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Mach-IV: Evidence of Structural, Discriminant and Predictive Validity with Argentinian Students

Mach-IV: evidencia de validez estructural, discriminante y predictiva con estudiantes argentinos

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Machiavellians are defined as self-interested and manipulative people, who use others as mere means for their ends. The Mach-IV scale consists of 20 items measuring different aspects of Machiavellianism. In this study, we investigate the psychometric properties of the Mach-IV Scale with Argentinian university students. First, we translated and adapted the Mach-IV Scale to the target culture. Second, we evaluated the structure and internal consistency of the scale. Third, we examined the correlation between Mach-IV and Social Value Orientation (SVO), and between the Mach-IV scale and decisions and expectations in a Dictator Game (DG), both in its "give" and "take" versions. None of the structures evaluated showed good indexes of fit. We opted for the original one-factor structure but without items 19 and 20. Assuming such a structure, we observed negative correlations between the Mach-IV scale and SVO, and between the Mach-IV scale and cooperation in the DG. Materials, data, and scripts are available at https://bit.ly/2In6fgI.
Keywords: Machiavellianism, psychometry, cooperation, social value orientation, Dictator Game.

El maquiavelismo es definido como una tendencia egoísta y manipulativa, caracterizada por usar a otros como medios para fines propios. La Escala Mach-IV consiste en 20 ítems que evalúan distintos aspectos del maquiavelismo. En este estudio indagamos sobre las propiedades psicométricas de la escala Mach-IV con estudiantes universitarios argentinos. Primero tradujimos y adaptamos la escala a la cultura local. Segundo, evaluamos su estructura y consistencia interna. Tercero, examinamos la correlación entre la escala Mach-IV y la Orientación de Valores Sociales (SVO en inglés), y entre la escala Mach-IV y decisiones y expectativas en versiones "Dar" y "Tomar" del Juego del Dictador. Ninguna de las estructuras evaluadas mostró buenos índices de ajuste. Optamos por la estructura original de un factor, pero excluyendo los ítems 19 y 20. Asumiendo esa estructura, observamos correlaciones negativas tanto entre la escala Mach-IV y SVO, como entre la escala Mach-IV y cooperación en el Juego del Dictador. Los materiales y bases de datos se encuentran disponibles en https://bit.ly/2In6fgI.
Palabras clave: Maquiavelismo, psicometría, cooperación, orientación de valores sociales, Juego del Dictador.

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Introduction

Machiavellianism refers to interpersonal strategies that advocate self-interest, deception, and manipulation. It is also defined as the behavior of using others as devices for achieving goals (Bereczkei et al., 2015; Christie & Geis, 1970). Machiavellian people behave in a self-interested manner and show a tendency to be callous, selfish, and malevolent in their interpersonal relationships (Paulhus & Williams, 2002). Machiavellian behavior involves the endorsement of deception and manipulation in interpersonal interactions, a cynical view of human nature as weak, coward and susceptible to social pressures, and a disregard for conventional morality (Bereczkei et al., 2015; Corral & Calvete, 2000). It should be pointed out that the study of Machiavellianism has been indentified as a predictor of white-collar crimes (Paulhus, 2014) and related to fraud and corruption (Zhao, Zhang, & Xu, 2016). Furthermore, Machiavellianism has been related to violence (Pailing, Boon, & Egan, 2014) and unethical behavior in the workplace (Castille, Buckner, & Thoroughgood, 2018).

Regarding the measurement of Machiavellianism, Christie and Geis (1970) developed two versions of a scale denominated Mach-IV (Likert-type) and Mach-V (forced-choice-type). The original version of the Mach-IV Scale (Christie & Geis, 1970) is composed by three dimensions: tactics (nine items), views of human nature (nine items) and abstract morality (two items) (Christie & Lehman, 1970). The Mach-IV Scale is the most widely employed instrument for measuring Machiavellianism (e.g., Brewer et al., 2018; Clemente, Padilla-Racero, & Espinosa, 2020; Fehr, Samson, & Paulhus, 1992; Monaghan, Bizumic, & Sellbom, 2016). In addition, the original work made by Christie and Geis (1970) has 2,103 cites in Scopus which demonstrate the relevance of that research in the field.

The psychometric properties of the Mach-IV Scale have been studied in different countries (e.g., Brazil [Monteiro, Coelho, Cavalcanti, Grangeiro, & Gouveia, 2022]; Germany [Rauthmann, 2013]; Hungary [Czibor, Vincze, & Bereczkei, 2014; Szijjarto & Bereczkei, 2014]; Pakistan [Qadir & Khalid, 2017]; Portugal [Esteves-Pereira, Azeredo, Moreira, Almeida, & Brandão, 2020]; Spain [Corral & Calvete, 2000]). Several studies have shown that the factorial solution is unclear. For example, Monagan et al. (2016) found two factors: views and tactics. Corral and Calvete (2000) identified four factors: positive view of human nature, cynical view of human nature, positive interpersonal tactics, and negative tactics. In turn, Qadir and Khalid (2017) and Esteves-Pereira et al. (2020) found four different factors: negative interpersonal tactics, positive interpersonal tactics, cynical view of human nature, and positive view of human nature. Besides, Ahmed and Stewart (1981) identified five: tactics, tactics negative, Pollyanna syndrome, Machiavellian views, and moral ideal. Furthermore, Monteiro et al. (2022) found that the structure of two factors (views and tactics) has a better fit than the structure of one factor and three factors (tactics of interpersonal manipulation, cynical view of humanity and lack of morality). From one research to another, what differs is not only the number of retained factors or the labels applied on the factors but also the number of items. For example, Hunter, Gerbing and Boster (1982) removed seven of the 20 items while Monagan et al. (2016) deleted 10 items. Corral and Calvete (2000) suggested that item 19 should be eliminated because the social consideration of euthanasia has changed since the scale was developed. Also, several studies modified the Mach-IV scale by rewording items (e.g., Monagan et al., 2016) or adding dimensions (e.g., Corral & Calvete, 2000) to get a good fit. Further, some researchers consider Machiavellianism as a multidimensional construct with cognitive, emotional, motivational, and behavioral components (e.g., Rauthmann & Will, 2011) but recognizes that Machiavellianism is conceptually unclear (e.g., Rauthmann, 2013). Fehr et al. (1992) also noted that there is no single theory prescribing a clear factorial structure of Machiavellianism and that the Mach-IV Scale has been frequently scored as a unitary construct. These authors postulated that the total score may be more useful to predict certain behaviors, which favors the use of the scale as a unidimensional measure.

In general, Cronbach's alpha indices for the Mach-IV Scale (indicator that we will use in this study) vary between .61 and .82, although some authors observed low reliability for the subscales. For example, Corral and Calvete (2000) found the following values: .50, .53, .62, and .40 for the subscales positive view of human nature, cynical view of human nature, positive interpersonal tactics, and

negative tactics, respectively. Because of this lack of clarity, we believe more evaluations about the structure and functionality of this scale is needed.

When evaluating the availability of versions that can be employed in Argentina, we found none in the literature. Although there is a Spanish version adapted for the population of Spain (Corral & Calvete, 2000), Latin American countries have their idiomatic expressions and their culture is different from the Spanish population, which would make it inappropriate to use this version of the Mach-IV scale in Argentina. Besides, even when there is a Brazilian version adapted for the population of Brazil (Monteiro et al., 2022), the language between this country and Argentina is different, and the data of this study was collected before Monteiro et al. (2022) adaptation. Furthermore, counting with an Argentinian version of the Mach-IV scale would be useful for researchers interested in corruption and white-collar crimes, topics that have a crucial relevance in recent years in Argentina.

Machiavellianism has been related to low levels of prosocial orientation. Individuals with low levels of Machiavellism (LM; Mach-IV scores < 94; Bereczkei & Czibor, 2014) are less likely to show concern about other people's wellbeing beyond their self-interest as compared to individuals with high levels of machiavellism (HM; Mach-IV scores > 109; Bereczkei & Czibor, 2014). Böckler, Tusche, and Singer (2016) observed a negative relation between Machiavellianism (e.g., Machiavelli Index) and prosociality (e.g., Social Value Orientation Scale) measures. Recently, Lee, Kim, Kim, and Ko (2018) found that a proself orientation was positively related to a dimension of the Machiavellianism Personality Scale (MPS) from Dalhing, Whitaker and Levy (2009) called amoral manipulation, defined as the will to ignore moral standards and value behaviors that benefit one at the expense of others.

The Mach-IV Scale has been related to decisions in experimental games modeling the distribution of economic resources. Dictator Game (DG) or Dictator Game Giving (DGG) is an economic game widely used to measure social preferences in the distribution of economic resources (Camerer, 2003). In the classic DG, Player 1 (dictator) divides an amount of money between him and Player 2 (recipient). A modified version of the DG is called Taking (DG-Take). In this version, the dictator decides how much money to take from the recipient, instead of offering money. Some studies found that individuals with high Mach-IV scores gave less money in the DG-Give (Spitzer, Fischbacher, Herrnberger, Grön, & Fehr, 2007; Zhang & Ortmann, 2016) and took more money in the DG-Take (Zhang & Ortmann, 2016).

Another game that measures cooperative behavior is the Public Good Game (PGG). In this game, players receive an amount of money, and they decide how much to contribute to a common pool. Then, the money raised in the shared pool is multiplied and distributed equally among players, regardless of the contribution made individually. Bereczkei and Czibor (2014) observed that HM contributed less but collected a higher amount of money than LM in a PGG. In addition, using the Joy of Destruction Game (in which there are two players, each player earns an endowment, and both players can mutually and simultaneously destroy each other's endowments), Zhang and Ortmann (2016) found that individuals with high Mach-IV scores did not destroy more money than individuals with low Mach-IV scores , but they ended up earning more money, showing that individuals with high Mach-IV scores are not nasty if it is not beneficial for themselves. Some authors pointed out that Machiavellians are not concerned about compliance with moral and social norms (Spitzer et al., 2007). Czibor et al. (2014) suggest that Machiavellians prioritize personal gain instead of complying with a social norm. Using Public Goods Games with punishing and non-punishing conditions, Spitzer et al. (2007) observed that individuals with high Mach-IV scores made the largest profit because they paid little money under non-punishable conditions, but they avoided punishment by raising their contribution under punishable conditions. These findings suggest that Machiavellians can opportunistically adjust their behavior when they face the risk of punishment or other threats to their self-interest.

In this study, we analyzed the psychometric properties of the Mach-IV Scale with Argentinian university students. First, we translated and adapted the items of the scale. Second, we evaluated its construct validity and internal consistency. Third, we examined the discriminant and predictive validity of the scale regarding the Slider Social

Value Orientation Scale, and cooperative decisions and expectations in give and take versions of a Dictator Game.

Method

Participants

Four hundred and seventy-two students from the National University of Cordoba (M = 24.11 years old, SD = 4.5; 81.4% women) completed at least the Mach-IV Scale, while 387 completed all the tasks of this study (see instruments section), which was available online from June 29th to July 27th, 2017. For evaluating the psychometric properties of the Mach-IV Scale, we employed the data from participants who answered the scale (n = 472), whereas for discriminant and predictive validity, we used only the data of those who completed all the tasks (n = 387).

Instruments

Mach-IV. To generate an appropriate version of the Mach-IV Scale (Christie & Geis, 1970) for our population, we opted for a committee approach translation (Furukawa, Driessnack, & Colclough, 2014; Swaine-Verdier, Doward, Hagell, Thorsen, & McKenna, 2004). Two of the authors of this manuscript and two invited researchers (all bilingüals) generated independent translations for each Mach-IV item. After that, the authors of this work and one external collaborator evaluated the translations for accuracy, simplicity, clarity, and adequacy to the local culture. This process continued until an agreement was reached for each item, providing a first version of the translated scale. We conducted four cognitive interviews for the first version with students from the Universidad Nacional de Córdoba to evaluate item comprehension. We did not amplify the sample due to the high convergence of answers (theoretical saturation). We modified the items that showed difficulties or multiple interpretations. The final version included 20 items adapted from the original scale maintaining the original order of items. Participants indicated their degree of agreement with each sentence on a 6-point Likert-type scale (1 = *strongly disagree*, 6 = *strongly agree*).

Social Value Orientation. Social Value Orientation (SVO) refers to individual preferences for the distribution of resources between the self and another person. We used the Social Value Orientation Slider Measure (SVO-SM) proposed by Murphy, Ackermann and Handgraaf (2011). This measure evaluates the SVO as a continuous construct, in addition to a categorical classification (prosocial, individualistic, and competitive). We implemented the six primary items, which locate a person in a continuum ranging from altruistic to competitive orientation, passing through prosocial and individualistic orientations. Each participant indicated how they preferred to distribute the money between themselves and another anonymous person in the different items. Each item comprises nine alternatives for the distribution of money. This scale was adapted for the local population (Reyna, Belaus, Mola, Ortiz, & Acosta, 2018), and showed adequate properties of temporal stability and convergent validity with the Triple Dominance Orientation Measure (Van Lange, Otten, De Bruin, & Joireman, 1997).

Cooperation in Give and Take Dictator Games. Participants played a Dictator Game (DG) in two possible variations, Dictator Game Giving (DG-give; Kahneman, Knetsch, & Thaler, 1986; Forsythe, Horowitz, Savin, & Sefton, 1994) and Dictator Game Taking (DG-take; Bardsley, 2008). In DG-give, participants decided how much (from AR$ 0 to AR$ 100) to give to an anonymous person (a higher amount is associated with greater cooperation). On the contrary, in the DG-take, the other person had the money, and the dictator chose how much to take from that person (from AR$ 0 to AR$ 100; a lower amount is associated with greater cooperation).

Procedure

Throughout the study we followed the ethical guidelines for human research suggested by the American Psychological Association (2017) and the Argentinean National Law on the Protection of Personal Data #25326. The study was approved by the ethics committee of the Instituto de Investigaciones Psicológicas (Universidad Nacional de Córdoba).

The study was conducted online through a LimeSurvey™ digital platform. After consenting participation, participants completed the Mach-IV scale and the six main items of the SVO (Reyna et al., 2018). The presentation order of these scales was randomly assigned (51.7% completed the Mach-IV Scale first). The T-test results showed

that there were no differences in the Mach Scale total score due to application order: Mach first: M = 51.10, SD = 11.31; SVO first: 51.36, SD = 10.62; $t(1,385) = -.236$; $p = .814$.

After completing the Mach-IV and SVO scales, participants expressed their preference in one of two versions of the hypothetical Dictator Game (DG-give, 46.3%, DG-take, 53.7% of the sample). Participants also expressed their beliefs about how much would the majority of participants (give)take (to)from the other person (empirical expectations; Bicchieri, 2006), and what the majority of people would consider appropriate to (give)take (to)from the other person (normative expectations, Bicchieri; 2006) as indicators for social norms. Participants were randomly assigned to complete only the DG game (n = 126), the DG followed by beliefs (n = 128), or the beliefs followed by the DG (n = 133).

Data analysis

Factor analyses. First, the sample (n = 472) was randomly divided into two subsamples to explore the dimensionality of the scale (EFA), and to run confirmatory analyses (CFA) respectively. Before proceeding with the EFA and CFA, we conducted preliminary analyses of cases and variables. Cases with z values > ±3.29 were considered univariate outliers, and multivariate outlier cases were evaluated at a level $p < 0.001$ (Tabachnick & Fidell, 2001). Asymmetry and kurtosis values were excellent in the ±1 range and acceptable in the ± 1.5 range (George & Mallery, 2001). Additionally, we computed the Mardia's multivariate skewness and kurtosis coefficients with the second subsample (to be used in the CFA). In the EFA, we used the principal axis factoring as estimation method. The feasibility of the analysis was evaluated through the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy index and the Bartlett sphericity test. The Kaiser-Guttman rule and the sedimentation chart for the interpretation of the underlying factors were considered. To interpret the factors, the correlation between them was considered and Varimax rotation was performed[1].

In the CFA, the following models were examined: a) one factor model; b) three-factor model (original proposal): tactics, views of human nature, and abstract morality; c) four-factor model following the proposal by Corral and Calvete (2000): positive view of human nature, cynical view of human nature, positive interpersonal tactics, and negative tactics; d) model based on the previous EFA. The following variants of the models presented above were analyzed when it was possible: 1) model with all items; 2) model with all items allowing covariance between errors; 3) model without non-significant items and allowing covariance between errors. Moreover, in the one factor model, we analyzed: 4) model without items 19 and 20; 5) model without items 19 and 20 and allowing covariance between errors. Due to the discrepancies found in the literature, we tested different models.

All models were tested using the maximum likelihood estimation method, the method more commonly used to explore the scale under study. The following goodness-of-fit indices were considered: χ^2 (Bollen, 1989), indicates discrepancies between the model and data covariance; Root Mean Square Error of Approximation (RMSEA and 90% confidence interval), values < .08 indicate a reasonable fit, and < .05 a good fit (Steiger, 1990); Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI), values > .90 indicate an acceptable fit, and values > .95 are preferred (Hu & Bentler, 1999). Additionally, AIC and BIC are informed for each model. Modification indices and residuals were considered to re-specify the model, and covariance of items of the same dimension was allowed. The standardized coefficients were interpreted.

Internal consistency. To evaluate the internal consistency of the scale, we calculated Cronbach's alpha index and also McDonald's omega index, specifically, the internal consistency of the model presenting the best fit.

Discriminant and predictive validity. We evaluated the evidence of discriminant validity of Mach-IV Scale with SVO and predictive validity for cooperative decisions and expectations in one-shot Dictator Games. We employed both the Mach-IV total score and the classification of participants as High-Machs (HM) and Low-Machs (LM) if their scores were half a standard deviation

[1] Moreover, we carried-out analysis using the weighted least squares means and variance adjusted (WLSMV) estimator which is more appropriate for ordinal items. Results were very similar to those reported here and are available at OSF (https://bit.ly/2In6fgI).

above or below the media, respectively (Bereczkei & Czibor, 2014). Similarly, we used both the SVO angle and its categories.

We analyze correlations between Mach-IV total score and SVO angle, as well as correlations between Mach-IV total score and cooperation, empirical expectations, and normative expectations in both give and take Dictator Games (DG). We also carried out T-test for comparing cooperation and empirical and normative expectations between High and Low Machiavellians, in both versions of DG. Regarding SVO and the Mach-IV scale, we expected higher-machs to score as individualistic. In relation to Dictator Games and Machiavellianism, we expected higher-machs expressing lower cooperation and expectations.

Software. Factor analysis and internal consistency were carried out employing SPSS 19 (IBM SPSS), Mplus 6 (Muthén & Muthén, 1998-2010), R 4.0.2 (R Development Core Team, 2018), MBESS (v4.8, Kelley, 2007), and MVN (v5.9, Korkmaz, Goksuluk, & Zararsiz, 2014) were employed. Discriminant and predictive validity were analyzed using SPSS 19 (IBM SPSS).

Results

Exploratory factor analyses

Preliminary analysis. The first subsample comprised 236 people aged 18 to 35 (M = 24.04, SD = 4.45). Items 9, 10, and 17 presented asymmetry values greater than 1.5, signaling that many participants chose the highest response categories. In contrast, item 19 showed a notable negative asymmetry, meaning that many participants chose the lowest categories (table 1). In total, 22 cases were univariate, and two were multivariate outliers. The inspection of item distribution excluding those cases did not substantially improve the values of asymmetry and kurtosis. Consequently, we continued the analysis with all the items.

Table 1
Descriptive statistics of the items of the MACH-IV

	First Subsample (n = 236)				Second Subsample (n = 236)			
	M	*SD*	A	C	*M*	*SD*	A	C
m1	3.43	1.673	-.040	-1.343	3.51	1.680	-.180	-1.289
m2	2.42	1.398	.784	-.359	2.41	1.537	.854	-.446
m3	2.78	1.468	.623	-.631	4.05	1.535	-.578	-.670
m4	3.82	1.539	-.030	-1.305	3.35	1.535	-.094	-1.139
m5	3.20	1.634	.165	-1.199	3.26	1.518	.056	-1.080
m6	1.93	1.202	1.473	1.569	4.93	1.383	-1.455	1.307
m7	2.82	1.485	.529	-.784	3.92	1.625	-.312	-1.116
m8	3.40	1.630	-.049	-1.195	3.22	1.648	.086	-1.272
m9	1.79	1.180	1.843	3.105	4.99	1.445	-1.453	1.060
m10	1.78	1.143	1.760	2.748	5.16	1.205	-1.880	3.466
m11	4.44	1.341	-.523	-.718	2.65	1.364	.365	-.875
m12	2.23	1.375	.831	-.490	2.25	1.481	.972	-.198
m13	2.54	1.508	.632	-.776	2.39	1.432	.649	-.757
m14	4.06	1.422	-.096	-1.026	3.17	1.458	.060	-.931
m15	2.86	1.497	.180	-1.121	2.81	1.509	.261	-1.091
m16	3.13	1.666	.398	-1.044	3.85	1.621	-.471	-.947
m17	1.65	1.285	2.054	3.355	1.61	1.167	1.901	2.619
m18	3.04	1.600	.232	-1.212	2.93	1.663	.283	-1.203
m19	5.21	1.276	-1.882	2.953	5.24	1.289	-1.880	2.872
m20	2.01	1.321	1.225	.563	2.24	1.477	1.225	-.145

Note. M = mean; SD = standard deviation; A = asymmetry; C = kurtosis.

Exploratory factor analysis. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .734; Bartlett's sphericity test was significant (χ^2 approx. [190, n = 213] = 913.1, p < .001), which guaranteed the feasibility of the factorial analysis. The Kaiser-Guttman rule suggested the extraction of six factors. However, because such a rule tends to overestimate the underlying dimensions (Cohen & Swerdlik, 2010), the sedimentation graph was interpreted, which suggested the existence of three factors. The analysis was repeated with three factors, and we observed that the correlation between them was less than .34. Thus, varimax rotation was performed to facilitate the interpretation of the factorial loads. Items 19 and 20 were eliminated since they had very low factor loads (<.15). This solution yielded a KMO equal to .746, while Bartlett's sphericity test was significant (χ^2 approx. [153, n = 213] = 865.6, p < .001). The first factor grouped 9 items referring to cynical view and negative tactics and explained 12.5% of the variance after rotation (e.g., "Es más seguro asumir que todas las personas tienen un costado malintencionado y que lo mostrarán cuando tengan oportunidad"). The second factor grouped 4 items referring to positive tactics and explained 9.95% of the variance (e.g., "Cuando le pedís a alguien que haga algo por vos, es mejor darle las verdaderas razones por las que se lo pedís antes que razones exageradas"), while the third factor grouped 5 items referring to positive view and morality and explained 9.29% of the variance (e.g., "La mayoría de las personas son buenas y amables"). Together, the three factors explained 31.75% of the variance. All the items showed factorial loads higher than .40 in the corresponding factor, except for items 1, 13 and 15 (table 3).

Confirmatory factor analysis

Preliminary analysis. The second subsample consisted of 236 people aged 18 to 35 (M = 24.3, SD = 4.57). Item 17 presented positive asymmetry higher than acceptable, while items 10 and 19 showed negative asymmetry also higher than the acceptable limit (table 1). In total, nine cases were univariate and three cases were multivariate outliers. The inspection of the distribution of the items excluding those cases did not substantially improve the values of asymmetry and kurtosis; consequently, the following analyses included all the items. Moreover, the Mardia's multivariate skewness (2716.68) and kurtosis (10.08) coefficients were statistically significant.

Confirmatory factor analysis. Although the Mardia coefficients were significant, the results obtained with the ML estimator are reported below. Similar results were obtained with the WLSMV estimator (see OSF platform). The goodness-of-fit indices of the models under analysis are presented in table 2. For Model a) we could examine all variants (1 to 5). For Model b) we only assessed variants 1, 2 and 3 due to the last variant implied the elimination of a factor involving the item 19, hence variants 4 and 5 were meaningless. Models c) based on Corral and Calvete (2000) presented convergence problems; hence, the solution could not be interpreted and is not presented here. Specifically, the problem was a high correlation between factors 1 and 3[2]. Model d) based on the EFA involved three factors; in this case we only examined variants 1 and 2.

According to RMSEA indices, models allowing covariance between errors showed the best fit (see table 2). Besides, models that also excluded items offered a good fit according to comparative indices. Considering that items 19 and 20 presented problems, and that unidimensional models offered a subtle better fit, we opted to interpret the factor loadings of that solution. That is, a one-dimensional model that excluded items 19 and 20 and included covariance between errors (a5 model, table 3). Although other models showed a subtle better fit (particularly the a3 model), we opted for the a5 model which comprised the most original items. All items resulted statistically significant except for item 3 that presented low factor loading (.037).

Internal consistency

Regarding internal consistency, the Cronbach's α value corresponding to the items comprised in the a5 model resulted in .724 (95% IC .668-.774). When deleting items 3 and 8, the value improved subtly (see table 3). The McDonald's Ω value was .718 (95% IC .641-.797).

[2] Additionally, we carried out models delimiting the correlation between factors 1 and 3 to .40 those factors in order to obtain an interpretable solution. All explored solutions with this restriction are available at OSF (https://bit.ly/2In6fgI).

Table 2
Goodness-of-Fit Indices of the models estimated by Confirmatory Factor Analysis

Model[1]		χ^2	*df*	RMSEA [90% CI]	CFI	TLI
a) One factor						
a1	Base	532.6	170	0.095 [0.086, 0.104]	0.477	0.415
a2	Base, CE	259.2	151	**0.055 [0.044, 0.066]**	0.844	0.804
a3	Base, CE and without items 3, 11, 14, 19	161.5	93	0.056 [0.041, 0.070]	**0.875**	**0.839**
a4	Base, without 19, 20	493.5	135	0.106 [0.096, 0.116]	0.469	0.398
a5	Base, CE and without 19, 20	228.4	117	0.064 [0.051, 0.076]	0.835	0.784
b) Original proposal – Three factors						
b1	Base[2]	-	-	-	-	-
b2	Base, CE	324.3	154	**0.068 [0.058, 0.079]**	0.754	0.697
b3	Base, CE and without items 9, 19 (two factors)	264.4	121	0.071 [0.059, 0.082]	**0.774**	**0.715**
d) Three factors based on EFA						
d1	Base	280.5	132	0.069 [0.058, 0.080]	0.780	0.745
d2	Base, CE	267.4	131	**0.066 [0.055, 0.078]**	**0.798**	**0.764**

Note. df = degrees of freedom; RMSEA = root mean square error of approximation; CI = confidence interval; CFI = Comparative Fit Index; TLI = Tucker-Lewis index; CE = Covariance between errors. [1] All models presented statistically significant χ^2 values ($p < .001$). [2] This model did not offer an interpretable solution.

Table 3
Factorial matrix after EFA (with varimax rotation) and CFA (standardized loadings) of the items of the MACH-IV, and internal consistency

	First subsample (n = 236)			Second subsample (n = 236)	
	EFA			CFA	Cronbach's α if item is deleted
	F1	F2	F3	F1	
m1	**.398**	.057	.028	.555*	.705
m2	**.401**	.260	-.185	.47*	.709
m3	-.101	.214	**.429**	.037	.729
m4	.164	.140	**.609**	.248*	.714
m5	**.648**	-.060	.023	.489*	.709
m6	.086	**.580**	.293	.272*	.711
m7	-.011	**.493**	.273	.29*	.708
m8	**.452**	-.180	-.101	.279*	.728
m9	-.043	**.643**	.031	.222*	.716
m10	.162	**.675**	.145	.338*	.709
m11	-.050	.113	**.433**	.157*	.718
m12	**.580**	.004	-.018	.492*	.710
m13	**.394**	.016	-.066	.547*	.706
m14	.000	.056	**.554**	.168*	.715
m15	**.367**	.167	-.423	.306*	.724
m16	.093	.304	**.434**	.182*	.715
m17	**.589**	.073	.108	.551*	.703
m18	**.498**	.169	.108	.485*	.701

* $p < .05$. Bold characters emphasize factorial charges > .35.

Discriminant and predictive validity

All analyses were conducted by excluding items 19 and 20 to calculate the Mach-IV total score. However, results remained qualitatively similar when including all the items.

Cooperation was higher in DG-take (n = 208, M = 67.33, SD = 29.55) than in DG-give (n = 179, M = 41.79, SD = 19.61; $t(385) = -9.85$; $p < .001$; $d = -.90$). The same happened with empirical and normative expectations: $t(259) = -2.955$; $p = .003$; $d = -.36$; $t(259) = -4.395$; $p < .001$; $d = -.53$ (see table 4). Also, empirical expectations, normative expectations, and decisions correlated positively (all with rs > .460 and ps < .001).

Following the procedure of previous studies (e.g., Bereczkei & Czibor, 2014), we classified

participants as Low-Machiavellians when their total scores were half a standard deviation below the media (45.74 points) or lower (LM, $n = 116$, 30%). In contrast, those who scored half a standard deviation above the media (56.72 points) or higher were classified as High-Machiavellians (HM, $n = 117$, 30.2%). A total of 154 participants (39.8%) remained unclassified by this criterion. Regarding SVO, 3 participants were classified as altruistic (0.8%), 343 as prosocial (88.6%), 38 as individualistic (9.8%), and 3 as competitive (0.8%). The mean score for the sample was 33.24 ($SD = 10.37$).

Mach and SVO. We found a negative correlation between Mach-IV total score and SVO angle ($r = -.272$, $p < .001$). We also observed differences in Mach total score between SVO categories ($F(3, 383) = 4.87$, $p = .002$, $n^2_p = .04$), specifically between prosocial and individualistic participants (*mean difference* = -6.15, $SE = 1.85$, $p = .006$). Also, most individualistic participants were categorized as HM (82%) although, within prosocials, half of the participants were classified as HM (46.38%).

Mach and DG. Descriptive data for DG and Machiavellianism is detailed in table 5. Independently of their classification (i.e., LM and HM), the majority of participants preferred to distribute the money equally (50/50). However, within HM, almost 8% ($n = 9$) of participants chose not to cooperate at all (give zero or take everything according to the type of DG played), while only 3% ($n = 3$) of LM did so. Also, whereas only 14.5% ($n = 17$) of HM showed full cooperation, a total 35.3% ($n = 41$) of LM cooperated.

Cooperation ($t(231) = 5.02$; $p < .001$; $d = .61$) and normative expectations ($t(158) = 3.12$; $p = .002$; $d = .50$) were higher in LM compared with HM, but there were no differences in empirical expectations ($t(158) = 1.86$; $p = .064$). This pattern was also observed in the DG-take (cooperation: $t(121) = 3.82$; $p < .001$; $d = .69$; normative expectations: $t(81) = 2.08$; $p = .041$; $d = .54$; empirical expectations: $t(81) = .003$; $p = .998$). However, in the DG-give, cooperation and empirical expectations where higher for LM (cooperation: $t(108) = 2.51$; $p = .013$; $d = .28$; empirical expectations: $t(75) = 2.36$; $p = .021$; $d = .45$), while there were no differences in normative expectations ($t(75) = 1.25$; $p = .214$).

When considering the Mach-IV total score, we observed a negative correlation between Machiavellianism and cooperation ($n = 387$, $r = -.225$, $p < .001$), empirical expectations ($n = 261$, $r = -.126$, $p = .021$), and normative expectations ($n = 261$, $r = -.159$, $p = .005$). However, these results do not completely hold when differentiating between DG-take and DG-give. In the DG-give, the Mach-IV total score correlated negatively with cooperation ($n = 179$, $r = -.156$, $p = .019$) and empirical expectations ($n = 127$, $r = -.151$, $p = .045$), but not with normative expectations ($n = 127$, $r = -.079$, $p = .217$). Regarding the DG-take, Machiavellianism correlated negatively with cooperation ($n = 208$, $r = -.264$, $p < .001$) and normative expectations ($n = 134$, $r = -.175$, $p = .022$), but not with empirical expectations ($n = 134$, $r = -.070$, $p = .212$).

Discussion

Machiavellianism represents a personality trait characterized by the tendency to manipulate others for personal gain (Christie & Geis, 1970). This construct has been found to have good predictive power for several behaviors and intentions (e.g., Zhao et al., 2016). Various scales have been developed to measure Machiavellianism, being the Mach-IV scale (Christie & Geis, 1970), the most used and recommended (Monaghan et al., 2016). To generate a valid version of the Mach-IV Scale for the local population, we translated and adapted the items of the scale to Argentinian culture. Then, we examined the reliability, structure, and evidence of discriminant (towards social value orientation) and predictive validity (for cooperation and expectations in DG games) of the Mach-IV Scale with Argentinian students.

Table 4
Cooperation and expectations on DG for the complete sample and by level of Machiavellianism

	n	*M*	*SD*	95% CI	*n*	*M*	*SD*	95% CI	*n*	*M*	*SD*	95% CI
Complete sample												
Cooperation	387	55.51	28.42	52.67-58.36	179	41.79	19.60	38.90-44.68	208	67.33	29.55	63.29-71.37
Empirical expectations	261	34.49	25.92	31.33-37.65	127	29.69	23.59	25.55-33.84	134	39.04	27.27	34.38-43.71
Normative expectations	261	49.73	26.70	46.48-52.99	127	42.52	21.99	38.66-46.38	134	56.57	28.96	51.62-61.52
Low-Machs (LM)												
Cooperation	116	66.55	26.54	61.67-71.43	47	48.94	10.05	45.99-51.89	69	78.55	27.61	71.92-85.18
Empirical expectations	82	39.59	23.22	34.48-44.69	30	38.50	18.62	31.55-45.45	52	40.21	25.65	33.07-47.35
Normative expectations	82	57.68	28.93	51.33-64.04	30	47.33	21.44	39.33-55.34	52	63.65	31.12	54.99-72.32
High-Machs (HM)												
Cooperation	117	49.16	26.33	44.34-53.99	63	40.89	20.15	35.81-45.97	54	58.81	29.43	50.78-66.85
Empirical expectations	78	32.14	27.19	26.01-38.27	47	26.83	22.56	20.20-33.45	31	40.19	31.72	28.56-51.83
Normative expectations	78	44.29	25.17	38.62-49.97	47	41.06	21.39	34.78-47.34	31	49.19	29.72	38.29-60.10

Note. The minimum and maximum for all levels varies between 0 and 100, except for Low Machs: Cooperation (max 90) and Empirical expectations (max 80).

Using our Mach-IV scale version (one-factor, without items 19 and 20), we explored the evidence of discriminant validity towards SVO. As reported in the literature (Böckler et al., 2016), a higher score in Machiavellianism meant a lower concern for the earnings of the other person. However, when analyzing the association by categories, the majority of individualistic participants were categorized as High Machs (HM), and the set of Prosocials contained half LM and half HM. Nonetheless, it is important to note that almost 90% of participants were classified as prosocials, so the possibility to discriminate by such categories is not optimal. A sample with wider SVO variation would be needed to explore the association between these two constructs as categories. Also, the differentiation between HM and LM is not univocal, and other ways of classifying participants could be tested. It is also relevant to note that both the Mach-IV scale and SVO are considered to best represent participants' preferences by their continuous score rather than by categories. It should be noted that Böckler et al. (2016) used a different scale to assess Machiavellianism, so comparisons should be taken with caution. Future studies may continue to analyze the evidence of discriminant validity of the Mach-IV scale towards SVO.

Lastly, we inquired about the predictive validity of the Mach-IV scale for cooperative decisions and expectations in Taking and Giving versions of the Dictator Game. We found that participants with higher levels of Machiavellianism cooperated less, both when using Mach total score or HM and LM categories. This result was also strong when differentiating DG-give and DG-take, although the difference in cooperation was more notorious in the DG-take. The Mach-IV total score showed that participants with higher scores expected less cooperation from others (empirical expectations) and believed that it would be socially appropriate to give(take) less(more) to(from) the other person (normative expectations). However, this correlation was observed only for empirical expectations in the DG-give, and for normative expectations in the DG-take. When compared with LM, HM showed a stronger cynical view in the DG-give, with expectations of rather low cooperation from others, but a more permissive perception in the DG-take, where they believed it was socially appropriate to contribute less.

These results show that the perception of the situation differed between HM and LM, but that difference did not suffice to explain their divergences in cooperation. There is mixed evidence about the extent to which HMs take social cues and other people's behavior into account (e.g., Czibor & Bereczkei, 2012; Fehr & Schneider, 2010). However, several studies showed that Machiavellians adapt their behavior to the specifics of the situation (e.g., Czibor & Bereczkei, 2012; Jones & Paulhus, 2009; Wilson, Near, & Miller, 1996). This characteristic is also evident concerning HM norm obedience. Various studies found that HM cooperate and respect social norms if it is beneficial for them, like when they can be punished for not doing so (e.g., Czibor et al., 2014; Fehr & Schneider, 2010; Spitzer et al., 2007). Our results show the adaptability of HMs to the situation, although LMs present the same flexibility. Also, in our sample, HMs seem to take at least one kind of expectation into account for making their decisions, although those

expectations do not entirely explain HM's behavior. Notably, in the DG-take, HMs seem to consider the social appropriateness of their behavior. Maybe this is so because the particularity of the framing increases the salience of ownership as a cue for decision making (Cappelen, Nielsen, Sorensen, Tungodden, & Tyran, 2013). It is also possible for HM to be using motivated reasoning (Kunda, 1990), for easing the justification of their selfishness, even when they believed that most people would cooperate at higher rates than they did.

It is relevant to note that HM cooperated more than what would be expected by the characteristics of the game. In the present study, participants played a one-shot DG game with an anonymous partner and no possibility of retaliation. Consequently, there was no incentive for HM to cooperate any amount higher than zero. However, only a small percentage (8%) of HM decided not to cooperate at all. These results go in line with the hypothesis that, although HMs are selfish, they do cooperate at a certain level. Further investigation would be needed to understand better whereas this behavior is due to some caring for the welfare of others, strategic behavior, or self-image maintenance.

Before closing, we want to discuss some significant limitations of this study. Firstly, the evidence for discriminant and predictive validity was evaluated with the same sample employed to examine the structure and internal consistency of the scale (divided in halves). Therefore, for the evaluation of the discriminant and predictive validity of the scale, participants completed the 20 items of the Mach-IV scale and not the resulting version after factorial analyses (without items 19 and 20). The limitation for doing so was based entirely on budget availability. It would be necessary to conduct new studies with the Mach-IV scale's final version to acquire a better understanding of its discriminant and predictive validity. Secondly, in the adaptation process, we modified the valence of item 17, which was originally stated in negative terms (i.e., "P.T. Barnum was very wrong when he said there is a sucker born every minute") but resulted as a positive statement in our version (i.e., "Every minute, someone to take advantage from is born"). This difference may affect how the item relates to other items and the general structure of the scale. However, this item did not show any particularity when compared with previous studies. Lastly, in the present study, neither the decisions nor the expectations in the DG game were economically incentivized. Although there are some studies with non-monetarily incentivized decisions (e.g., Meyer, 1992), most results are based on games with economic incentives (e.g., Czibor & Bereczkei, 2012; Czibor et al., 2014; Fehr & Schneider, 2010; Zhang & Ortmann, 2016). In this regard, we need to remember that Machiavellian people are characterized as selfish and goal oriented (Czibor et al., 2014). Without the possibility of earning real money, there is no incentive for HM to prefer selfish allocations more than LM. This represents a limitation and a strength at the same time. It is a limitation because it reduces the confidence in comparing our results with others employing monetary incentivized decisions. It is also a strength because our results evidence that even without the possibility of making real gains, HM showed less concern for others' wellbeing and a clear tendency towards selfish preferences. Future local studies may apply monetary incentivized decisions and continue to analyze the predictive validity of the Mach-IV scale.

To conclude, we could not find a structure with good fit but preferred a one-factor version without items 19 and 20. This version showed acceptable internal consistency and evidence of good discriminant and predictive validity for prosocial behavior. We consider that the present version of the Mach-IV scale could be used to study and understand cooperative behaviors and beliefs as well as for studying criminal behaviors (e.g., corruption or fraud) but further inquiries about the internal structure and construct validity would be needed for its implementation as a diagnostic tool.

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