stroop test. The researchers demonstrated that participants with scarce economic resources have worse performance than the participants with more resources.

Also, Mani et al. (2013) and Graves (2015) evaluated the effect of scarcity of economic resources on fluid intelligence using Raven’s progressive matrices test. Mani et al. (2013) found that people with high and low incomes have similar performance in easy scenarios. However, in difficult scenarios, people with low incomes have worse performance than people with high incomes. However, Graves (2015) did not find differences in performance in the Raven test.

It should be pointed out that in tasks that evaluated fluid intelligence, like the Raven test, it was observed that men have a better performance than women (e.g., Plaisted, Bell & Mackintosh, 2011). Whereas in a task that evaluated cognitive control, like the Stroop test, it was observed that women have better performance (e.g., Baroun & Alansari, 2006). Nevertheless, according to our knowledge, there is no evidence about the role of sex on the performance in the Dots Task of Diamond (Davidson et al., 2006).

In sum, considering the previous evidence in this study we proposed to compare the performance in a fluid intelligence and cognitive control task between participants exposed to a low or high economic resource condition, considering the sex and the income level as covariates. We hypothesized that the participants in the condition of low economic resources will have worse performance.

Not only do poverty/wealth conditions affect cognitive performance but also decisions in social interactions, e.g., social preferences. According to Camerer & Fehr (2004), social preferences are understood as how people believe that economic resources must be distributed. One of the economic games most used for evaluating social preferences is the ultimatum game. In this game one player (proponent), makes an offer about how to distribute the money and the other player (respondent) can accept or reject the offer. If he accepts, both win the amount

offered by the proponent and if he rejects the offer, both players lose the money (Martínez, Zeelenberg, & Rijsman, 2011).

Recently, the researchers have advanced in the comprehension of the effects of poverty/wealth on the decisions in the ultimatum game. Ding et al. (2017) observed that rich people in the respondent role rejected more unfair offers than poor people. In the local context, Mola, Godoy, & Reyna (2018) used social status as an indicator of inequality and found no differences in the decisions regarding different offers in the ultimatum game.

Besides poverty/wealth, dispositional variables as the social value orientation (SVO) influence on social preferences. SVO is defined as the stable preferences of people when allocating resources for themselves and others (Murphy, Ackermann, & Handgraaf, 2011). Previous studies have shown that SVO is related to the decisions that people make in the ultimatum game. Karagonlar and Kuhlman (2012) observed that in the respondent role the prosocial people accepted more unfair offers than individualistic and competitive people. On the contrary, in the local context, Reyna, Blouse, Mola, Ortiz, and Acosta (2018) found that the decisions that participants took in the respondent role were not affected by the SVO.

Also, other studies have shown that emotions affect social preferences. It has been observed that people who experience positive emotions reject fewer unfair offers in the ultimatum game compare to those who experience negative emotions (Andrade & Ariely, 2009; Forgas & Tan, 2013). Likewise, people report more negative emotions to unfair offers than fair ones (Mola et al. 2018; Xiang, Lohrenz, & Read Montague, 2013).

In addition, it has been observed that social preferences differ by sex. Especially, in the ultimatum game women in the proponent role make lower offers, while in the respondent role they reject more offers than men (García-Gallego, Georgantzís, & Jaramillo-Gutiérrez, 2011). In turn, men make more generous offers when the respondent is a woman (Saad & Gill, 2002).

This way, taking into account the previous findings about the impact of poverty/wealth on social decisions making, in this study the decisions in the ultimatum game and the emotional valence to the fair, intermediate, and unfair offers between participants exposed to high or low economic resources, considering SVO, sex, and income level were compared like covariates. It is hypothesized that everyone will accept more fair offers than intermediate and unfair offers and that the participants in the condition of low economic resources will accept more unfair offers than those in the condition of high economic resources. For the rest of the variables, no hypothesis is mentioned since the analysis was exploratory.

## Materials and Methods

### *Design*

We conducted an inter-subject experimental study. Participants were randomly assigned to the condition of high or low economic resources but ensuring that there are equal numbers of participants with high and low family income (according to self-report) in each of the experimental conditions. The dependent variables were: performance in the task of fluid intelligence, performance in the task of inhibitory control, the acceptance rate of fair, intermediate and unfair offers in the Ultimatum Game (UG) and the level of emotional valence generated for the different types of offers in the UG.

### *Participants*

The sample consisted of 60 students from the National University of Córdoba, from 18 to 25 years old ( $M = 21.55$ ,  $SD = 2.05$ ) of both sexes (70% female). The participants were selected through a self-chosen sampling. Five participants were excluded from the sample for taking

medication due to migraines or anxiety. Thus, the sample was made up of 55 university students (67.3% women,  $M = 21.55$  years,  $SD = 2.05$ ).

### ***Instruments***

- *Experimental conditions.* We use the situations used by Vohs et al. (2006) to manipulate poverty/wealth conditions, adapted to the local context by Correa and Reyna (2017). Following Ding et al. (2017) and Vohs et al. (2006) the effectiveness of manipulation was evaluated using a short version of PANAS.

- *Raven's progressive matrix test.* Ten trials of this task were used in computerized format. The participant had to choose the figure that completed the matrix pattern among eight possible figures. There was no time limit to respond. The items of this task were selected from a pool of 36 items of the advanced version of the Raven test (Raven, 2016). To select the items, a previous study was conducted that allowed us to choose stimuli that did not generate a ceiling or floor effect.

- *Diamond points task.* We build a computerized version of this task from the task of Davidson et al. (2006). Throughout several trials a stimulus (heart or flower) appeared on either side of a fixation point. The test included three blocks of increasing difficulty: congruent, inconsistent and mixed.

- *Ultimatum game.* A modified version of the UG (Hu, Cao, Blue, & Zhou, 2014) was used, based on the version computerized by Mola et al. (2018). Participants played in the role of responders during 108 trials. The task they performed consisted of accepting/rejecting offers. The offers were operationally defined as: unfair (1/9, 1.5/8.5, 2/8, 2.5/7.5), intermediate (3/7, 3.2/6.8, 3.8/6.2, 4/6) and fair (4.2/5.8, 4.5/5.5, 4.8/5.2, 5/5). Participants were informed that the offers were proposed by people who participated in previous sessions of the study, although they were pre-programmed. The participants gained money according to their decisions.

- *Self-Assessment Manikin (SAM).* We used the subtest that measures the level of pleasure generated by a stimulus. The participants indicated through a Likert scale how unpleasant or pleasant they considered the different types of offers (12 offers in total, 4 of each type) in the UG.

- *Social Values Orientation Scale.* The participant had to indicate the distribution option he preferred to distribute 100 points between himself and another unknown person. In this study, only the six primary items were used and administered in paper format. It is worth mentioning that this instrument has been adapted to the local context (Reyna et al., 2018). In this task the decisions were also economically incentivized.

- *Sociodemographic questionnaire.* A questionnaire with structured questions was used. Specifically, the participants provided information on age, sex, career and year of study. In addition, during the call to participate in the study, these data were collected more information on the level of income, which allowed to select participants of high and low income and counterbalance their presence in the experimental groups.

More information on the instruments can be found in the supplementary material available at [https://osf.io/qfexm/?view\\_only=a44b3f6a8424425a96be6c04f85a9f5c](https://osf.io/qfexm/?view_only=a44b3f6a8424425a96be6c04f85a9f5c).

### ***Procedure and ethical issues***

Students were invited to participate through various media such as social networks and posters. People interested in participating had to complete socio-demographic information. Subsequently, they were contacted to agree assessment day and time. The assessment was individual. Computerized tasks were programmed in PsychoPy (version 1.82, Pierce, 2007).

The order of presentation of the tasks was as follows: at the beginning the participants completed the SVO Scale, they read the scenarios proposed by Vohs et al. 2006 (according to the experimental condition) and then played UG (in the last rounds of the game they responded to the SAM test). Then, they completed the Raven test and the Diamond test (counterbalanced among participants) and, finally, they completed a sociodemographic questionnaire. At the end of the tasks, the participants received oral information on questions related to the experiment (purpose of the study) and were able to ask questions. Finally, they received the corresponding payment according to the decisions in the UG and the SVO Scale, plus a show-up fee. On average, participants received \$85 (*min* = \$ 66, *max* = \$ 103).

We respect the ethical guidelines for human research recommended by the American Psychological Association (Ethical principles of psychologist and code of conduct, Washington, DC, American Psychological Association, 2010) and local codes of ethics (College of Psychologists of the Province of Córdoba, 2016; Federation of Psychologists of the Argentine Republic, 2013). Informed consent forms were used and efforts were made to ensure the proper use and handling of the information. In addition, the protocol applied in this study was approved by the Ethics Committee of the National Hospital of Clinics of the city of Córdoba, Argentina.

### ***Data analysis***

Descriptive analyses and group comparison analyses were carried out. When the assumptions of the parametric analyses were fulfilled, multivariate analyses of covariance (MANCOVAs) followed by univariate analyses (ANCOVAs) were carried out. In cases where the assumptions were not met, non-parametric analyses were carried out (Mann-Whitney). In addition, the Pearson (or Spearman) *r* coefficient was calculated to assess the relationship between sex, income level, SVO, Raven and Diamond's tests performance, and performance in the UG. A significance level of .05 was established and the effect size was considered. The statistical program SPSS 23 was used.

## **Results**

### ***Effectiveness of the experimental manipulation***

The levels of affectivity between GB and GA were compared and, as expected, no statistically significant differences were observed. Additionally, the income level between the two groups was compared with no significant differences (Table 1). Although one of the effect sizes was medium, the confidence interval indicates that it may be due to random fluctuation, perhaps linked to the sample size.

Table 1.  
*Effectiveness of the experimental manipulation*

	LG ( <i>n</i> = 28)		HG ( <i>n</i> = 27)		<i>t</i> (gl)	<i>p</i>	<i>d</i> of Cohen [IC 95%]
	<i>M</i>	<i>DS</i>	<i>M</i>	<i>DS</i>			
Affectivity							
Positive	3.30	0.82	3.59	0.57	-1.52(53)	.13	0.41 [-0.12, 0.95]
Negative	1.74	0.61	1.70	0.55	0.26(53)	.78	0.07 [-0.60, 0.46]
Income level	5.32	3.51	5.44	3.44	-0.13(53)	.89	0.04 [-0.49, 0.56]

### *Performance in cognitive tests*

Five participants presented atypical scores in some cognitive tests, so those cases were excluded from the following analyzes. Therefore, the sample consisted of 50 university students (64% female,  $M = 21.66$  years,  $DS = 2.07$ ).

#### *Fluid intelligence – Raven test*

The assumptions of normality and homogeneity of variances for the dependent variables were examined, fulfilling them in an acceptable manner. The results indicated statistically significant differences in the performance in the vector of means that included the variables dependent on the Raven test according to sex (Lambda de Willks = .680;  $F(2,45) = 3.652$ ,  $p = .034$ ,  $\eta^2_p = .140$ ). While there were no significant differences considering the experimental condition (Lambda de Willks = .962;  $F(2,45) = .897$ ,  $p = .415$ ,  $\eta^2_p = .038$ ) or the income level (Lambda de Willks = .903;  $F(2,45) = 2.420$ ,  $p = .100$ ,  $\eta^2_p = .097$ ).

When comparing the number of correct answers in the Raven test between the GB and the GA, it was observed that the participants of the GB responded less correctly than those of the GA, but the difference was not statistically significant (Table 2). However, there were statistically significant effects of the covariates sex and income level (Table 3).

To advance the understanding of the role of covariates, correlation analyzes were conducted. The relation between income level and sex with number of correct answers was statistically significant and positive (Table 4). By reiterating the correlation analyzes for each experimental group it was found that in the LG the level income and sex were not related with the performance in the Raven test. When controlling for sex, the relationship between income level and Raven performance was not significant either (Table 5). While in the HG, the income level and sex were related with the performance in the Raven test. However, controlling for sex, the relation between income level and performance in the Raven test ceased to be significant (Table 6).

When considering the reaction time that the participants in the Raven test had, it was observed that, although the participants from LG had a shorter reaction time than those from HG, statistically significant differences were not observed. In this case, no significant effects of the covariates were observed (Table 2).

*Inhibitory control – Diamond test*

The normality and homocedasticity analyzes were not fulfilled, so it was decided to conduct non-parametric analyzes. The results indicated a statistically significant difference between the experimental groups in block 1. The participants of HG answered a greater number of responses to congruent stimuli than the participants of LW. Regarding the level of efficiency of the responses and the reaction time in each block, the comparison between the LG and HG did not show statistically significant differences (Table 7).

Subsequently, the relationships between sex, level income and dependents variables were inspected. For both the variable number of responses and the efficiency of the responses, no significant relationships were found with sex and income level. However, the relation between reaction time and sex in each of the blocks was statistically significant, but the relation with income level was not significant (Table 4).

By reiterating the analyzes for each group, parametric analyzes were implemented to be able to appreciate partial correlations in a simple way. It was found that in GB the level of income and sex were not related to performance in Diamond. When controlling for sex, the relationship between income level and Diamond performance was not significant either (Table 5). While in the GA the income level was not related to the performance in Diamond, however sex was related to the performance in blocks 1 and 3 (Table 6).

Table 2.

*Descriptive statistics for Raven and SAM according to experimental condition*

	LG		HG	
	<i>M</i>	<i>DS</i>	<i>M</i>	<i>DS</i>
Raven				
Correct answers	3.44	2.36	3.68	2.60
Reaction time	30.25	12.68	36.18	19.12
SAM				
Fair	6.51	1.06	7.12	1.26
Intermediate	4.32	0.96	4.73	1.26
Unfair	2.35	0.77	2.25	1.05

Table 3.

*Comparison analysis for Raven and SAM according to experimental condition*

	Experimental group	Sex	Income level
Raven Correct answers			
<i>F</i> (df)	0.137(1,46)	7.157(1,46)	4.521(1,46)
<i>p</i>	.71	.01	.04
<i>n</i> <sup>2</sup> <sub><i>p</i></sub> [IC 95%]	.00 [0, 0.10]	.14 [0.01, 0.31]	.09 [0, 0.26]
Raven Reaction time			
<i>F</i> (df)	1.789(1,46)	2.657(1,46)	2.210(1,46)
<i>p</i>	.19	.11	.14
<i>n</i> <sup>2</sup> <sub><i>p</i></sub> [IC 95%]	.04 [0, 0.19]	.06 [0, 0.21]	.05 [0, 0.20]
SAM			
<i>F</i> (df)	1.678 (1,41)	0.397 (1,41)	0.196 (1,41)
<i>p</i>	.20	.53	.66
<i>n</i> <sup>2</sup> <sub><i>p</i></sub> [IC 95%]	.04 [0, 0.20]	.01 [0, 0.13]	.00 [0, 0.11]



Table 4.

*Pearson and Spearman correlation matrix of the variables in Raven and Diamond performance, income level and sex*

	Income level	Sex
Raven		
Correct answers	.35*	.41**
Reaction time	.26	.27
Diamond		
Answers		
Block 1	-.08	.15
Block 2	-.04	.27
Block 3	.07	-.06
Efficiency		
Block 1	-.08	.08
Block 2	-.09	.24
Block 3	-.03	-.18
Reaction time		
Block 1	-.07	-.39**
Block 2	-.13	-.29*
Block 3	-.08	-.48**

\*\* The correlation is significant at level 0.01

\* The correlation is significant at level 0.05

Table 5.

*Pearson's correlation matrix of the variables in Raven and Diamond performance, income level and sex for LG*

	Income level	Sex	Income level controlling by sex
Raven			
Correct answers	.24	.36	.23
Reaction time	.34	.19	.33
Diamond			
Answers			
Block 1	-.31	-.05	-.31
Block 2	-.22	.25	-.24
Block 3	.17	-.15	.18
Efficiency			
Block 1	-.27	-.15	-.27
Block 2	-.17	.22	-.18
Block 3	.25	-.33	.28
Reaction time			
Block 1	-.01	-.18	.00
Block 2	.08	.04	.08
Block 3	.25	-.30	.27

Table 6.

*Pearson's correlation matrix of the variables in Raven and Diamond performance, income level and sex for the HG*

	Income level	Sex	Income level controlling by sex
Raven			
Correct answers	.45*	.45*	.35
Reaction time	.21	.34	.11
Diamond			
Answers			
Block 1	.12	.23	.04
Block 2	.10	.25	.02
Block 3	-.19	-.10	-.16
Efficiency			
Block 1	.13	.20	.07
Block 2	-.09	.19	-.16
Block 3	-.38	-.29	-.31
Reaction time			
Block 1	-.15	-.50*	.02
Block 2	-.33	-.38	-.24
Block 3	-.23	-.64**	-.03

\*\* The correlation is significant at level 0.01

\* The correlation is significant at level 0.05

Table 7.

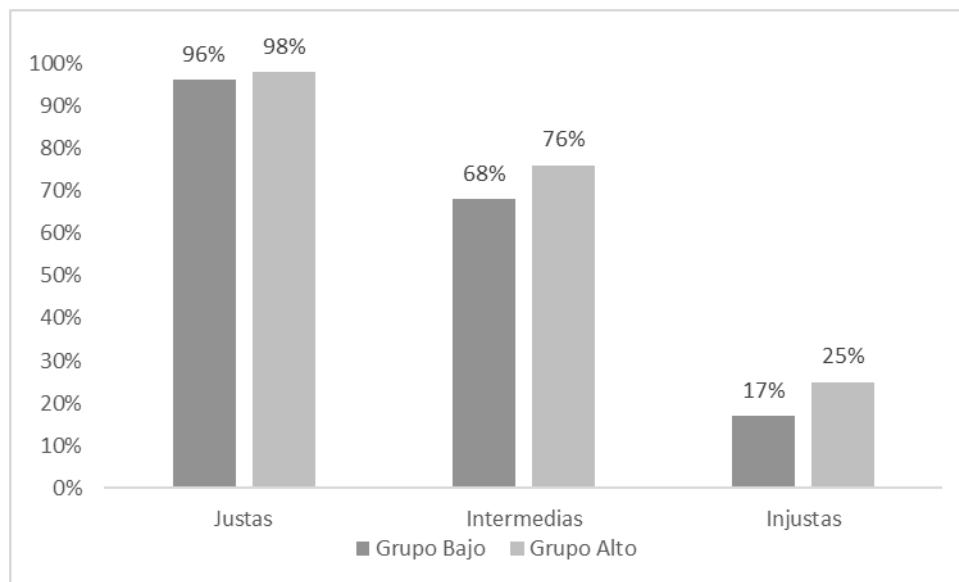
*Diamond test performance according to experimental condition*

	LG		HG		U	p	d of Cohen
	Mdn	R	Mdn	R			
Diamond							
Answers							
Block 1	12.00	12.00	12.00	6.00	226.00	.03*	0.49
Block 2	14.00	14.00	14.00	4.00	304.00	.84	0.05
Block 3	21.00	24.00	22.00	10.00	257.00	.28	0.31
Efficiency							
Block 1	1.00	1.00	1.00	0.33	236.50	.10	0.37
Block 2	1.00	0.18	1.00	0.17	278.00	.60	0.13
Block 3	0.87	0.48	0.94	0.42	238.50	.21	0.36
Reaction time							
Block 1	1.46	0.95	1.41	0.46	259.50	.30	0.29
Block 2	1.51	0.97	1.43	1.34	299.00	.79	0.07
Block 3	1.66	0.94	1.70	0.43	299.00	.79	0.07

### *Social decisions – Ultimatum game and emotional valence*

Nine participants accepted all the offers in the Ultimatum Game (UG), so it was decided to exclude them. Thus, the sample consisted of 46 university students (69.6% female,  $M = 21.46$  years,  $DS = 2.05$ ). The assumptions of normality and homogeneity were evaluated. The analysis performed indicated that such assumptions were not fulfilled. However, parametric techniques were used to compare the decisions of the participants of the experimental conditions taking into account how robust the ANOVA is to the breach of these assumptions.

The results indicated a significant effect only for the type of offer (Lambda de Willks = .331;  $F(2,40) = 40.436$ ,  $p = <.001$   $\eta^2_p = .669$ ), while were not resulted significant the interactions with de experimental group or the covariates. Peer comparisons (Bonferroni adjustment) showed statistically significant differences between the three types of offers. The acceptance rate for fair offers was higher than for intermediate and unfair offers. There were no statistically significant differences between the LG and HG in the decisions in the UG, nor interaction between the experimental condition and the type of offer. In descriptive terms, it was observed that the participants of the LG accepted fewer fair, intermediate and unfair offers than the participants of the HG (Figure 1).



*Figure 1.*

Acceptance rate of the offers in the JU according to the experimental condition

Regarding the emotional valence generated by the offers the results indicated a significant effect only for the type of offer (Lambda de Willks = .373;  $F(2,40) = 33.690$ ,  $p = .000$ ,  $\eta^2_p = .627$ ), while the interactions with the experimental group or with the covariates were not significant. Peer comparisons (Bonferroni adjustment) showed statistically significant differences between the three types of offers (Table 3). The level of pleasure was higher for fair offers than for intermediate and unfair offers. Although the interaction between the experimental group and type of offers was not resulted statistically significant, in descriptive terms it was observed that the participants of LG tended to consider fair and intermediate offers less pleasant than the participants of the HG. In turn, the participants of the LG considered more pleasant the unfair offers than those of the HG (Table 2).

## Discussion

In this research, we proposed to analyze the effect of the availability of economic resources on cognitive performance and social preferences. The results obtained are discussed below, in the context of the reviewed background.

Regarding cognitive performance, on the one hand, the results showed that there were no statistically significant differences in fluid intelligence performance between the LG and HG. These results coincide with those observed by Graves (2015) but are in the opposite direction to those found by Mani et al. (2013). It should be noted that the comparison with this last work cannot be made directly because the conformation of the groups is dissimilar. Mani et al. (2013) compared group performance which was defined from the income level of the people; however, in this study the groups were formed using the manipulation of Vohs et al. (2006), a manipulation that probably had no effect on cognitive variables. In fact, in this study, the income level of the participants was positively related to the performance in Raven's task, in line with the results by Mani et al. (2013).

On the other hand, the results indicated that there were no statistically significant differences in the performance in the inhibitory control between the LG and HG, except in the first block of the Diamond test. The results are in line contrary to those reported in the literature (e.g., Graves, 2015; Mani et al. 2013; Shah et al. 2012; Spears, 2010). However, it is worth noting some differences between these works and our study. First, the same experimental manipulation of poverty/wealth was not used (e.g., Spears used a Market Game). Second, the tasks that evaluated the cognitive constructs are different (e.g., Shah evaluates inhibitory control through the numerical Stroop). Finally, the characteristics of the samples are also dissimilar (e.g., Graves turned to a sample of fishermen).

In addition, it was observed that the performance in both cognitive domains varies according to the sex of the people. Specifically, the results in the Raven test indicated that men responded more correctly than women, consistently with previous studies (e.g., Plaisted et al., 2011). Instead, men responded faster to stimuli in the three blocks of the Diamond test. Baroun and Alansari (2006) observed the opposite result but using the Stroop test. Future studies could further investigate the role of sex in cognitive performance.

Regarding social preferences, the results obtained from the comparison of the decisions in the UG between the LG and HG demonstrated that there were no statistically significant differences in the acceptance rate. In relation to the justice level of the offers, the results showed that the participants accepted more fair offers than intermediate and unfair offers, in coincidence with what was observed by Mola et al. (2018).

Although no significant effect of interaction was observed between the experimental condition and the level of justice of the offers, in descriptive terms the results indicated that the participants in the LG accepted the unfair offers less than those of the HG, which goes in the opposite direction to what was found by Ding et al. (2017). A possible explanation for these contradictory results may be due to the emotions people experience. Kraus, Horberg, Goetz, and Keltner (2011) found that people with a low socioeconomic status experience more negative emotions than those with high status. In addition, Hu et al. (2014) express that people with a low position in a social hierarchy tend to experience more negative emotions regarding unfair offers compared to those with a high position and that this negative emotional state could decrease the acceptance rate of such offers in the UG.

Also, the results obtained from the comparison of the level of emotional valence generated by the offers in the UG indicated that participants considerate fair offers more pleasant than the intermediate and unfair offer, coinciding with what was observed in the previous literature (Mola et al. 2017; Xiang et al. 2013). Although there was no significant interaction effect between the experimental condition and the level of pleasure of the offers, in descriptive terms

the participants of the HG considered fair and intermediate offers more pleasant than those of the LG. In addition, participants of HG considered unfair offers less pleasant than those of the LG. To our knowledge, there are no previous studies that inquire about the level of pleasure generated by each type of offer considering GA and GB. A possible explanation to these results may be due to what Ding et al. (2017) and Hu et al. (2014) call “entitlement”, namely, that people in a high position in the hierarchy believe they deserve a fairer treatment. Probably, participants of the HG considered the unfair offers less pleasant for believing that they did not deserve such distribution.

To sum up, no statistically significant differences were observed between GB and GA in the dependent variables analyzed. As mentioned before, a possible explanation can be derived from the handling technique used. In recent years, the number of studies that are repeated in the priming technique to manipulate poverty/wealth conditions has increased (Vohs, 2015). However, there are few studies that have managed to replicate the effects of this technique on human behavior (Belaus, Freidin, & Reyna, 2018). With this in mind, the results derived from studies that use priming to manipulate poverty/wealth should be considered with caution (e.g., Bratanova et al. 2016; Vohs et al. 2006).

This research is not without limitations. The first and most important one refers to experimental manipulation. To check the effectiveness of the experimental manipulation, we consider the level of affectivity, as did other researchers (e.g., Ding et al., 2017; Vohs et al., 2006). However, it would be advisable to consider other indicators to assess the success of the manipulation. In addition, future studies could focus on the replication of the studies where poverty/wealth conditions have been manipulated. This would allow for greater clarity on the effectiveness of manipulations and thus would be able to examine their impact in different domains.

Another limitation refers to the omission of some variables that could be mediating the impact of the poverty/wealth conditions on cognitive functions. For example, stress (e.g., Cohen, Doyle, & Baum, 2006; Hjelm, Handa, De Hoop, Palermo, & Zambia C.G.P., 2017). Thus, future studies could incorporate this variable for explicating the effects of poverty on different cognitive or social domains.

In summary, this research advanced in the generation of local empiric evidence about the effects of poverty/wealth conditions on cognitive functioning and social preferences in experimental contexts, a contribution that is considered fundamental for the generation of evidence-based interventions to reduce multidimensional problems such as poverty.

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