



WethosAI Psychometric Properties

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Human + Aii > AI

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Overview

This document provides empirical psychometric properties underpinning the Wethos AI Scale (WAS). Completing the WAS offers individuals a robust profile representing Professionalism Traits. In addition, when used by teams, WAS is a remarkable tool for predicting how individual Professionalism Traits interact and how these interactions impact team performance and cohesion.

A brief introduction to WAS is followed by research supporting the tool's reliability and validity. Portions of the original validation study were replicated; these results are provided throughout this report. The scales' reliability was examined using Coefficient Alpha internal consistency estimates of reliability with three independent samples. The construct validity was investigated using exploratory (EFA) and confirmatory (CFA) factor analyses.

Wethos AI Scale (WAS)

Subscales

The WAS is an 84-item scale that measures professionalism traits across four subscales (Wilson & Getz, 1982). WAS constructs align with individual behaviors and team performance. The subscales are described in Table 1:¹

Table 1. Wethos AI Scale Descriptions

| Scale | Description | Mindset |
|-------------------|--|--|
| Ideas | How you process and express ideas, from abstract to concrete. | Abstract: What could work? Concrete: Is it ready to work yet? |
| Relational | How you engage with emotions from others and yourself, from empathetic to insulated. | Empathetic: I am aware. Insulated: I want rational. |
| Action | How you exert your force of will on objectives, from assertive to unifying. | Assertive: Directs projects. Unifying: Completes tasks. |
| Order | How you structure and complete work, from routine to flexible. | Routine: Hands-on completion. Flexible: Speed of execution. |

¹ WAS also includes a Motivational Distortion scale that measures how a person tends to represent themselves. The Motivational Distortion scale provides an avenue for detecting self-report response biases that are overly positive or overly negative. This scale is excluded from the following analysis, as it is a secondary measure that was constructed using an approach that deviates from the four primary subscales.

Item Types

Each WAS subscale consists of two item types: Statements and Adjectives. Statements describe personal attitudes, behavior patterns, and abilities concerning ideas, tasks, and relationships. Adjectives are single-word descriptors that align with personal traits or attitudes.

See Table 2 for examples of WAS Statement and Adjective item types and Table 3 for a count of items for each subscale and item type count.

Table 2. Wethos Scale Statement and Adjective examples.

| Scale | Statements | Adjectives |
|------------|--|--------------------|
| Ideas | I am the type to think of new ways to do things | I am free-thinking |
| | I have an active imagination | I am curious |
| Relational | I am perceptive in my observations of people | I listen |
| | I enjoy trying to figure out what others are feeling | I am warm |
| Action | I get a goal in mind, and don't quit | I am decisive |
| | I love a challenge | I am competitive |
| Order | I keep a neat desk | I am accurate |
| | I am an orderly person | I am consistent |

Table 3. Count of items for each subscale and item type.

| Subscale | Statements | Adjectives |
|------------|------------|------------|
| Ideas | 13 | 7 |
| Relational | 13 | 7 |
| Action | 13 | 7 |
| Order | 11 | 7 |

Scoring

WAS is scored using a three-point Likert Scale. Respondents select the degree to which each statement or adjective describes them with the following response options: Disagree, Undecided, and Agree. A total score is calculated for each scale, including both Statement and Adjective items.

Of note, respondents are encouraged to select Disagree or Agree versus Undecided. These instructions result in highly dichotomous response patterns.

Method

Sample

Original Study, $n = 2000$

Two samples of 1000 respondents were randomly selected from a database of Wethos results. These responses were collected between 2007 and 2011.

The first sample was designated the Derivation Sample, and the second was the Cross-Validation sample.

Both samples were used to assess the reliability of the scale. The Derivation sample was used for the Exploratory Factor Analysis (EFA), and the Cross-Validation sample was used for the Confirmatory Factor Analysis (CFA).

Replication, $n = 310$

A sample of 310 WAS responses were used to replicate reliability and EFA findings. Demographics for this sample are available by request and reflect a diverse population.

Procedure

Reliability

Cronbach's alpha (α) was calculated to evaluate the internal consistency of WAS subscales. Cronbach's α is a measure of reliability for psychometric assessments, ranging from 0 to 1.² It is calculated based on the average inter-item correlation and the number of items in the assessment. Cronbach's α assesses the extent to which assessment items measure the same underlying construct. A high value (usually above 0.70) indicates good internal consistency, suggesting that the items are related and measuring the same latent variable. Conversely, low values indicate that the items may be measuring different constructs or that there is a high level of measurement error.³

Item-Level EFAs

Two item-level EFAs were conducted, one for Statement items and one for Adjective items.

In the original and replication studies, factors were extracted using Principle Axis Factoring (PCA) with oblique rotation of factors. Principal Axis Factoring (PAF) is a factor extraction method that aims to identify the underlying factors that account for the common variance among observed variables.⁴ Oblique rotation is a type of factor rotation that allows factors to correlate with each other.⁵ Oblique rotation is common in social sciences because many psychological, social, and behavioral constructs are expected to correlate. This approach allows for a more realistic representation of the relationships among latent variables associated with behaviors or human traits.

² Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297-334.

³ Streiner, D. L. (2003). Starting at the beginning: An introduction to coefficient alpha and internal consistency. *Journal of Personality Assessment*, 80(1), 99-103.

⁴ Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, 4(3), 272-299.

⁵ Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, 10(7), 1-9.

Cluster-Level Multi-Trait-Multi-Method Analyses (MTMM) and EFA

Clustering

Due to the dichotomous response patterns associated with WAS and the three-point Likert response scale, WAS items were clustered to establish multiple continuous measures of each WAS subscale.

Clusters were created by sampling every third Statement item and every other Adjective item, resulting in 5 clusters per WAS subscale. This approach also results in two types of clusters per scale due to differences in item type (Statement and Adjective, Table 4).

Table 4. Subscales and Clusters.

| WAS Subscale | Item Type | Cluster | Total Items |
|--------------|------------|---------|-------------|
| Ideas | Adjectives | IA 1 | 4 |
| | | IA 2 | 3 |
| | Statements | IS 1 | 5 |
| | | IS 2 | 4 |
| | | IS 3 | 4 |
| Relational | Adjectives | RA 1 | 4 |
| | | RA 2 | 3 |
| | Statements | RS 1 | 5 |
| | | RS 2 | 4 |
| | | RS 3 | 4 |
| Order | Adjectives | OA 1 | 4 |
| | | OA 2 | 3 |
| | Statements | OS 1 | 4 |
| | | OS 2 | 4 |
| | | OS 3 | 3 |
| Action | Adjectives | AA 1 | 4 |
| | | AA 2 | 3 |
| | Statements | AS 1 | 5 |
| | | AS 2 | 4 |
| | | AS 3 | 4 |

Cluster-Level EFA

After creating the 20 clusters, an additional EFA was conducted using the same approach described above, PCA with oblique rotation. Clustering and EFAs were completed in the original study and the replication study.

MTMM Matrix

To assess the convergent and discriminant validity of the four WAS subscales, an MTMM matrix was constructed by calculating correlations across the 20 clusters. Convergent validity was examined by assessing the correlations between clusters measuring the same dimension, while discriminant validity was evaluated by comparing these correlations to those between clusters measuring different dimensions.⁶ High and statistically significant correlations between clusters measuring the same dimension provide evidence for convergent validity, while lower correlations between clusters measuring different dimensions support discriminant validity.⁷

Confirmatory Factor Analysis

CFA is a statistical technique used to test the fit of a hypothesized measurement model to observed data.⁸ In CFA, the researcher specifies a priori the number of factors, the pattern of factor loadings, and the relationships among factors based on theory or previous research.⁹ The hypothesized model is then tested against the observed covariance matrix to determine how well the model fits the data.¹⁰

Using the results of the MTMM EFA (derivation sample), a CFA was performed using the maximum likelihood estimation method (cross-validation sample). Goodness of Fit statistics were calculated to evaluate the model fit, including the Chi-Square (χ^2) statistic, Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). (See Table)

⁶ Trochim, W. M., et al. (2016). *Research methods: The essential knowledge base* (2nd ed.). Boston, MA: Cengage Learning.

⁷ Campbell, D. T., & Fiske, D. W. (1959). *Psychological Bulletin*, 56(2), 81-105.

⁸ Brown, T. A. (2015). *Confirmatory factor analysis for applied research* (2nd ed.). Guilford Press.

⁹ Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.

¹⁰ Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1-55.

Results

Reliability Results

In both experiments, the four WAS subscales demonstrated excellent internal consistency estimates of reliability. See results in Table 5.

Table 5. Internal consistency.

| Subscale | Original α | Replication α |
|------------|-------------------|----------------------|
| Ideas | 0.82 | 0.83 |
| Relational | 0.89 | 0.88 |
| Action | 0.81 | 0.89 |
| Order | 0.84 | 0.84 |

EFA Results

Item-Level

The results of the item-level EFA for Statement items are provided in Table 6 for the original study and Table 7 for the replication study.¹¹ The items are sorted within each factor, so the highest coefficient is at the top. These coefficients represent the unique contribution of each item in estimating the underlying factor, with a theoretical range between -1.0 to 1.0. Some items in both the Adjective and Statement EFAs load onto other factors or do not load onto a factor. However, this is not unexpected due to a relatively small sample size (replication study) and the dichotomous nature of the individual WAS item scoring (both studies).

¹¹ Numbers for items in the original study do not map 1-to-1 to item numbers in the replication study.

Table 6. Item-Level EFA for Statement Items
Original Findings, 2011

| Statements | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---------------|----------|----------|----------|----------|
| Ideas 13 | 0.69 | | | |
| Ideas 1 | 0.69 | | | |
| Ideas 5 | 0.64 | | | |
| Ideas 12 | 0.56 | | | |
| Action 7 | 0.55 | | | |
| Ideas 8 | 0.55 | | | |
| Ideas 10 | 0.54 | | | |
| Ideas 7 | 0.49 | | | |
| Ideas 6 | 0.46 | | | |
| Ideas 2 | 0.44 | | | |
| Ideas 4 | 0.40 | | | 0.33 |
| Ideas 3 | 0.35 | | | |
| Action 11 | 0.30 | | | |
| Order 11 | | 0.71 | | |
| Order 3 | | 0.68 | | |
| Order 9 | | 0.68 | | |
| Order 1 | | 0.67 | | |
| Order 2 | | 0.67 | | |
| Order 4 | | 0.57 | | |
| Order 10 | | 0.55 | | |
| Order 6 | | 0.49 | | |
| Order 8 | | 0.46 | | |
| Order 5 | | 0.44 | | |
| Ideas 11 | 0.34 | -0.38 | | |
| Ideas 9 | | -0.37 | | |
| Relational 5 | | | 0.67 | |
| Relational 9 | | | 0.62 | |
| Relational 8 | | | 0.61 | |
| Relational 7 | | | 0.61 | |
| Relational 10 | | | 0.60 | |
| Relational 13 | | | 0.60 | |
| Relational 2 | | | 0.59 | |
| Relational 12 | | | 0.59 | |
| Relational 6 | | | 0.56 | |
| Relational 3 | | | 0.55 | |
| Relational 1 | | | 0.53 | |
| Relational 4 | | | 0.46 | |
| Relational 11 | | | 0.43 | |
| Action 5 | | | | 0.65 |
| Action 3 | | | | 0.63 |
| Action 10 | | | | 0.56 |
| Action 6 | | | | 0.55 |
| Action 9 | | -0.35 | | 0.45 |
| Action 12 | 0.37 | | | 0.42 |
| Action 13 | | | 0.39 | 0.42 |
| Action 8 | | | | 0.42 |
| Action 2 | | 0.34 | | 0.40 |
| Order 7 | | | | 0.39 |
| Action 1 | | | | 0.37 |

Table 7. Item-Level EFA for Statement Items
Replication, 2024

| Statements | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---------------|----------|----------|----------|----------|
| Relational 36 | 0.75 | | | |
| Relational 55 | 0.74 | | | |
| Relational 2 | 0.73 | | | |
| Relational 40 | 0.72 | | | |
| Relational 32 | 0.66 | | | |
| Relational 22 | 0.65 | | | |
| Relational 52 | 0.65 | | | |
| Relational 27 | 0.65 | | | |
| Relational 44 | 0.64 | | | |
| Relational 48 | 0.62 | | | |
| Relational 7 | 0.56 | | | |
| Relational 12 | 0.52 | | -0.40 | |
| Action 56 | 0.39 | | 0.47 | |
| Ideas 26 | 0.32 | | | |
| Order 4 | | 0.82 | | |
| Order 14 | | 0.81 | | |
| Order 9 | | 0.76 | | |
| Order 50 | | 0.76 | | |
| Order 42 | | 0.75 | | |
| Order 19 | | 0.69 | | |
| Order 38 | | 0.55 | -0.37 | |
| Order 46 | | 0.50 | | |
| Action 45 | | 0.41 | | |
| Action 8 | | 0.35 | 0.37 | |
| Ideas 39 | | -0.33 | | |
| Action 23 | | | 0.75 | |
| Action 28 | | | 0.65 | |
| Action 41 | | | 0.59 | |
| Action 53 | | | 0.52 | |
| Action 13 | | | 0.49 | |
| Action 37 | | | 0.46 | |
| Action 3 | | | 0.44 | |
| Action 18 | | | 0.41 | 0.31 |
| Action 33 | | | 0.39 | |
| Action 49 | | | 0.38 | 0.36 |
| Ideas 43 | | | | 0.68 |
| Ideas 6 | | | | 0.60 |
| Ideas 35 | | | | 0.60 |
| Ideas 54 | | | | 0.55 |
| Ideas 1 | | | | 0.53 |
| Ideas 16 | | | | 0.52 |
| Ideas 31 | | | | 0.50 |
| Ideas 11 | | | | 0.45 |
| Ideas 51 | | | | 0.35 |
| Ideas 21 | | | | 0.34 |

The results of the item-level EFA for Adjective items are provided in Table 8 for the original study and Table 9 for the replication study. The results are similar, such that the items primarily load on their expected factor.

Table 8. Item-Level EFA for Adjectives
Original Findings, 2011

| Wethos Adjectives | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|-------------------|----------|----------|----------|----------|
| Ideas 16 | 0.71 | | | |
| Ideas 20 | 0.69 | | | |
| Ideas 17 | 0.61 | | | |
| Ideas 18 | 0.52 | | | |
| Ideas 14 | 0.49 | | | |
| Action 18 | 0.45 | | | 0.43 |
| Order 16 | | 0.76 | | |
| Order 12 | | 0.72 | | |
| Order 14 | | 0.64 | | |
| Order 13 | | 0.62 | | |
| Order 17 | | 0.61 | | |
| Order 18 | | 0.56 | | |
| Relational 16 | | | 0.73 | |
| Relational 14 | | | 0.66 | |
| Relational 15 | | | 0.62 | |
| Relational 20 | | | 0.56 | |
| Relational 18 | | | 0.41 | |
| Relational 19 | | | 0.40 | |
| Action 15 | | | | 0.69 |
| Action 19 | | | | 0.69 |
| Action 14 | | | | 0.51 |
| Action 20 | | | | 0.51 |
| Action 16 | | | | 0.47 |

Table 9. Item-Level EFA for Adjectives
Replication, 2024

| Wethos Adjectives | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---------------------|----------|----------|----------|----------|
| ActionWethos75 | 0.81 | | | |
| ActionWethos83 | 0.68 | | | |
| IdeasWethos69 | 0.68 | | | |
| ActionWethos71 | 0.65 | | | |
| ActionWethos79 | 0.63 | | | |
| ActionWethos63 | 0.62 | | | |
| ActionWethos67 | 0.58 | | | |
| IdeasWethos81 | 0.58 | | 0.54 | |
| ActionWethos59 | 0.47 | 0.45 | | |
| OrderWethos80 | | 0.67 | | |
| OrderWethos76 | | 0.65 | | |
| OrderWethos68 | | 0.65 | | |
| OrderWethos60 | | 0.60 | 0.44 | |
| OrderWethos84 | | 0.59 | | |
| OrderWethos64 | | 0.59 | | |
| Relational Wethos78 | | | 0.64 | |
| IdeasWethos65 | | | 0.61 | |
| Relational Wethos74 | | | 0.57 | |
| IdeasWethos57 | | | 0.56 | |
| Relational Wethos82 | | | 0.53 | |
| IdeasWethos73 | | | 0.53 | |
| Relational Wethos70 | | | 0.47 | |
| Relational Wethos66 | | | | 0.79 |
| Relational Wethos58 | | | | 0.66 |
| Relational Wethos62 | | | | 0.65 |

Cluster-Level

The cluster-level EFA results echo the findings of the item-level EFAs. Clustering the items reduced the impact of dichotomous scoring, and coefficients show an excellent fit of the cluster scores to the four-dimensional model. For both studies, all five cluster variables for each WAS subscale load onto the corresponding factor (see Table 10 and Table 11).

Table 10. Clustered Factor Analysis, Original Findings 2011

| | | | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|------------|------------|------|----------|----------|----------|----------|
| Idea | Adjectives | IA 1 | 0.84 | | | |
| | | IA 2 | 0.54 | | | |
| | Statements | IS 1 | 0.86 | | | |
| | | IS 2 | 0.83 | | | |
| | | IS 3 | 0.71 | | | |
| Relational | Adjectives | RA 1 | | 0.74 | | |
| | | RA 2 | | 0.66 | | |
| | Statements | RS 1 | | 0.83 | | |
| | | RS 2 | | 0.85 | | |
| | | RS 3 | | 0.83 | | |
| Order | Adjectives | OA 1 | | | 0.72 | |
| | | OA 2 | | | 0.81 | |
| | Statements | OS 1 | | | 0.73 | |
| | | OS 2 | | | 0.78 | |
| | | OS 3 | | | 0.84 | |
| Action | Adjectives | AA 1 | | | | 0.75 |
| | | AA 2 | | | | 0.87 |
| | Statements | AS 1 | | | | 0.59 |
| | | AS 2 | | | | 0.76 |
| | | AS 3 | | | | 0.79 |

Table 11. Clustered Factor Analysis, Replication, 2024

| | | | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|------------|------------|------|----------|----------|----------|----------|
| Idea | Adjectives | IA 1 | 0.64 | | | |
| | | IA 2 | 0.64 | | | |
| | Statements | IS 1 | 0.92 | | | |
| | | IS 2 | 0.87 | | | |
| | | IS 3 | 0.58 | | | |
| Relational | Adjectives | RA 1 | | 0.77 | | |
| | | RA 2 | | 0.56 | | |
| | Statements | RS 1 | | 0.88 | | |
| | | RS 2 | | 0.91 | | |
| | | RS 3 | | 0.88 | | |
| Order | Adjectives | OA 1 | | | 0.61 | |
| | | OA 2 | | | 0.82 | |
| | Statements | OS 1 | | | 0.78 | |
| | | OS 2 | | | 0.82 | |
| | | OS 3 | | | 0.85 | |
| Action | Adjectives | AA 1 | | | | 0.86 |
| | | AA 2 | | | | 0.78 |
| | Statements | AS 1 | | | | 0.60 |
| | | AS 2 | | | | 0.79 |
| | | AS 3 | | | | 0.81 |

MTMM Convergent & Discriminant Validity

Convergent Validity

The primary pattern of results in the MTMM matrix that indicates convergent validity is the presence of significant and high correlations across methods within a construct.

For both studies, the correlations in Tables 11 and 12 show a strong correspondence to this pattern for all four WAS subscales. Notably, the between-method, within-scale correlations (e.g., Ideas Statements with Ideas Adjectives, ranging from 0.45–0.60 in the original study and ranging from 0.39–0.55 in the replication study) are as high as the within-method, within-scale correlations (e.g., Ideas Statements with Ideas Statements, ranging from 0.51–0.61 in the original study and ranging from 0.52–0.64 in the replication study), providing strong evidence for convergent validity.

Discriminant Validity

Discriminant validity is indicated by low values for the between-scale, within-method correlations (e.g., Ideas Statements with Relationship Statements) and between-scale, between-method correlations (e.g., Ideas Statements with Relationship Adjectives).

The results for the original study found in Table 11 demonstrate a strong divergent validity pattern for the following relationships:

1. Relational and the other three dimensions
 - a. All 100 correlations between the clusters for Relational and the other dimensions are less than 0.20.
2. Action and Order
 - a. All correlations between the Action and Order clusters are less than 0.20.
3. Ideas and Order
 - a. All 25 correlations between the Idea and Order clusters are less than 0.30
4. Ideas and Action
 - a. The pattern of correlations reveals a significant, moderate convergence between the Ideas and Action cluster scores.
 - b. Of the 25 cluster correlations, two are in the 20s, four are in the 40s, and 18 are in the 30s.
 - c. These results suggest that while Ideas and Action constructs are distinct, they are correlated with each other.

Table 11. MTMM Matrix, Original Research, 2011

| Ideas | Clusters | | | | Ideas | | | | Order | | | | Action | | | | Relational | | | |
|------------|------------|------|------|------|------------|------|------|------|------------|------|------|------|------------|------|------|------|------------|------|------|------|
| | Statements | | | | Adjectives | | | | Statements | | | | Statements | | | | Statements | | | |
| | IS 1 | IS 2 | IS 3 | IS 4 | IA 1 | IA 2 | IA 3 | IA 4 | OS 1 | OS 2 | OS 3 | OS 4 | AS 1 | AS 2 | AS 3 | AS 4 | RS 1 | RS 2 | RS 3 | RS 4 |
| Statements | 0.61 | 0.52 | 0.45 | 0.46 | 0.11 | 0.24 | 0.14 | 0.12 | 0.5 | 0.6 | 0.52 | 0.53 | 0.49 | 0.6 | 0.55 | 0.5 | 0.62 | 0.66 | 0.51 | 0.52 |
| Adjectives | 0.57 | 0.56 | 0.48 | 0.46 | 0.11 | 0.24 | 0.14 | 0.12 | 0.41 | 0.42 | 0.48 | 0.49 | 0.41 | 0.47 | 0.53 | 0.5 | 0.41 | 0.41 | 0.41 | 0.41 |
| Statements | 0.18 | 0.22 | 0.19 | 0.12 | 0.14 | 0.26 | 0.14 | 0.12 | 0.09 | 0.08 | 0.08 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.17 | 0.05 | 0.09 | 0.02 |
| Adjectives | 0.21 | 0.24 | 0.21 | 0.14 | 0.26 | 0.23 | 0.14 | 0.12 | 0.04 | 0.02 | 0.04 | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | 0.18 | 0.04 | 0.03 | 0.03 |
| Statements | 0.12 | 0.17 | 0.09 | 0.05 | 0.23 | 0.41 | 0.09 | 0.05 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.19 | 0.06 | 0.07 | 0.04 |
| Adjectives | 0.23 | 0.25 | 0.25 | 0.15 | 0.28 | 0.53 | 0.15 | 0.28 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.17 | 0.0 | 0.03 | 0.02 |
| Statements | 0.36 | 0.34 | 0.3 | 0.36 | 0.32 | 0.32 | 0.33 | 0.33 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Adjectives | 0.37 | 0.36 | 0.33 | 0.33 | 0.33 | 0.46 | 0.35 | 0.35 | 0.03 | 0.07 | 0.07 | 0.07 | 0.06 | 0.06 | 0.06 | 0.06 | 0.62 | 0.62 | 0.62 | 0.62 |
| Statements | 0.41 | 0.39 | 0.35 | 0.35 | 0.35 | 0.46 | 0.35 | 0.35 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.62 | 0.62 | 0.62 | 0.62 |
| Adjectives | 0.35 | 0.32 | 0.33 | 0.33 | 0.37 | 0.41 | 0.33 | 0.33 | 0.04 | 0.02 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.62 | 0.62 | 0.62 | 0.62 |
| Statements | 0.28 | 0.27 | 0.31 | 0.22 | 0.35 | 0.41 | 0.33 | 0.33 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.62 | 0.62 | 0.62 | 0.62 |
| Adjectives | 0.03 | 0.12 | 0.06 | 0.13 | 0.03 | 0.03 | 0.03 | 0.03 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.62 | 0.62 | 0.62 | 0.62 |
| Statements | 0.06 | 0.14 | 0.11 | 0.19 | 0.03 | 0.03 | 0.03 | 0.03 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.62 | 0.62 | 0.62 | 0.62 |
| Adjectives | 0.02 | 0.06 | 0.04 | 0.14 | 0.04 | 0.04 | 0.04 | 0.04 | 0.08 | 0.12 | 0.12 | 0.12 | 0.15 | 0.15 | 0.15 | 0.15 | 0.49 | 0.51 | 0.52 | 0.52 |
| Statements | 0.07 | 0.01 | 0.06 | 0.01 | 0.11 | 0.11 | 0.06 | 0.01 | 0.07 | 0.07 | 0.05 | 0.05 | 0.03 | 0.01 | 0.01 | 0.01 | 0.39 | 0.41 | 0.37 | 0.36 |
| Adjectives | | | | | | | | | | | | | | | | | | | | |

Table 12. MTMM Matrix, Replication, 2024

| Ideas | Clusters | | | | Ideas | | | | Order | | | | Action | | | | Relational | | | |
|------------|------------|-------|-------|------|------------|-------|------|------|------------|------|------|------|------------|------|------|------|------------|------|------|------|
| | Statements | | | | Adjectives | | | | Statements | | | | Statements | | | | Statements | | | |
| | IS 1 | IS 2 | IS 3 | IS 4 | IA 1 | IA 2 | IA 3 | IA 4 | OS 1 | OS 2 | OS 3 | OS 4 | AS 1 | AS 2 | AS 3 | AS 4 | RS 1 | RS 2 | RS 3 | RS 4 |
| Statements | 0.66 | 0.42 | 0.39 | 0.38 | 0.08 | -0.11 | 0.08 | 0.08 | 0.58 | 0.64 | 0.41 | 0.41 | 0.61 | 0.7 | 0.55 | 0.66 | 0.61 | 0.52 | 0.58 | 0.58 |
| Adjectives | 0.55 | 0.49 | 0.39 | 0.38 | 0.08 | -0.11 | 0.08 | 0.08 | 0.52 | 0.64 | 0.41 | 0.41 | 0.52 | 0.58 | 0.55 | 0.66 | 0.58 | 0.58 | 0.58 | 0.58 |
| Statements | -0.04 | -0.01 | -0.03 | 0.08 | 0.08 | -0.11 | 0.08 | 0.08 | 0.52 | 0.64 | 0.41 | 0.41 | 0.52 | 0.58 | 0.55 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 |
| Adjectives | -0.08 | -0.08 | -0.11 | 0.04 | 0.04 | -0.09 | 0.04 | 0.04 | 0.45 | 0.42 | 0.41 | 0.41 | 0.45 | 0.42 | 0.41 | 0.41 | 0.45 | 0.42 | 0.41 | 0.41 |
| Statements | 0.01 | -0.02 | 0.01 | 0.19 | -0.02 | -0.15 | 0.08 | 0.08 | 0.48 | 0.58 | 0.64 | 0.64 | 0.61 | 0.58 | 0.58 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 |
| Adjectives | -0.11 | -0.08 | -0.09 | 0.08 | 0.08 | -0.15 | 0.08 | 0.08 | 0.48 | 0.58 | 0.64 | 0.64 | 0.61 | 0.58 | 0.58 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 |
| Statements | 0.36 | 0.31 | 0.36 | 0.48 | 0.48 | 0.36 | 0.48 | 0.48 | 0.27 | 0.25 | 0.24 | 0.24 | 0.35 | 0.23 | 0.23 | 0.23 | 0.45 | 0.19 | 0.23 | 0.26 |
| Adjectives | 0.42 | 0.33 | 0.39 | 0.31 | 0.31 | 0.44 | 0.44 | 0.44 | 0.09 | 0.15 | 0.2 | 0.2 | 0.19 | 0.14 | 0.14 | 0.14 | 0.61 | 0.52 | 0.52 | 0.52 |
| Statements | 0.37 | 0.35 | 0.33 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | -0.03 | 0.07 | 0.15 | 0.15 | 0.11 | 0.11 | 0.11 | 0.11 | 0.52 | 0.52 | 0.52 | 0.52 |
| Adjectives | 0.23 | 0.22 | 0.36 | 0.3 | 0.31 | 0.31 | 0.31 | 0.31 | 0.12 | 0.11 | 0.16 | 0.16 | 0.21 | 0.17 | 0.17 | 0.17 | 0.66 | 0.66 | 0.66 | 0.66 |
| Statements | 0.07 | 0.2 | 0.1 | 0.3 | 0.41 | 0.35 | 0.35 | 0.35 | 0.13 | 0.13 | 0.22 | 0.22 | 0.35 | 0.23 | 0.23 | 0.23 | 0.45 | 0.19 | 0.23 | 0.26 |
| Adjectives | 0.13 | 0.19 | 0.22 | 0.36 | 0.16 | 0.16 | 0.16 | 0.16 | 0.2 | 0.2 | 0.2 | 0.2 | 0.26 | 0.03 | 0.03 | 0.03 | 0.42 | 0.23 | 0.17 | 0.22 |
| Statements | 0.14 | 0.18 | 0.28 | 0.34 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.08 | 0.08 | 0.24 | 0.07 | 0.07 | 0.07 | 0.42 | 0.21 | 0.18 | 0.25 |
| Adjectives | 0.12 | 0.16 | 0.18 | 0.41 | 0.16 | 0.16 | 0.16 | 0.16 | 0.24 | 0.19 | 0.13 | 0.13 | 0.27 | 0.18 | 0.18 | 0.18 | 0.43 | 0.18 | 0.15 | 0.15 |
| Statements | 0.18 | 0.21 | 0.17 | 0.31 | 0.14 | 0.14 | 0.14 | 0.14 | 0.29 | 0.22 | 0.12 | 0.12 | 0.36 | 0.09 | 0.09 | 0.09 | 0.27 | 0.09 | 0.09 | 0.09 |
| Adjectives | | | | | | | | | | | | | | | | | | | | |

correlations exceeding 0.40, with a minimum correlation of .36 found on the Relational subscale. Across discriminant validity correlations, only 2.7% of the correlations were greater than 0.40, with 74.6% of the discriminant validity correlations being less than or equal to 0.20.

For the replication study, the results are similar but trend towards decreased discriminant validity. This is due to the sample size of the replication study ($n = 310$). Full results are provided in Table 12 but should be interpreted cautiously due to a lack of statistical power.

Confirmatory Factor Analysis

The original researchers also conducted a Confirmatory Factor Analysis (CFA) of the WAS using the cross-validation sample. The model is shown in Figure 1. The CFA involves the calculation of Goodness of Fit statistics as a test of the fit of the actual data in the sample to the model. The results are shown in Table 13. The results of the CFA indicate a high degree of construct validity for the WAS measurement model, as shown in Figure 1.

Table 13. Correlation among WAS Scales.

| Component | 1 | 2 | 3 | 4 |
|-----------|-------|-------|------|------|
| 1 | 1.00 | | | |
| 2 | 0.12 | 1.00 | | |
| 3 | -0.21 | 0.12 | 1.00 | |
| 4 | -0.50 | -0.01 | 0.06 | 1.00 |

Table 14. Goodness of Fit Statistics for the CFA of WAS across Two Samples.

| Measure | Model | Chi-Square | DF | CFI | RMSEA | SRMR |
|---|----------|------------|-----|--------|--------|--------|
| Goodness of Fit Criteria Cut-Off Values | | | | > 0.90 | < 0.08 | < 0.05 |
| Cross-Validation Sample | 4 Factor | 246.21 | 116 | 0.98 | 0.03 | 0.02 |

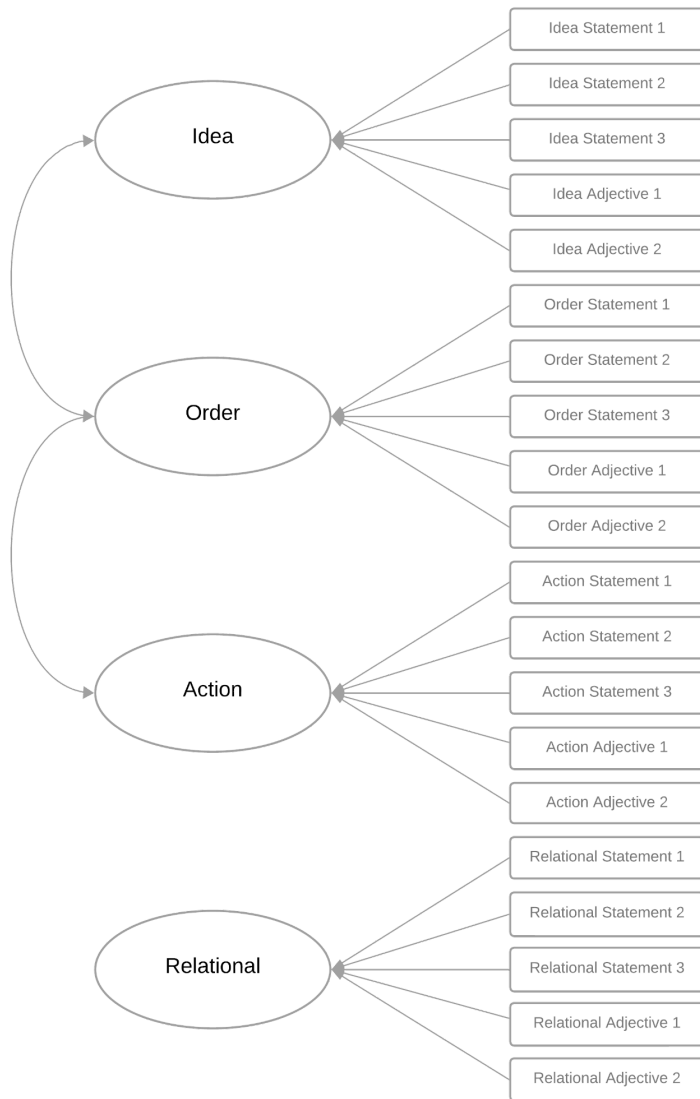


Figure 1. WAS Model.