

Original Article


Examining the Internal Structure and Measurement Invariance of the Organizational Justice Scale in a Sample of Employees in Puerto Rico


Evaluación de la Estructura Interna e Invarianza de Medición de la Escala de Justicia Organizacional en una Muestra de Empleados de Puerto Rico

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ABSTRACT

The purpose of current study was to examine the internal structure, psychometric properties, and measurement invariance of the Organizational Justice Scale (OJS) in a sample of people employed in Puerto Rico. A total of 1,099 employed people who worked at least 20 hours per week and were 21 years of age or older participated in the study. Item analysis by dimension, exploratory factor analysis, and confirmatory factor analysis were performed using structural equation modeling to examine the internal structure of the OJS. The revised version of the OJS (OJS-R) was made up of 12 items, three for each of the dimensions of distributive justice and formal procedural, and six for the dimension of interactional justice. The results of the factor analysis, especially the confirmatory one, support the three-dimensional internal structure of the OJS-R. In terms of reliability, Cronbach's alpha and McDonald's omega coefficients ranged from .793 to .927. The new version of the OJS-R seems to be invariant by gender, age, job position and type of organization. In this way, the results provide evidence of the validity and reliability of the OJS-R to measure the perception of organizational justice.

Keywords: confirmatory factor analysis, exploratory factor analysis, internal structure, measurement invariance, organizational justice, psychometric properties

RESUMEN

El propósito de la presente investigación fue examinar la estructura interna, propiedades psicométricas e invarianza de medición de la Escala de Justicia Organizacional (EJO) en una muestra de personas empleadas en Puerto Rico.

Participaron en el estudio un total de 1,099 personas empleadas que trabajaban al menos 20 horas a la semana y tenían 21 años de edad o más. Se realizaron análisis de reactivos por dimensión, análisis de factores exploratorios y análisis de factores confirmatorio utilizando modelos de ecuaciones estructurales para examinar la estructura interna de la EJO. La versión revisada de la EJO (EJO-R) quedó compuesta por 12 ítems, tres para cada una de las dimensiones de justicia distributiva y justicia de procedimientos formales y seis para la dimensión de justicia interaccional. Los resultados de los análisis factoriales, especialmente el confirmatorio, sustentan la estructura interna tridimensional de la EJO-R. En términos de la confiabilidad, los coeficientes alfa de Cronbach y omega de McDonald fluctuaron entre .793 y .927. La nueva versión de la EJO-R parece ser invariante por género, edad, puesto de trabajo y tipo de organización. De esta forma, los resultados aportan evidencia de la validez y confiabilidad de la EJO-R para medir la percepción de justicia organizacional.

Palabras Claves: análisis de factores exploratorio, análisis de factores confirmatorio, estructura interna, invarianza de medición, propiedades psicométricas, justicia organizacional

INTRODUCTION

Organizational justice is an important issue for employees and can be defined as an individual's perception of fairness at the workplace (Cropanzano et al., 2001). Organizational justice concerns can be seen in a variety of aspects of employees' working lives. The fairness of resource allocations, such as compensation, rewards, promotions, and the outcome of dispute resolutions, for instance, is a concern for employees. According to some literature (e.g., Adams, 1963, 1965; Deutsch, 1975; Homans, 1961; Levanthal, 1976), this is what distributive justice is. People also care about formal procedural justice, which is the fairness of the decision-making processes that result in those outcomes (Levanthal, 1980; Levanthal et al., 1980; Thibaut & Walker, 1975). Last but not least, interactional justice has to do with how people are also concerned with the manner in which they are treated by others, particularly important organizational authorities (Bies & Moag, 1986; Greenberg, 1993). Therefore, organizational justice is a phrase coined by Greenberg (1987) to describe how individuals perceive fairness in organizations and its components include distributive justice, formal procedural justice, and interpersonal justice. It is important to mention that Greenberg (1993) introduced a four-factor theory in which he argued that interactional justice should be separated into two separated constructs that he labeled interpersonal justice and informational justice. Interpersonal justice refers to the fairness of the treatment an individual receives from authorities or decision-makers. It involves showing respect, politeness, and dignity in the interactions. Whereas informational justice refers to the adequacy and clarity of the

information provided by authorities when they communicate their decisions. Employees want explanations that are thorough, honest, and transparent. In the current study, we considered a three-factor model of organizational justice.

Thus, organizational justice refers to people's perceptions of how fairly formal organizational procedures are carried out and how fairly management treats employees (Loi et al., 2009). There are studies that suggest that perception of organizational justice is related to job satisfaction (e.g., Lotfi & Pour, 2013), organizational commitment (e.g., Deressa et al., 2022), job performance and organizational citizenship behaviors (e.g., Colquitt et al., 2013; Rupp et al., 2014; Wang et al., 2010), lower turnover intention (e.g., Mengstie, 2020) and turnover rates (e.g., Imran & Al-lil, 2016), among others. In addition, although less well-known, there is evidence that organizational justice increases well-being and mental health (e.g., Cropanzano & Wright, 2011; Eib et al., 2018; Greenberg, 2010; Ndjaboué et al., 2012; Robbins et al., 2012). In other words, employee perceptions of organizational fairness can have important organizational consequences for company achievement as well as employee feelings and attitudes. In this way, the perception of organizational justice can be altered by changing the justice of the situation, or by providing adequate explanations of organizational events (Rosario-Hernández & Rovira-Millán, 2007).

In terms of the measurement of organizational justice, Rosario-Hernández and Rovira-Millán (2007) developed the Organizational Justice Scale (OJS) with a sample of employees in Puerto Rico based on the

proposal of Colquitt et al. (2001) and Rahim et al. (2000). Thus, the OJS is made up of 16 items, four of which measure distributive justice, four formal procedural justice, and eight interactional justice. The authors tested three dimensions as proposed by Colquitt et al. and Rahim et al., however, their results supported an internal structure of two factors where the items belonging to distributive justice and formal procedural justice loaded on one factor, while the items of interactional justice loaded on the other. In this way, it is important to point out the debate that exists on the dependence/independence of the dimensions of distributive justice and formal procedural justice. The results of the OJS authors supported some of the literature that argues that these two dimensions are dependent on each other (e.g., Martocchio & Judge, 1995; Sweeney & McFarlin, 1997; Welbourne et al., 1995). Moreover, Ambrose and Arnaud (2005) indicate that distributive and formal procedural justice are functionally the same because they are both about outcomes. Nevertheless, these authors added that when individuals are asked specific questions about the fairness of outcomes and the fairness of procedures, they can distinguish between them in a systematic and meaningful way. As a result, this can explain the strong association between distributive and formal procedural justice, but it may also explain how they can differ from one another.

The OJS has been used in several studies in Puerto Rico (e.g., Rodríguez Rosa, 2003; Rosario-Hernández & Rovira-Millán, 2006; Rosario-Hernández & Rovira-Millán, 2011; Rosario-Hernández & Rovira-Millán, 2014; Zayas Ortiz, 2011) since its development; however, the psychometric properties of the OJS and especially, its internal structure, has not been examined. Moreover, there are not any certainty related to whether the OJS is invariant across groups, such as gender, age, job position, type of organization, and type of contract. Therefore, the purpose of the current study was to examine the internal structure, psychometric properties, and measurement invariance of the OJS in a sample of employees in Puerto Rico.

METHOD

Participants

A total of 1,099 employed individuals from different organization in Puerto Rico participated in this non-experimental instrumental research design (Ato

et al., 2013). They were selected based on availability and their voluntariness, anonymity and the right to abandon the investigation were guaranteed when they considered it necessary. Table 1 shows the description of the sample's sociodemographic characteristics. For example, 64.1% of the people were female, and most of the participants were between 31-50 years of age (23.7%), which can be considered to be in the prime of their careers. Most of the participants completed at least undergraduate studies (26.2%). On the other hand, 13.6% of the participants held a managerial position, and 62.1% had a tenure.

Table 1

Sociodemographic characteristics of the sample.

Variable	Frequency	Percent
Gender		
Male	375	34.1
Female	705	64.1
Age (in years)		
21-30	206	18.7
31-50	260	23.7
≥ 51	101	9.2
Education		
≤ High School	38	3.5
Undergraduate	288	26.2
Graduate	199	18.1
Employment Type		
Tenure	682	62.1
Temporary	187	17.0
Position Type		
Managerial	150	13.6
Non-Managerial	561	51.3
Organization Type		
Public	180	16.4
Private	365	33.2

Note. n=1,099.

Measures

Sociodemographic data. First, a sociodemographic data sheet was developed and used for the current study. With this, information was collected from the participants related to gender, age, marital status, among other variables, in order to describe the sample of the present study.

Organizational Justice. We used the Organizational Justice Scale (OJS; Rosario-Hernández & Rovira-Millán, 2007). The OJS is comprised of 16 items measured on a six-point Likert scale anchored

by the response options '1' = "Totally Disagree" and '6' = "Totally Agree". Four items comprised the distributive justice subscale (e.g., "I consider that the responsibilities that I have in my work are equitable with my pay"). Formal procedural justice subscale was measured with four items (e.g., "All work decisions are applied consistently to all employees."). Finally, the remaining eight items comprised the interactional justice subscale (e.g., "Management shows a false interest in my rights as an employee when making decisions about my work"). The authors originally proposed a three-factor structure of the OJS; however, results supported a two-factor structure in which items of the distributive and formal procedural justice subscales loaded in one factor and items of the interactional justice on the other one. Reliability, using Cronbach's alpha techniques, of the OJS and its subscales has been reported between .85 to .90 (Rosario-Hernández & Rovira-Millán, 2007).

General Procedures and Data Analysis

First, authorization to carry out the research was requested from the Institutional Review Board of Ponce Health Sciences University. It was approved on November 9, 2016 and the protocol number is 160930-ER.

The Organizational Justice Scale was administered to a total sample of 1,099 individuals employed in different organizations in Puerto Rico. The data were analyzed, first, with the IBM-SPSS version 28.0 program, and with it descriptive statistics, correlation, item analysis, reliability, and exploratory factor analysis were performed. In addition, we used the "lavaan" package of the R3.6.3 program (Rosseel, 2012) to perform the confirmatory factors analyses and invariance testing by gender, age, job position, type of company and type of contract.

We performed descriptive statistics analyses to obtain sociodemographic characteristics of the sample. Also, we conducted descriptive analyzes of the scale's items, such as the mean, standard deviation, skewness, kurtosis, and the minimum and maximum values. Item analyses were also performed individually to each group of items of the subscale to obtain the discrimination index which is also known as "item-total correlation" or "rbis". We used the whole sample to perform these descriptive and item analyses.

The total sample was randomly split into two samples, calibration, and validation. Exploratory factor analyses (EFA) were conducted with the calibration sample using SPSS v.28 (IBM, 2021). EFA was conducted using the extraction method of "principal axis factoring" and "direct oblimin" rotation. Those items that obtained a factor loading $\geq .30$ in the factor to which it supposedly belongs and less than .30 in the other factors were selected, as recommended by Kline (1994).

All items that complied with requirements of the EFA were subjected to confirmatory factor analyses (CFA) using the structural equation modeling to test three models of the OJS using the weighted least squares-mean and variance adjusted (WLSMV) estimator with the "lavaan" package of the R3.6.3 program, which robustly deals with potentially non-normal data and items are treated as ordinal (Li, 2016a, 2016b). To evaluate the results of the CFA, several fit indices of the structural equation models were used. Kline (2016) recommends the use of at least four fit indices, although more can be reported. One of the indices that is reported is Chi-Square (χ^2). This is a fundamental index of absolute adjustment and it is basically the same one that is used when you want to examine the association between nominal variables; however, the crucial difference when used as an index of fit in the structural equations model is that the researcher looks for no differences between the matrices to support that the tested model is representative of the data (Hair et al., 2019).

Given that the χ^2 is sensitive to the sample size and therefore the probability of rejecting the hypothesized model increases when the sample size increases, it is recommended to take into account other indices (Marsh et al., 1996). In this way, the Root Mean Square Error of Approximation (RMSEA; Byrne, 2016; Hu & Bentler, 1999) was used, values less than .08 for the RMSEA indicate an acceptable fit, while values equal to .05 or less indicate a good fit of the model (Browne & Cudeck, 1993; MacCallum et al., 1996). In addition, Standardized Square Root Mean Residual (SRMR; Hu & Bentler, 1995) was used, which examines the average difference between predicted and observed variances and covariances, based on the residual standard error. The lower the SRMR, the better the fit of the model and to consider an acceptable model it must be equal to or less than

.05. On the other hand, the Bentler Comparative Fit Index (CFI) was used as an increased fit index to compare the theoretical model with the null model, which assumes that the latent variables of the model they do not correlate with each other and values greater than .90 are considered acceptable (Hair et al., 2019). Another increased adjustment index is the Tucker-Lewis Index (TLI) and it reflects the proportion in which the theoretical model improves the adjustment in relation to the null model (Littlewood Zimmerman & Bernal García, 2011; Tucker & Lewis, 1973). Values greater than .90 are considered acceptable. We conducted CFA's with the validation sample.

We examined convergent and divergent validity of the OJS using the average variance extracted (AVE), maximum variance share (MSV), and average variance share (ASV). Moreover, we correlated observed scores of the OJS and its subscales. We assessed measuring invariance across gender, age, job position, type of organization, and type of contract with the whole sample.

We tested configural invariance, metric invariance, and scalar invariance as suggested by some of the literature (e.g., Byrne, 2016; Muthén & Muthén, 1998-2012; Wang & Wang, 2012). We conducted hierarchical tests for invariance of measurement parameters. First, we examined the configured invariance model or pattern invariance, which imposes no equality restrictions on model parameters. This is a necessary condition for testing invariance by comparing it with other invariance models based on fit indices. Second, we examined the weak invariance model or metric invariance. In this model, the factor loadings are treated as invariant across groups. This ensures that the measures are on the same scale across groups for making valid comparisons. Third, we examined the strong invariance model. This model imposes invariance on both factor loadings and item intercept across groups. This is to ensure the underlying factors can be compared across groups. We capitalized on fit index differences for SRMR, RMSEA, CFI and TLI when constraining factor loadings (i.e., Δ SRMR > .03, Δ RMSEA > .015, Δ CFI < .01, Δ TLI < .01) and when constraining intercepts (i.e., Δ SRMR > .01, Δ RMSEA > .015, Δ CFI < .01, Δ TLI < .01) reference points as recommended by Chen (2007), who found in a Monte Carlo study that these indices were equally sensitive to all types of invariances when the sample is greater

than to 300. Notably, as the X2 is known to be highly influenced by the sample size (e.g., Rigdon, 1995), it was reported but not considered as fit index for the invariance testing.

Finally, we performed descriptive and reliability analyses for the OJS to estimate means, standard deviation, internal consistency via Cronbach's alpha and McDonald's omega, standard error of measurement and 95% confidence interval for the scale with the whole sample.

RESULTS

Descriptive and Item Analysis

First, we conducted descriptive statistics and item analysis for each OJS subscale. Table 2 shows the mean, standard deviation, skewness, kurtosis, and item-total correlations (r_{bis}). Only item 9 did not reach a r_{bis} of .30 and it was eliminated.

Table 2
Descriptive statistics and discrimination index (r_{bis}) of the Organizational Justice Scale's items.

Subscale	Item	Mean	SD	Ske	Kur	r_{bis}
Distributive Justice	oj1	3.44	1.867	0.058	-1.433	.696
	oj2	3.44	1.665	0.023	-1.204	.560
	oj3	3.48	1.667	-0.008	-1.170	.682
	oj4	3.45	1.755	0.028	-1.280	.757
Formal Procedural Justice	oj5	3.45	1.766	0.073	-1.299	.801
	oj6	3.44	1.754	0.077	-1.283	.868
	oj7	3.43	1.706	0.058	-1.219	.828
	oj8	3.42	1.716	0.059	-1.220	.749
Interactional Justice	oj9*	3.43	1.673	0.060	-1.165	.251
	oj10	3.47	1.698	0.025	-1.171	.442
	oj11	3.46	1.801	0.043	-1.320	.717
	oj12	3.41	1.976	0.060	-1.537	.786
	oj13	3.42	1.887	0.051	-1.442	.839
	oj14	3.43	1.917	0.056	-1.468	.845
	oj15	3.47	1.876	0.031	-1.433	.802
	oj16	3.39	1.974	0.099	-1.531	.664

Note. n = 1,099, SD = Standard Deviation; Ske = Skewness; Kur = Kurtosis; *item eliminated.

Exploratory Factor Analyses (EFA)

We conducted a first EFA with the calibration sample and results of this first iteration shown a three-factor structure for the OJS and a total of 60.62% of the variance is explained by these three factors.

One item of the distributive justice subscale had cross-loadings as it can be seen in table 3 that item 3 loaded on factors two and three. Meanwhile, item 5 of the formal procedural justice cross-loaded factors two and three. On the other hand, one item of the interactional justice subscale, specifically item 10, obtained cross-loadings on factors one and two. Therefore, these three items were not included in the second

EFA. Results of the EFA in this second iteration also replicated a three-factor structure with all items of the interactional justice subscale loaded on factor 1, all items of the formal procedural justice on factor 2, and all items of the distributive justice subscale on factor 3. All factor loadings were greater than .30 (see Table 3).

Table 3

Exploratory factor analysis results of the Organizational Justice Scale.

Subscale	Item	1 st Round			2 nd Round		
		Factor			Factor		
		1	2	3	1	2	3
Distributive Justice	oj1			<u>.78</u>			<u>.80</u>
	oj2			<u>.62</u>			<u>.59</u>
	oj3*		.38	.66			X
	oj4			<u>.80</u>			<u>.82</u>
Formal	oj5*		.76	.33		X	
Procedural Justice	oj6		<u>.85</u>			<u>.79</u>	
	oj7		<u>.81</u>			<u>.86</u>	
	oj8		<u>.71</u>			<u>.72</u>	
Interactional Justice	oj10*	.45	.39		X		
	oj11	<u>.68</u>			<u>.69</u>		
	oj12	<u>.74</u>			<u>.74</u>		
	oj13	<u>.83</u>			<u>.83</u>		
	oj14	<u>.82</u>			<u>.82</u>		
	oj15	<u>.76</u>			<u>.76</u>		
	oj16	<u>.53</u>			<u>.53</u>		
	Eigen Value	3.69	2.95	2.46	4.52	3.49	2.43
% Explained Variance	24.66	19.67	16.38	41.28	20.16	6.56	
% Accumulated Variance	24.66	44.24	60.62	41.28	61.44	68.00	

Note. $n_{\text{cal}} = 553$; *Item eliminated, X = Item not included in analysis.

Confirmatory Factor Analyses (CFA)

All items of the OJS that complied with requirements of the EFA were included in the CFA analysis. We tested three models: (a) unidimensional in which all items loaded on one-factor; (b) bidimensional in which items of the subscales distributive and formal procedural justice loaded on one factor and items of the interactional justice loaded on the other; and (c) tridimensional in which items of the three subscales loaded in their respective factor. We used validation sample for these CFA. The three-factor model obtained by far the best fit indices of the three models (see table 4).

Convergent and Divergent Validity

To establish convergent validity, it is important to estimate the average variance extracted (AVE). To estimate AVE, it is necessary to obtain factor loadings (λ) of each item and they can be appreciated in table 5, factor loadings fluctuated between .690 and .937. We calculated the AVE of the three subscales of the OJS that fluctuated between .672 and .794, which are well above the threshold of .50 (Fornell & Bookstein, 1982; Fornell & Larcker, 1981). Therefore, the indicators of the three subscales of the OJS share a high proportion of variance with their respective subscale providing convergent validity evidence.

Table 4*Fit indices of the three models tested.*

Fit Index/Model	One-Factor	Two-Factor	Three-Factor
χ^2 (df)	2,635.667* (54)	731.271* (53)	84.154* (66)
SRMR	.197	.104	.035
RMSEA (CI)	.296* (.287 - .306)	.153 (.143 - .163)	.035 (.021 - .047)
CFI	.919	.979	.999
TLI	.901	.974	.999

Note. $n_{val} = 546$, * $p < .05$; NS = Not Significant, df = degree of freedom, CI = Confidence Interval.

Table 5*Item's factor loading (λ) and subscale's average variance extracted (AVE).*

Subscale	Item	λ	λ^2	AVE
Distributive Justice	oj1	.775	.601	.672
	oj2	.690	.476	
	oj4	.970	.940	
Formal Procedural Justice	j6	.908	.824	.794
	oj7	.937	.878	
Interactional Justice	oj8	.824	.680	.680
	oj11	.718	.515	
	oj12	.828	.685	
	oj13	.908	.825	
	oj14	.916	.838	
	oj15	.849	.721	
	oj16	.706	.498	

Note. $n_{val} = 546$.

To evaluate convergent validity, AVE for each construct was evaluated against its correlation with the other constructs. Where AVE was larger than the construct's correlation with other constructs, then convergent validity was considered to be confirmed (Fornell & Bookstein, 1982; Fornell & Larcker, 1981). Discriminant validity was established where maximum shared variance (MSV) and the average shared squared variance (ASV) were both lower than the AVE for all the constructs (Hair et al., 2019; see table 6). Also, correlations of the observed scores show the relationship between distributive and formal procedural justice, and formal procedural justice and interactional justice; however, the relationship between distributive justice and interactional justice was a low one.

Measurement Invariance

Since the three-factor model was the best fitted, we examined the measurement invariance of the OJS by gender, age, job position, organization type, and contract type. Thus, measurement invariance was done with a bottom-up approach, from an unrestricted model to a model with strong restriction (Stark et al., 2006). Thus, we tested an unrestricted model of equality (configurational invariance) and continued with successive restrictions applied to factor loadings and thresholds (metric invariance), and intercepts (scalar invariance). Considering the sample size (> 300 ; Chen, 2007), the invariance criteria were: CFI $< .010$, SRMR $< .030$, and RMSEA $< .015$ (Chen, 2007). The differences between fit indices (Δ_{SRMR} , Δ_{RMSEA} , Δ_{CFI} , & Δ_{TLI}) were within limit suggesting that the OJS is invariant among those groups, except for contract type that reached metric invariance, but not scalar invariance (see Table 7); therefore, comparisons can be made among gender, age, organization type, and position type.

Reliability and Descriptive Statistics

We estimated the mean, standard deviation, standard error of measurement, and 95% confidence interval for the scores of the final version of the Organizational Justice Scale-Revised (see Table 8). Moreover, we estimated the reliability using Cronbach's alpha and McDonald's omega with their respective confidence interval, and all reliability coefficients were above .70 as suggested by some of the literature (e.g., DeVellis, 2017; Spector, 1992).

Table 6*Convergent and divergent validity.*

Subscale	AVE	MSV	ASV	DJ	FPJ	IJ
Distributive Justice (DJ)	.672	.334	.198	1	.463**	.187**
Formal Procedural Justice (FPJ)	.794	.334	.325	.580**	1	.459**
Interactional Justice (IJ)	.680	.316	.189	.245**	.564**	1

Note. n = 546, *p < .05, **p < .01; values above the diagonal represent the correlation between observed variables, while the values below the diagonal represent the correlation between latent variables.

Table 7*Measurement invariance of the Organizational Justice Scale-Revised by gender, age, job position, type of organization, and type of contract.*

Model	X ² (df)	SRMR	RMSEA	CFI	TLI	MR	ΔX ²	ΔSRMR	ΔRMSEA	ΔCFI	ΔTLI
Multigroup analysis by gender (male/female)											
1: Configural	549.102* (102)	.058	.090	.988	.984	-----	-----	-----	-----	-----	-----
2: Metric	699.245* (111)	.063	.099	.984	.981	1	+150.14	+0.005	+0.009	-0.004	-0.003
3: Scalar	638.566* (156)	.058	.076	.987	.989	2	-60.68	-0.005	-0.023	+0.003	+0.008
Multigroup analysis by age (21-30 /31-50 / ≥51)											
1: Configural	400.152* (153)	.063	.093	.988	.984	-----	-----	-----	-----	-----	-----
2: Metric	388.234* (171)	.065	.082	.989	.987	1	-11.92	+0.002	-0.011	+0.001	+0.003
3: Scalar	493.307* (261)	.063	.069	.988	.991	2	+105.07	-0.002	-0.013	-0.001	+0.004
Multigroup analysis by job position (managerial/non-managerial)											
1: Configural	387.102* (102)	.057	.089	.990	.987	-----	-----	-----	-----	-----	-----
2: Metric	380.701* (111)	.057	.083	.990	.989	1	-6.40	.000	-0.006	.000	+0.002
3: Scalar	455.015* (156)	.057	.074	.989	.991	2	+74.31	.000	-0.009	-0.001	-0.002
Multigroup analysis by type of organization (public/private)											
1: Configural	287.633* (102)	.057	.082	.991	.988	-----	-----	-----	-----	-----	-----
2: Metric	296.149* (111)	.059	.078	.991	.989	1	+8.52	+0.002	-0.004	.000	+0.001
3: Scalar	335.432* (156)	.057	.065	.991	.992	2	-39.28	-0.002	-0.013	.000	+0.003
Multigroup analysis by type of employment (tenure/temporary)											
1: Configural	443.372* (102)	.058	.088	.987	.983	-----	-----	-----	-----	-----	-----
2: Metric	584.137* (111)	.063	.099	.982	.979	1	+140.77	+0.005	-0.011	-0.005	-0.004
3: Scalar	503.193* (156)	.058	.072	.987	.989	2	-80.94	-0.005	-0.027	+0.005	+0.010

Note. *p < .05, df = degree of freedom, MR = Model of reference; NS = Not Significant.

Table 8*Descriptive statistics, reliability using Cronbach's alpha (α) and McDonald's omega (ω), standard error of measurement and 95% confidence intervals of the Organizational Justice Scale-Revised and its subscales.*

Sub-scale/Scale	#Items	M	SD	Reliability		sem	95% CI	Scores	
				α (CI)	ω (CI)			Min	Max
DJ	3	10.33	4.45	.793 (.766 - .817)	.810 (.787 - .831)	2.02	± 4	3	12
FPJ	3	10.29	4.71	.897 (.881 - .910)	.899 (.886 - .910)	1.51	± 3	3	12
IJ	6	20.58	9.75	.925 (.916 - .933)	.927 (.918 - .934)	2.67	± 5	6	36
OJ	12	41.20	14.14	.872 (.860 - .884)	.846 (.823 - .863)	5.55	±10	12	72

Note. n = 1,099; DJ = Distributive Justice, FPJ = Formal Procedural Justice, IJ = Interactional Justice, OJ = Organizational Justice, M = Mean, SD = Standard Deviation, sem = standard error of measurement, CI = Confidence Interval.

DISCUSSION

The aim of this study was to examine the internal structure, psychometric properties, and measurement invariance of the OJS. Our results from the EFA and CFA support the three-factor structure of the OJS as proposed by some of the literature (e.g., Bies, 1987; Bies & Moag, 1986; Colquitt et al., 2001; Rahim et al., 2000), which is composed of distributive, formal procedural, and interactional justice and what the OJS's authors tested originally when developing it (Rosario-Hernández & Rovira-Millán, 2007), but obtained a two-factor structure. Some authors (e.g., Comrey & Lee, 1992) might argue that the sample size used in the original study of Rosario-Hernández and Rovira-Millán (2007) was too small ($n = 256$), whereas they recommend a sample size greater than 300 subjects. Also, the ratio of subjects per item was 6.4, which some authors (e.g., Nunnally, 1978; Pett, Lackey, & Sullivan, 2003) might argue that is not sufficient to conduct a factor analysis and they indicate that a proper ratio should be at least 10 subjects per item.

Although there is some literature (e.g., Kline, 1994) that indicate that a ratio of two subjects per item is appropriate for factor analysis. In the current study, the ratio for the calibration sample was 34 (553 subjects / 16 items) and for the validation sample was 45 (546 subjects / 12 items), which both are higher than recommended. Another aspect to consider in terms of the internal structure is that we cross-validated the results by using a calibration and a validation sample as recommended by Fabrigar et al. (1999), which allows examining the stability of the structural factor's solution across the halves. Therefore, we expect that the internal structure of the new OJS-Revised (OJS-R) may be reproduced in other samples of employees.

In terms of convergent and divergent validity of the OJS-R, all subscales obtained AVE values well above .50 as some authors suggest (Fornell & Bookstein, 1982; Fornell & Larcker, 1981). In other words, the indicators of each subscale measure more of the construct than of error, which provide evidence of the convergent

validity of the OJS-R. Meanwhile, all AVE values of each subscale were greater than the MSV and ASV values, providing evidence of the divergent validity of the OJS-R subscales. This is significant because, according to Rosario-Hernández and Rovira-Millán's (2007) findings in their original study of the OJS, distributive and formal procedural justice were combined into a single factor. At the time, it was assumed that these two constructs were the same, but in the present study, they appear to be related but distinct constructs. In addition, formal procedural justice obtained high correlation coefficients with distributive and interactional justice, which concurred with some literature (e.g., Cohen-Charash & Spector, 2001; Hauenstein et al., 2001; Skarlicki & Folger, 1997).

On the other hand, the relationship between distributive and interactional justice can be considered as low in both observed and latent correlations ($r_{obs} = .187$, $p < .01$; $r_{latent} = .245$, $p < .01$, respectively) when compared to other studies' results (e.g., Martínez-Tur et al., 2006; Skarlicki & Folger, 1997), which obtained a higher correlation coefficients ($r_{obs} = .46$, $p < .05$; $r_{obs} = .43$, $p < .05$, respectively). Nevertheless, there are some studies that have obtained low correlations between distributive and interactional justice; for example, Finkelstein et al. (2009) obtained a correlation of $r = .23$, $p < .01$, and Moliner et al. (2005) obtained a non-significant correlation of $r = .16$. Given that distributive justice is associated with individuals' perception of the results they receive, whereas interactional justice focuses on individuals' perception about to the communication and interpersonal treatment they obtain from the organization, it seems plausible that a type of "halo" error could happen while making evaluative justice judgements because this may be a function of the justice source (Colquitt & Shaw, 2005). For instance, a supervisor who is charismatic and outgoing may be seen of as being fairer than one who is reserved or socially awkward and this might explain this low correlation between distributive and interactional justice.

Meanwhile, we tested the measurement invariance of OJS-R among employees by gender, age, job position, type of organization, and type

of employment. Exploration on the first two levels revealed metric or factor loading invariance (i.e., weak measurement invariance) and scalar invariance (i.e., strong measurement invariance) of the three-factor model across gender, age, job position, and type of organization, but not for type of employment. Metric invariance is important to ensure the measure across multiple groups is on the same scale, or the factors are measured in the same way in all groups (Vandenberg & Lance, 2000; Meredith & Teresi, 2006; Wang & Wang, 2012). Scalar invariance refers to the item intercept being invariant across multiple groups in the present study. This indicates that none of the groups tends to respond systematically higher or lower to the items of scales than other groups (Meredith & Teresi, 2006; Vandenberg & Lance, 2000; Wang & Wang, 2012). The present study met both invariance requirements, except for the type of employment. These results confirm that the compared groups, had an equivalent understanding on each of the twelve-items of the OJS-R, which is an important prerequisite for making a meaningful comparison between groups on the measure of organizational justice, except for the type of employment that was not able to establish the scalar invariance. Researchers have argued that error variance invariance (i.e., strict measurement invariance) is not required for substantive analyses in many disciplines and such invariance is considered unnecessary (Wang & Wang, 2012).

In terms of reliability, the coefficients and levels achieved are good, especially when considering the small number of items on the subscales of distributive justice and formal procedural justice and the values reached (Ponterotto & Ruckdeschel, 2007). Both coefficients were very similar in the three subscales, and it can be argued that factors loading are very similar. Given the similarity of the coefficients (α & ω) and, it is assumed that any variations in the factorial loadings were insignificant and did not significantly affect the distance between the two coefficients (Hayes & Coutts, 2020). This distance is usually correlated with the degree of tau-equivalence, which is a need for the coefficient to be valid (Green & Yang,

2009; Hayes & Coutts, 2020). This similarity suggests that the coefficient may be used to measure internal consistency effectively without requiring SEM modeling or SEM modeling approaches to determine the coefficient (Rosario-Hernández et al., 2021). However, the ω coefficient was lower than α for the whole OJS-R. According to Dunn et al. (2014), because α does not consider the specific variance of each item (item-specific error) and other forms of error that omega does, it tends to produce less precise coefficients than ω . By considering all potential causes of error, ω offers a more conservative estimate of reliability, which is often a more accurate representation of the scale's actual reliability. As a result, as compared to α , ω may yield a more precise estimate of reliability if there is a significant amount of item-specific variance or unmodeled error in the scale.

Limitations and Recommendations

The current study has several shortcomings that must be kept in mind when interpreting the results. First, the population representativeness is not guaranteed, because the convenient sample selection of the workers did not corroborate the population similarity of employees in organizations in Puerto Rico. However, the sample was sufficiently large and heterogenous; moreover, the strategy of dividing the sample in halves as recommended by Fabrigar et al. (1999), it gave the opportunity to examine the stability and replicability of results (de Rooij & Weeda, 2020).

Second, the evaluation of the measurement invariance was done by a single procedure, since different methods can produce different percentage of type I and Type II, it may require exploring the equivalence with other method (e.g., item response theory). Third, the bifactor model was not implemented, and the assessment of multidimensionality in contrast to the dimensionality of a general factor may be required (Gicnac, 2016; Reise, 2012; Rodriguez et al., 2016a, 2016b). Finally, the reliability of the scores over time was not evaluated for stability; therefore, to examine the scores' stability over time a test-retest approach should be used.

CONCLUSION

The revised version of the OJS is now comprised of 12-items that measures a tridimensional construct of organizational justice composed of distributive, formal procedural, and interactional justice. Convergent and divergent validity of the OJS-R was supported by correlation between observed and latent variables as hypothesized. Measurement invariance of the scale was supported for gender, age, job position, and type of organization; in other words, comparison among these groups are appropriated. Finally, the OJS-R and its subscales have good reliability coefficients. Therefore, the use of the OJS-R to measure organizational justice with employees in Puerto Rico appears to be appropriated given the evidence obtained and provided in the current study.

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Approval of the Institutional Board for the Protection of Human Subjects in Research: This study was approved by the Ethics Committee (IRB) of the Ponce Health Sciences University, Ponce, Puerto Rico.

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Appendix 1

<h2 style="text-align: center;">Escala de Justicia Organizacional</h2> <p style="text-align: center;">Autores: Dr. Ernesto Rosario-Hernández & Dra. Lillian V. Rovira-Millán 2007© Derechos Reservados</p>							
INSTRUCCIONES:		Totalmente en Desacuerdo	Moderadamente en Desacuerdo	Algo en Desacuerdo	Algo en Acuerdo	Moderadamente en Acuerdo	Totalmente en Acuerdo
<p>Lea con detenimiento cada una de las siguientes aseveraciones e indique cuán de acuerdo está usted con las mismas. Marque sus respuestas circulando en el número que aproximadamente refleja cuánto está usted de acuerdo con el contenido de las aseveraciones en el continuo numérico que se provee al lado derecho de cada aseveración. Trate de contestar todas las aseveraciones sin omitir ninguna y sin repasar sus respuestas. Recuerde que no hay contestaciones correctas o incorrectas; por lo tanto, conteste honestamente cada aseveración. Conteste de acuerdo con el siguiente continuo numérico:</p> <p style="text-align: center;"> 1=Totalmente en Desacuerdo 2=Moderadamente en Desacuerdo 3= Algo en Desacuerdo 4= Algo en Acuerdo 5= Moderadamente en Acuerdo 6= Totalmente en Acuerdo </p>							
1.	Creo que mi salario es justo.	1	2	3	4	5	6
2.	Considero que mi carga/volumen de trabajo es bastante justo.	1	2	3	4	5	6
3.	En general, las recompensas que me dan es esta organización son bastante buenas.	1	2	3	4	5	6
4.	Considero que son equitativas con mi paga las responsabilidades que tengo en mi trabajo.	1	2	3	4	5	6
5.	La gerencia se asegura de que todas las preocupaciones de los empleados se escuchen antes de tomar una decisión de trabajo.	1	2	3	4	5	6
6.	La gerencia recoge información completa y precisa para tomar una decisión de trabajo.	1	2	3	4	5	6
7.	La gerencia clarifica sus decisiones y les provee información a los empleados cuando se le requiere.	1	2	3	4	5	6
8.	Todas las decisiones de trabajo son aplicadas consistentemente a todos los empleados.	1	2	3	4	5	6
9.	A los empleados se les permite apelar cualquier decisión de trabajo hecha por la gerencia.	1	2	3	4	5	6
10.	La gerencia apenas me tiene consideración cuando toma decisiones acerca de mi trabajo.	1	2	3	4	5	6
11.	La gerencia me trata desatentamente cuando toma decisiones acerca de mi trabajo.	1	2	3	4	5	6
12.	La gerencia me trata sin dignidad cuando toma decisiones acerca de mi trabajo.	1	2	3	4	5	6
13.	La gerencia es insensible a mis necesidades personales cuando toma decisiones acerca de mi trabajo.	1	2	3	4	5	6
14.	La gerencia muestra un falso interés por mis derechos como empleado cuando toma decisiones acerca de mi trabajo.	1	2	3	4	5	6
15.	La gerencia me ofrece explicaciones sin sentido cuando toma decisiones acerca de mi trabajo.	1	2	3	4	5	6
16.	Siento que la gerencia me trata indignamente cuando toma decisiones acerca de mi trabajo.	1	2	3	4	5	6

Appendix 2

Escala de Justicia Organizacional-Revisada

Autores: Ernesto Rosario-Hernández, Lillian V. Rovira-Millán, Rafael A. Blanco-Rovira, & Ana C. López-Iglesias
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INSTRUCCIONES:

Lea con detenimiento cada una de las siguientes aseveraciones e indique cuán de acuerdo está usted con las mismas. Marque sus respuestas circulando en el extremo derecho de cada aseveración, el número que aproximadamente refleja cuánto está usted de acuerdo con el contenido. Trate de contestar todas las aseveraciones sin omitir ninguna y sin repasar sus respuestas. Recuerde que **no** hay contestaciones correctas o incorrectas, por lo tanto, conteste honestamente cada aseveración. Conteste basándose en el continuo numérico que aparece a continuación:

Totalmente en Desacuerdo 1	Moderadamente en Desacuerdo 2	Algo en Desacuerdo 3	Algo en Acuerdo 4	Moderadamente en Acuerdo 5	Totalmente en Acuerdo 6					
1.	La gerencia me trata desalentadamente cuando toma decisiones acerca de mi trabajo.				1	2	3	4	5	6
2.	Creo que mi salario es justo.				1	2	3	4	5	6
3.	La gerencia me trata sin dignidad cuando toma decisiones acerca de mi trabajo.				1	2	3	4	5	6
4.	La gerencia recoge información completa y precisa para tomar una decisión de trabajo.				1	2	3	4	5	6
5.	La gerencia es insensible a mis necesidades personales cuando toma decisiones acerca de mi trabajo.				1	2	3	4	5	6
6.	Considero que mi carga/volumen de trabajo es bastante justo.				1	2	3	4	5	6
7.	La gerencia muestra un falso interés por mis derechos como empleado cuando toma decisiones acerca de mi trabajo.				1	2	3	4	5	6
8.	La gerencia clarifica sus decisiones y les provee información a los empleados cuando se le requiere.				1	2	3	4	5	6
9.	La gerencia me ofrece explicaciones sin sentido cuando toma decisiones acerca de mi trabajo.				1	2	3	4	5	6
10.	Considero que son equitativas con mi paga las responsabilidades que tengo en mi trabajo.				1	2	3	4	5	6
11.	Siento que la gerencia me trata indignamente cuando toma decisiones acerca de mi trabajo.				1	2	3	4	5	6
12.	Todas las decisiones de trabajo son aplicadas consistentemente a todos/as los/as empleados/as.				1	2	3	4	5	6

Nota: Investigadores/as interesados/as en utilizar la Escala de Justicia Organizacional-Revisada, favor de escribir al siguiente correo electrónico: erosario@psm.edu

Appendix 3

Reactivos por Dimensión de la Escala de Justicia Organizacional-Revisada		
Justicia Distributiva	Justicia Procedimientos Formales	Justicia Interaccional
2	4	1*
6	8	3*
10	12	5*
		7*
		9*
		11*

Nota: *Invertir puntuaciones de la siguiente manera: 1=6, 2=5, 3=4, 4=3, 5=2, 6=1.