RUNNING HEAD: Factor analysis of RWA corrected for acquiescence

A bias-corrected exploratory and confirmatory factor analysis of right-wing authoritarianism: Support for a three-factor structure

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Abstract

The factor structure of Right-Wing Authoritarianism (RWA) remains a contentious issue. Although designed to measure three underlying attitude clusters, aggression, submission and conventionalism, many items are deliberately double- or triple-barrelled, to capture the covariation of the three clusters in a unidimensional scale. Additionally, although the scale is balanced, there is an item-direction bias in the clusters; aggression items are pro-trait, and conventionalism items are con-trait. Subscale structure is therefore potentially confounded with acquiescence bias. Although RWA as a unitary construct has been an effective tool for exploring prejudice, it would be useful in many cases to measure its underlying components directly. Proposed solutions to this problem include creating short-form scales as subsets of the original scale, or modifying items to simplify and un-confound the structure. We present convergent evidence of an underlying factor structure by considering one-, two- and three-factor solutions to the uncorrected scale and then using an indirect method to correct for acquiescence bias. Before and after correction, factor analysis supported a three-factor solution. Confirmatory factor analyses also support a three-factor solution compared to a one-factor solution.

Key Words: right-wing authoritarianism, factor analysis, social dominance, acquiescence bias

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Right-Wing Authoritarianism (RWA; Altemeyer, 1981, 1988, 1996) has been shown to be an important predictor of political and social attitudes (e.g., Altemeyer, 1996, 2004; Crowson, DeBacker, & Thoma, 2005; Heaven & St. Quintin, 2003; Mirisola, Sibley, Boca, & Duckitt, 2007) and represents a measure of political conservatism focusing on resistance to change (Jost, Glaser, Kruglanski, & Sulloway, 2003; Ray, 1985). A major conceptual issue currently facing researchers in this area is the underlying dimensionality of the construct. RWA is conceptualised and measured as a unidimensional scale representing the covariation of three underlying components: authoritarian aggression, authoritarian submission, and conventionalism. There are a number of situations however in which it is useful or necessary to be able to consider the components separately.

Research on the relationship between authoritarianism and attitudes to: homosexuality, women's equality, and conservative attitudes to sexuality, for example, may be distorted by inclusion of these issues within the construct definition and measurement of authoritarianism. Researchers have noted possible consequences ranging from simple inflation of correlations (Whitley & Lee, 2000) to spurious regression coefficients (Mavor, Macleod, Boal, & Louis, 2009).

To explore these issues requires a scale in which the overall RWA construct can be reliably decomposed into its constituent components, but this has proven difficult. There are two main problems: the confounding of the components with wording direction, and the double- and triple-barrelled nature of many items in the scale.

Together, these issues have made it very difficult to show the underlying structure of the scale using either exploratory or confirmatory factor analysis methods (Funke, 2005). While some researchers have tackled the issue of the complex item structure (e.g., Funke, 2005; Manganelli Rattazzi, Bobbio, & Canova, 2007), our main goal will be to complement these other approaches by addressing the confound due to item wording direction. We believe that this will provide convergent evidence of the underlying structure of the scale and encourage more researchers to explore authoritarianism at the component level of analysis.

Given that Altemeyer (1981) conceptualised the scale as uni-dimensional, it initially seemed sufficient to balance the overall scale with pro-trait (positively worded) and con-trait (negatively worded, reverse-scored) items. However, in that process, items that primarily tap the aggression component ended up being worded in a pro-trait direction, and items representing the conventionalism component were worded in a con-trait direction. Submission items are both positively and negatively worded, but are mostly double-barrelled items also capturing some of the other components (Duckitt & Fisher, 2003; Funke, 2005).

Summated rating scales can be susceptible to distortions in responding such as acquiescence bias (Ferrando, Lorenzo-Seva, & Chico, 2003); the tendency for participants to respond in a relatively positive or negative way to all items on a scale. Scale developers therefore seek to ensure a balance of pro-and con-trait items in a scale. In a balanced, unidimensional scale, the acquiescence bias can potentially inflate correlations among pro-trait items and among con-trait items, and reduce the correlations between items with opposite wording. This tendency might be sufficient to suggest a two-factor solution in exploratory factor analysis though typically the acquiescence effect is of little substance (Nunnally, 1978; Rorer, 1965). Researchers

nonetheless tend to ignore factor solutions where the items heavily divided into pro-trait and con-trait factors. This is the interpretation that Altemeyer has given to two-factor solutions of the RWA scale:

> I have a definite hypothesis about the factor structure of the RWA scale, namely, that it is essentially uni-dimensional. So I can take advantage of common factor analysis' ability to tell me if I am wrong.
>
> Over the years, my common factor analyses have sometimes produced just one factor on which most of the items have appreciable loadings, or else two factors that correlate .40 - .70 when oblique rotations are performed. … The one factor, or two factors together, account for about 25-35% of the total variance of the RWA scale. …
>
> Two factors seemingly disconfirm my hypothesis that the RWA scale measures basically one thing. But the two factors were well correlated. Furthermore, … all the protrait items (save one) loaded higher on one factor, and all the contraits had their higher loading on the other.
>
> … when we pull the common variance apart, the best we can do is get the portrait and contrait items into largely separate piles. (Altemeyer, 1996, pp. 53-54).

We propose several arguments that allow for a revised view on this issue. First and foremost is that item direction is confounded with the measurement of aggression and conventionalism. If we start with an alternative hypothesis that RWA is at least two-dimensional, then the same factor analysis findings support that view. Secondly, correlations between factors are not sufficient to argue against meaningful sub-scales. Finally, Altemeyer does not report analyses beyond two factors, perhaps because these accounted for most of the variance, and broke into pro- and con-trait factors.

However, given that there are three clusters theorised within RWA, it makes sense to consider a three-factor solution. If the scale is really unidimensional, and the second factor is due to acquiescence bias, then a third factor should not show any particular meaningful pattern. An interpretable three-factor solution however would support the contention that the two-factor pattern was due to a meaningful aggression/conventionalism distinction rather than merely pro- versus con-trait items.

Funke (2005) modelled a method factor in a confirmatory factor analysis of the RWA scale, as well as trying to deal with the multi-barrelled nature of many items. The combination of these two issues made it impossible to obtain satisfactory models using the original items, and Funke instead designed new items that were less dimensionally complex, and balanced within each component. Other researchers have used short-form component scales based on the original RWA items (e.g., Duncan, Peterson, & Winter, 1997; Smith & Winter, 2002).

The approach we have taken is to analyse the original RWA scale to address the alternative factor-analysis hypothesis directly, and then attempt to control for acquiescence bias using a novel analysis. A closely related measure, Social Dominance Orientation (SDO; Pratto, Sidanius, Stallworth, & Malle, 1994) is frequently included with RWA in predicting a range of social attitudes (Duckitt, 2001) SDO is closely conceptually related to RWA and yet often correlations are relatively low. SDO is generally considered to be unidimensional (but see Jost & Thompson, 2000). The commonly used 16-item version of the scale has 8 pro-trait items expressing dominance views, and 8 con-trait items expressing equality views. If some participants are responding partly on the basis of acquiescence bias, then this should be detectable in the SDO responses. The measured bias in SDO can be used to estimate acquiescence bias in the responses to the RWA items in the same sample,

and the RWA items can be corrected accordingly. Exploratory factor analyses on the corrected item correlations should then be a better test of the dimensionality of the scale. If the emergence of two or more factors in RWA were based only on acquiescence bias then a single clear factor should emerge from the corrected matrix. If the scale does have a real underlying multi-factor structure then this should emerge clearly in the corrected correlation matrix.

Method

Participants

Participants were 545 New Zealand undergraduates (258 men, 287 women; M_{age} = 27.9, SD_{age} = 17.0). Four hundred and two participants, self-identified as New Zealand European, 40 as Asian, and 32 as Maori (61 identified as other/unreported).

Materials and Procedure

Participants completed the 16-item version of the SDO scale (Pratto, et al., 1994), and the full 30-item version of the RWA scale (Altemeyer, 1996) as part of a mass testing session. All items were rated on a scale ranging from -3 (strongly disagree) to 3 (strongly agree).

Results

Overview of Analyses

Our first step was to conduct a factor analysis on the original RWA items without any correction, and directly explore the possibilities of one, two and three-factors. The second step was to estimate the acquiescence bias from the responses to the SDO scale, compute an adjusted correlation matrix for the 30 RWA items, and

examine factor analyses on the corrected matrices. We then constructed item parcels for RWA to test confirmatory factor models for one versus three factor solutions.

Factor analysis of the uncorrected RWA scale

To consider Altemeyer's (1996) argument about the factor solution of the scale, we report the one, two, and three-factor solutions in Table 1. (Item numbering comes from the Altemeyer [1996] scale, after removing the first four practice items. Therefore add four to identify the appropriate item in Altemeyer [1996].) We used a principal axis factoring method of factor extraction, and a Promax rotation method (Tabachnick & Fidell, 2001). The first four eigenvalues were 11.03, 3.17, 1.40, and 1.15. The first eigenvalue represents a large proportion of the variance and is consistent with a one-factor solution, but also with a higher-order factor with correlated sub-scales. The two-factor solution replicates the ambiguous common pattern with pro-trait (aggression) items loading on one factor, and con-trait (conventionalism) items on the other.

To disambiguate this result, we took the analysis one step further and considered a three-factor solution. We found that the three-factor solution was interpretable along theoretical lines. The first two factors continue to capture aggression and conventionalism, and the third factor can be interpreted as the submission component. Since submission is not confounded with item wording, the third factor contains both pro-trait and con-trait items. As seen in Table 1, the top loading items in each factor are: "What our country really needs is a strong, determined leader who will crush evil, and take us back to our true path" (Aggression); "There is nothing wrong with premarital sexual intercourse"

(Conventionalism); and "Obedience and respect for authority are the most important virtues children should learn" (Submission).

For completeness we extended the analysis one step beyond the theorised three-factor structure. In the four-factor solution, the submission factor splits into two as a result of the many items with complex loadings. Since the complex structure of submission was already captured in the three-factor solution in a theoretically coherent way, we did not consider the four-factor solution further.

This analysis suggests that the two and three factor solutions have a substantive interpretation. The third (submission) factor is less well defined because few items are simple submission items. The scale contains a number of items that mix submission with aggression or conventionalism, and some of these items have higher loadings with the more heavily represented aggression and conventionalism components. Nonetheless, the existence of the interpretable three-factor solution provides preliminary evidence that real differences in the components of RWA are a more likely explanation of the factor results than acquiescence bias.

Further evidence comes from comparing the one-factor solution with the two- and three-factor solutions. If RWA is an integrated single-factor construct then the one-factor solution should have a mixture of pro- and con-trait items among the highest loading items, representing the core of the construct. An examination of the one-factor solution in Table 1 however, shows that the top seven loading items are all (pro-trait) aggression items. Of the top 15 loading items (representing half of the 30-item scale), 11 are (pro-trait) aggression items, two are (con-trait) conventionalism items, and 2 are double loading items. This is not supportive of a view of RWA as a single-dimension, balanced scale.

Measuring acquiescence bias in the SDO scale

We tested the hypothesis that acquiescence bias was responsible for the two-factor configuration by measuring acquiescence bias in the SDO scale and statistically removing it from the RWA items. Exploratory factor analysis of the 16 SDO items showed a two-factor solution interpretable as a result of acquiescence bias, with con-trait items appearing on the first factor, pro-trait items appearing on the second, and a correlation of .48 between the factors. This provides a good basis from which to estimate any acquiescence effect in this sample.[1]

All 16 SDO items were rescaled as z-scores. The SDO scale score was computed by taking the mean of the 8 pro-trait items, and the 8 reverse-scored con-trait items. The acquiescence bias score was computed by taking the mean of all 16 items (i.e., without reversing the con-trait items). This measures the extent to which participants tended to consistently agree (or disagree) with all items irrespective of item direction. The measure of bias was uncorrelated with the SDO scale (r= .044, n.s.). A composite RWA score, computed from all 30 RWA items (reverse scoring as appropriate), correlated significantly with the SDO scale (r=.367, p<.001) but not with the acquiescence bias measure (r=.035, n.s.).

Factor analysis of the bias-corrected RWA scale

The bias measure computed from the SDO scale was then used as an estimate of acquiescence bias present in the RWA scale responses collected at the same time. For each RWA item, we were interested in the residual derived after correcting for the bias measure using Regression. One item (item 8) showed a small but significant acquiescence effect (β=.127, p=.003). However, one significant relationship could be found by chance in 30 analyses; all other acquiescence beta weights were below .08.

Nonetheless, the 30 residual variables were treated as bias-corrected RWA items and were used for the subsequent factor analysis, using principal axis factoring and a promax rotation. The first four eigenvalues remain essentially the same after correction (11.03, 3.16, 1.40, 1.15). Since the analyses remained essentially the same, we present only the three-factor solution for the corrected items (Table 1). As before, the three factors represent aggression, conventionalism, and submission.

In summary, exploratory factor analyses were consistent with a three-factor interpretation of the RWA scale. Our data show the common two-factor configuration reported by Altemeyer (1996) but three patterns argue against Altemeyer's interpretation: (1) The single factor solution is not balanced across the three components, but is dominated by Aggression items; (2) The three-factor solution is clearly interpretable; (3) After correcting for an estimate of acquiescence bias based on a similar balanced construct in the same sample, the factor analyses do not change.

Taken together these findings clearly indicate that the commonly found two-factor solution should be interpreted as a substantive solution and not a measurement artefact due to acquiescence bias (see also Duckitt & Fisher, 2003). As a final test, we combined RWA items based on the three-factor solution to create item parcels and compared two confirmatory factor analysis models using SEM.

Confirmatory factor analysis of one versus three factor solutions

Item parcelling was used in the confirmatory models in order to focus our attention on the higher order structure rather than on trivial patterns based on measurement noise at the item-level. We followed the guidelines suggested by Little, Cunningham, Shahar and Widaman (2002) for the construction of item parcels. For each of the aggression and conventionalism clusters we created three parcels (of 3 and

4 items respectively) consisting of a mixture of strongly and weakly loading items. Many other items demonstrated complex loading on two dimensions, and in particular items on the submission factor often showed complex loadings. We constructed a 3-item parcel of items with simple loadings on the submission factor, and three additional parcels representing complex loading combinations of Aggression-Submission (2 items), Conventionalism-Submission (3 items), and Aggression-Conventionalism (1 items). The allocation to items to parcels that we used is shown in Table 1.

The resulting 10 parcels were used to test the confirmatory factor models. This number of parcels allows each potential factor to be identified, and allows sufficient degrees of freedom in the model to test the two crucial configurations: a hierarchical model with three sub-scales and a single higher-order factor (Model 1, see Figure 1), and a simple single factor model (Model 2, see Figure 2). Model fit statistics are shown in Table 2. Model 1 and 2 both have significant χ^2 values, but Model 1 shows generally acceptable fit statistics (CFI and NFI > .95 and RMSEA close to .05). The CAIC statistic is particularly useful for comparing non-nested models, with lower values representing more parsimonious fit. The single factor solution is clearly not supported, with a χ^2 value an order of magnitude higher than the three-factor model. and very poor fit statistics.

Since factor analyses can be distorted when some elements of a domain are over-sampled, the large number of aggression and conventionalism parcels may distort the analysis in favour of the three-factor solution (although the ratio of parcels reflects the same general proportions as the full 30-item scale itself). We therefore conducted a more stringent test of the three-factor versus one-factor solution, allowing

only one simple parcel representing each of the three factors, and three complex-loading parcels (mixtures of aggression, conventionalism and submission).

Using these parcels, a one-factor solution is quite plausible (Model 4, see Figure 2). If the underlying RWA construct were unidimensional then these would all share the same common variance. At the same time, the three-factor solution is undermined, since each factor has only one pure indicator and they share the remaining three complex indicators (Model 3, see Figure 1). Indeed to fit this model, the loadings to the complex indicator of submission and conventionalism had to be fixed to be equal in order to obtain a stable solution, further handicapping this model. In spite of this attempt to create the optimal context to find support for a single-factor solution, the three-factor model remained clearly superior (See Table 2).

Discussion

There is growing support for the idea that RWA is best understood as a composite of three underlying factors rather than as a unidimensional measure. Some researchers have simply assumed this tridimensionality and created face-valid short-forms with subscales (e.g., Smith & Winter, 2002). Other researchers have created short-form subscales by changing the original RWA items to eliminate the complex-loading items and balancing item direction within each subscale to avoid acquiescence bias (Funke, 2005), or used statistical methods to create the optimal three-factor subscales by eliminating items requiring correlated errors (Manganelli Rattazzi, et al., 2007). Previous researchers have also demonstrated the utility of analysing results at the sub-scale level (Duncan, et al., 1997; Smith & Winter, 2002), even showing that a failure to do so may lead to biased results based on statistical artefacts (Mavor, et al., 2009).

These prior approaches require creating or using a shorter form of the RWA scale and/or rewording items. The methods used to create these scales may, however, be subject to some distortion. Face valid item choice may inadvertently include items that we found empirically to cross-load, or which may not be optimal to distinguish the separate components. Statistical methods removing items with residual correlations may also arbitrarily remove items that may be good indicators of the separate constructs. Our goal was to complement these approaches and findings by testing a three-factor solution on the full 30-item scale; tackling the acquiescence bias issue directly to remove any such effect from the items using multiple regression; and finally using confirmatory factor models to test the one-factor and three-factor hypotheses.

Our results are clear: A three-factor solution is consistently superior to a one-factor model in both exploratory and confirmatory factor analysis. No evidence was found to support the contention that a two-factor solution is due to acquiescence bias. The more plausible explanation is that previously found two-factor solutions are consistent with the strong measurement of aggression and conventionalism in the RWA scale. The third (submission) factor is also interpretable, although less clearly measured in the scale. The novelty in our analysis lies in directly interpreting the form of one- two, and three-factor solutions, and in using an associated scale (SDO) to estimate acquiescence bias and control for it through regression. We think other related scales that have good evidence for balance and uni-dimensionality, such as Fundamentalism or Orthodoxy, could also be used in the same way, but we would expect the same outcome. Importantly, we found no evidence of an acquiescence bias in operation here. If one starts with a three-factor hypothesis rather than assuming uni-dimensionality, it is not surprising to see that respondents differentiate aggression

items and conventionalism items. This real difference is likely to overwhelm what is typically a very small bias based on item directionality. The weight of past evidence together with our current analysis shows that acquiescence bias is a trivial influence in the responses to the RWA scale (Nunnally, 1978; Rorer, 1965).

Our results support an argument in favor of a three-dimensional model of RWA. On their own, each of the studies that have taken different approaches to the dimensionality issue can be argued to be incomplete in some way. However, when considered together, with our analyses complementing those previously published, we believe that the evidence is now conclusive in favor of RWA as a higher-order construct representing three conceptually and empirically distinct dimensions. With that in mind, the next step is to develop a new version of the RWA scale that is more balanced at all levels, with both pro- and con-trait items within each of the sub-scales, and a better representation of items from each dimension. Funke (2005) has made a start in this direction, but further work is needed. In current RWA scales, the submission dimension is under-represented both overall, and in items that load simply on that one factor. It is still plausible to have complex-loading items to try to capture Altemeyer's original interest in the covariation of the dimensions, since modern CFA and SEM methods can acceptably model complex item loadings as we have shown here.

Until an improved measure of RWA and its underlying dimensions emerges, we hope that our analysis may be used, in conjunction with the short-scales offered by other researchers, to give researchers more confidence in using selected items to capture the three dimensions. Using this method researchers should be able confidently to explore domains in which the omnibus RWA scale would lead to distorted results because of overlap of some subscales with other variables in the

analysis, and to investigate contexts in which the three underlying dimensions may show different patterns of relationships with criterion variables. Such possibilities will enrich the RWA concept itself and allow RWA to remain part of the researcher's toolkit in a wide variety of domains.

Notes

1. Debates about the dimensionality of the SDO scale (Jost & Thompson, 2000)(see Levin, Federico, Sidanius, & Rabinowitz, 2002, note 2) do not undermine the results presented here. Any acquiescence bias present in the sample will still be captured in our measure.

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Table 1: RWA factor loadings for items uncorrected, and corrected for acquiescence bias.

	Uncorrected Items						Corrected Items			
	One Factor	Two Factor		Three Factor			Three Factor			Parcel
Item	F1	F1	F2	F1	F2	F3	F1	F2	F3	
17	0.697	0.833		0.874			0.873			Agg1
28	0.685	0.859		0.856			0.856			Agg2
13	0.721	0.834		0.811			0.811			Agg3
19	0.775	0.858		0.782			0.782			Agg3
1	0.668	0.725		0.774			0.773			Agg1
3	0.634	0.786		0.662			0.662			Agg2
11	0.702	0.629		0.650			0.649			Agg3
7	0.602	0.653		0.647			0.646			Agg2
30	0.646	0.723		0.612			0.611			Agg1

24	0.701	0.710		0.489		0.403	0.488		0.404	AS
22	0.557	0.371	0.253	0.462	0.307		0.461	0.311		AC
8	0.600	0.562		0.370		0.353	0.366		0.352	AS
21r	0.598		0.746		0.784			0.786		Conv1
15r	0.563		0.792		0.781			0.78		Conv2
10r	0.468		0.728		0.728			0.726		Conv3
2r	0.660		0.674		0.641			0.642		Conv2
18r	0.525		0.676		0.625			0.631		Conv3
16r	0.455		0.623		0.605			0.603		Conv1
12r	0.541		0.650		0.572	0.201		0.574		Conv3
6r	0.580		0.554		0.563			0.56		Conv1
27r	0.388		0.599		0.519			0.522		Conv2
23r	0.494		0.580		0.518			0.519		Conv3

9r	0.530		0.456		0.448			0.446		Conv2
4r	0.596	0.229	0.457	0.222	0.438		0.219	0.444		Conv1
26	0.485	0.583		0.288	-0.21	0.543	0.286	-0.21	0.542	Sub1
25r	0.472		0.464		0.307	0.536		0.308	0.536	SC
29r	0.537	0.201	0.417		0.291	0.430		0.286	0.436	SC
5	0.507	0.375				0.393			0.393	Sub1
20r	0.603	0.279	0.411		0.302	0.376		0.298	0.381	SC
14	0.462	0.422		0.219		0.375	0.219		0.375	Sub1

Notes: r indicates reverse-scored (con-trait) items.

Table 2. Model comparisons for confirmatory factor models using item parcels

Model	χ^2 (df)	χ^2/df	CFI	NFI	RMSEA	CAIC
1. Three-factor model with second-order factor	78.19 (29)***	2.70	.987	.979	.056	268
2. Single-factor model	985.7 (35)***	28.16	.742	.736	.223	1132
3. Reduced three-factor model with second-order factor	10.6 (4)*	2.66	.995	.992	.055	135
4. Reduced single-factor model	139.35 (9)***	15.48	.897	.891	.163	227

Notes:

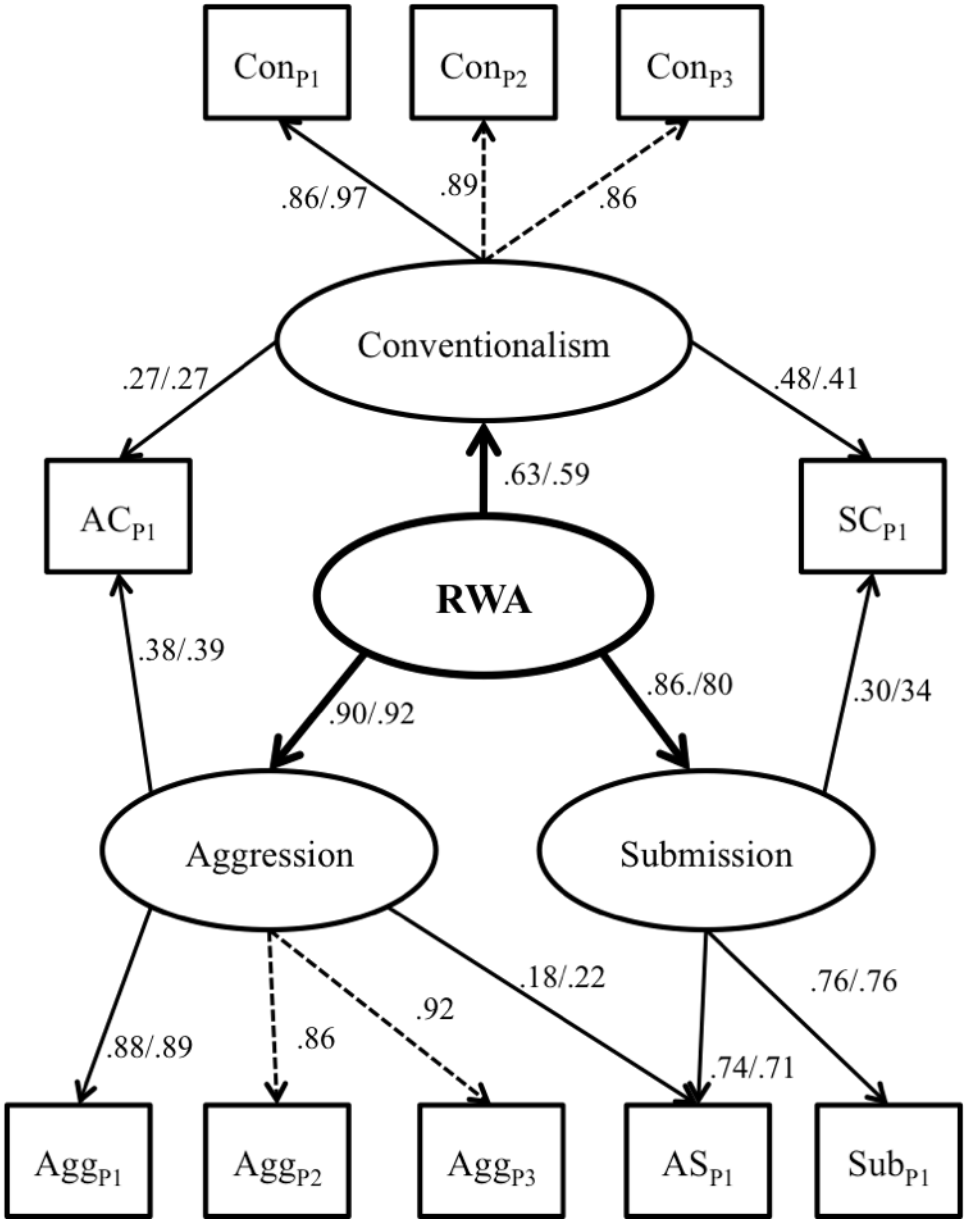
* p<.05; *** p<.001

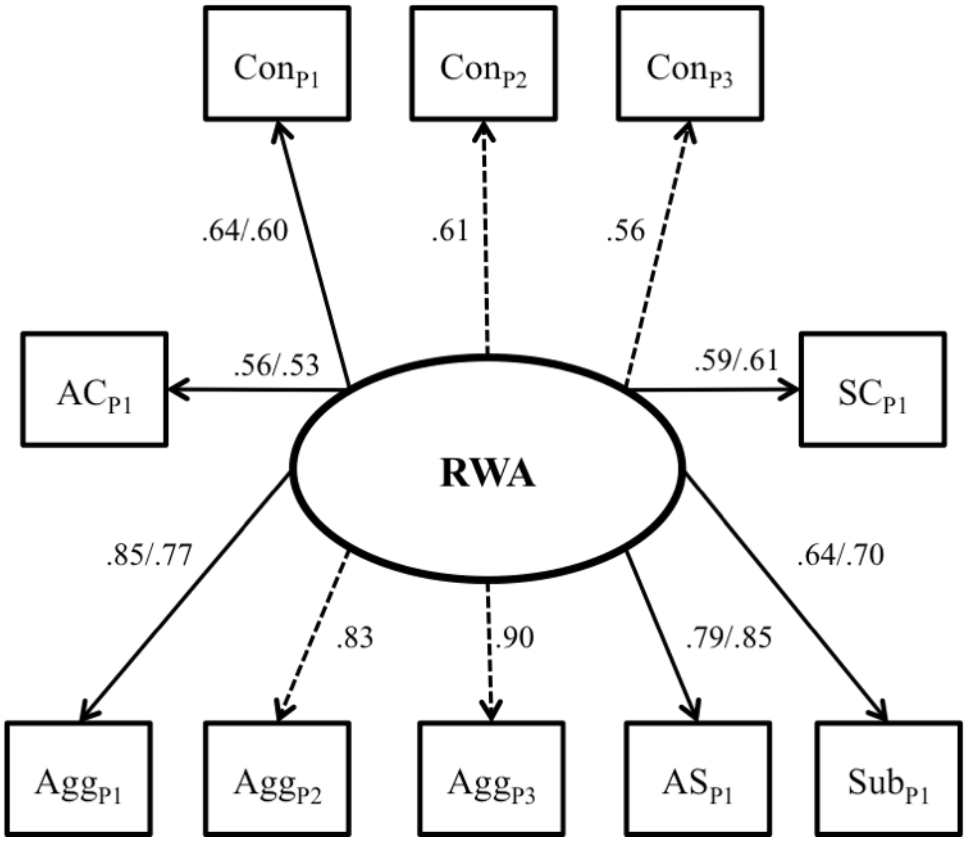
Model fit is indicated by non-significant χ^2; χ^2/df < 2; CFI, NFI >.95; RMSEA <.05; and relatively smaller CAIC.

Figure Captions

Figure 1: Three-factor model with second-order RWA factor (Model 1). Solid lines and second figures apply to reduced model (Model 3).

Figure 2: Single-factor model (Model 2). Solid lines and second figures apply to reduced model (Model 4).


Con$_{P1}$
Con$_{P2}$
Con$_{P3}$
.86/.97
.89
.86
Conventionalism
.27/.27
.48/.41
.63/.59
AC$_{P1}$
SC$_{P1}$
RWA
.38/.39
.86./80
.30/34
.90/.92
Aggression
Submission
.18/.22
.76/.76
.92
.88/.89
.86
.74/.71
Agg$_{P1}$
Agg$_{P2}$
Agg$_{P3}$
AS$_{P1}$
Sub$_{P1}$


Con$_{P1}$
Con$_{P2}$
Con$_{P3}$
.64/.60
.61
.56
AC$_{P1}$
.56/.53
.59/.61
SC$_{P1}$
RWA
.85/.77
.83
.90
.79/.85
.64/.70
Agg$_{P1}$
Agg$_{P2}$
Agg$_{P3}$
AS$_{P1}$
Sub$_{P1}$