PBC HOGAN

TECHNICAL BRIEF

Exploring Differences Among Aboriginal and Other Australians on the Hogan 360

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Introduction

When provided in the right context, 360 feedback can help leaders enhance their effectiveness in guiding their teams towards achieving organisational goals (Smither et al., 2005). However, the impact of 360 feedback is contingent on the quality of the tool used, the user's understanding of evidence-based practices around behavioural change, and their ability to motivate leaders to sustain their efforts to achieve outcomes. If invalid and biased measurements are used, 360 feedback could demotivate leaders (Nowack and Mashihi, 2012). The Hogan 360 Technical Manual presents evidence of the overall reliability and validity of the Hogan 360 (Peter Berry Consultancy, 2022). This technical brief summarises supplementary analyses examining measurement equivalence and mean group differences between Aboriginal and other Australians. The analyses provide insights into whether biases may influence how raters evaluate Aboriginal Australians on the Hogan 360 and whether there are any practically meaningful mean group differences in ratings between Aboriginal and other Australians.

Method

Sample

Data was analysed for 14,827 Australian subjects who completed the Hogan 360 between 1st January 2013 and 31st December 2023. A minority of the sample was Aboriginal Australians (n = 295, 2%), while the majority were categorised as other Australians (n = 14,532, 98%).

Instrument

The Hogan 360 (Peter Berry Consultancy, 2022), is a comprehensive multi-rater survey designed to gather leadership feedback from key stakeholder groups, such as managers, peers, and direct reports. This tool assesses four main domains and 14 underlying competency subthemes, providing a holistic view of leadership effectiveness.

In its current format, the Hogan 360 features:

- 50 scaled items rated on a 7-point scale, with 1 meaning 'Does not describe this person at all' and 7 meaning 'Describes this person exactly'. These items are aligned with the four domains of the Hogan 360 Leadership Model and their respective sub-themes.
- Ranked items that highlight the subject's top strengths and areas for improvement. Raters choose the subject's top four strengths and opportunities to improve from 30 items, with the top selection given the highest weight of 4, followed by weights of 3, 2, and 1.
- Three open-ended questions focused on identifying strengths, opportunities, and overused strengths.

This study focuses on data from the scaled items.

Figure 1

The Hogan 360 Leadership Model



Analysis

Measurement invariance refers to the statistical property that ensures a measurement tool (e.g., a survey, test, or assessment) functions equivalently across different groups or contexts. This means that the instrument measures the same underlying construct in the same way, regardless of factors such as cultural background, gender, or language. Establishing measurement invariance is critical for making valid comparisons between groups, as it confirms that the observed differences are due to the measured construct and not bias in the measurement tool (Brown, 2015).

For the Hogan 360 data used in the analyses, all items needed to include data at the sub-theme level for raters evaluating Aboriginal Australians. Full Information Maximum Likelihood (FIML) was implemented to deal with missing data. Unlike traditional methods that rely on listwise or pairwise deletion, FIML allows researchers to use all available data to estimate model parameters without discarding cases with missing observations. FIML estimates model parameters by calculating the likelihood for each case, conditional on the data available for that case (Beraldi & Enders, 2013).

In this technical brief, we followed the sequence Vandenberg and Lance (2000) recommended to test measurement invariance across multiple groups. We determined the equivalence of an oblique lower-order model for the Hogan 360 domains. Measurement invariance was assessed by comparing the fit statistics of a multigroup confirmatory factor model for configural invariance (equality of the factor structure across groups), metric invariance (similar factor loadings across groups), scalar invariance (similar intercepts across groups), and strict invariance (similar residual variances), using Version 0.6-19 of the lavaan package (Rosseel, 2012; Rosseel et al., 2024) in R (R Core Team, 2024).

The model-data fit of the Confirmatory Factor Analysis (CFA) was evaluated using the comparative fit index (CFI), the Tucker–Lewis Index (TLI), the standardised root mean-square residual (SRMR), and the root mean square error of approximation (RMSEA) (Brown, 2015; Hu & Bentler, 1999). The fit was considered suitable if the RMSEA and SRMR were ≤ .08 (Brown, 2006; Browne & Cudeck, 1992) and the CFI and TLI were ≥ .90 (Brown, 2006; Hu & Bentler, 1999). Brown (2015) argues that even if goodness-of-fit measures display a marginally good fit to the data (CFI and TLI in the range of .90 to .95), models may still be considered to display acceptable fit if other indices (SRMR and RMSEA) are within the acceptable range.

After inspecting bias with the test of invariance, robust t-tests were conducted on the 14 sub-themes of the Hogan 360 using Version 1.1-6 of the WRS2 package in R (Mair & Wilcox, 2020, 2024) to inspect the mean group differences between Aboriginal and other Australians.

Results

The inter-factor correlations for Aboriginal and other Australians are presented in Table 1. The fit statistics for the oblique lower-order confirmatory factor model of the 14 domains for Aboriginal Australians ($\chi 2$ [*df*] = 7855.77 [1084]; CFI = .92; TLI = .91; SRMR = .06; RMSEA = .05 [.05; .05]) and other Australians ($\chi 2$ [*df*] = 6121.11 [1084]; CFI = .90; TLI = .89; SRMR = .05; RMSEA = .06 [.05; .06]) were satisfactory (Brown, 2015; Hu & Bentler, 1999). The Tucker-Lewis Index (TLI) for other Australians is .01 below the recommended cutoff. However, model complexity could influence the TLI due to the number of mathematical parameters specified (Brown, 2015). Viewed in conjunction with the CFI, SRMR, and RMSEA, we concluded that the baseline models for both groups in Australia still displayed a reasonably good fit to be able to proceed with further tests for measurement invariance.

Table 1

Latent Factor Correlations From the 14-factor Confirmatory Factor Analysis for Aboriginal Australians (Under the Diagonal) and other Australians (Above the Diagonal)

Sub-Theme	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Integrity	-	.95	.76	.91	.88	.67	.75	.68	.79	.67	.57	.79	.65	.67
2. Resilience	.90	-	.84	.97	.91	.76	.76	.72	.81	.72	.59	.87	.69	.74
3. Communication	.74	.83	-	.86	.91	.85	.85	.79	.87	.80	.75	.82	.84	.85
4. People Skills	.89	.93	.88	-	.98	.77	.76	.70	.81	.75	.61	.89	.71	.74
5. Team Player	.84	.88	.97	.97	-	.84	.85	.77	.89	.81	.72	.94	.82	.82
6. Engaging	.69	.77	.97	.80	.90	-	.81	.73	.81	.83	.79	.83	.87	.88
7. Capability	.64	.65	.80	.64	.74	.81	-	.79	.91	.75	.73	.75	.80	.82
8. Efficiency	.64	.73	.91	.72	.82	.90	.78	-	.86	.72	.75	.72	.77	.74
9. Results	.73	.75	.87	.75	.85	.89	.86	.88	-	.77	.76	.80	.81	.82
10. Customer	.60	.61	.77	.68	.76	.77	.62	.73	.72	-		.72	.78	.81
11. Accountability	.48	.51	.83	.53	.68	.80	.63	.78	.69	.64	-	.72	.84	.78
12. Motivation	.79	.84	.91	.92	.96	.88	.66	.78	.77	.69	.63	-	.79	.81
13. Strategy	.57	.65	.91	.65	.78	.90	.70	.86	.78	.72	.84	.77	-	.95
14. Innovation	.58	.68	.85	.66	.79	.88	.71	.81	.78	.76	.74	.75	.92	-

Note. All the correlations were significant at the .05 level. The results are based on 2,784 raters for Aboriginal Australians and 1,150 for other Australians. A smaller subset of data was analysed for other Australians because complete item responses from raters were required. Rater categories for Aboriginal and other Australians included direct reports, peers, managers, and other stakeholders.

The pattern of inter-factor correlations reported between Aboriginals and other Australians was in the same range, suggesting a fair degree of similarity in the underlying structure of the data, regardless of the subject's descent. Furthermore, the factor-based inter-item reliabilities for Aboriginal and other Australians were acceptable (α and ω> 0.70). We then proceeded to explore the invariance of the model across raters that evaluated Aboriginal and other Australians, and the findings are reported in Table 2.

Table 2

Measurement Invariance Test Across Aboriginal and Other Australians on the Hogan 360 Lower-Order Model

Model	$\chi 2$	*df*	CFI	RMSEA	Δ *df*	Δ *CFI*	Δ RMSEA
Config	18680.65	2168	0.91	0.06	-	-	-
Metric	18807.32	2204	0.91	0.06	36	0.00	0.00
Scalar	19079.70	2240	0.91	0.06	36	0.00	0.00
Strict	19410.20	2290	0.91	0.06	50	0.00	0.00

Note. The results are based on 2,784 raters for Aboriginal Australians and 1,150 other Australians. A smaller subset of data was analysed for other Australians because complete item responses from raters were required. Rater categories for Aboriginal and other Australians included direct reports, peers, managers, and other stakeholders. The following is a brief explanation of the key terms used above.

- CFI: Compares how well your model fits the data against a baseline model where variables are uncorrelated. It ranges from 0 to 1, with higher values showing a better fit. A CFI of 0.90 or higher suggests the model demonstrates satisfactory fit.
- Δ CFI: When testing measurement invariance, we investigate changes in CFI between models with and without constraints. Constraints are conditions applied to ensure specific parts of the model, such as factor loadings (metric invariance), intercepts (scalar invariance), or error variances (strict invariance), are equal across the groups. These constraints test whether the model behaves similarly across the groups. If the change in CFI (ΔCFI) is less than 0.01 when constraints are added, it suggests the constraints do not significantly harm the model fit, supporting the equivalence of the measure across groups.
- RMSEA: Shows how well the model fits the data by measuring the difference between the model's predictions and the actual data, adjusted for its complexity (i.e., number of mathematical elements specified). Values at or below 0.08 suggest a satisfactory fit.
- ΔRMSEA: When testing measurement invariance, we check changes in RMSEA between models with and without constraints. Like the CFI difference, these constraints test whether the model behaves similarly across the groups. If the change in RMSEA (ΔRMSEA) is less than 0.015 when added, it suggests the constraints do not significantly harm the model fit, supporting measurement invariance.

The ΔCFI (< 0.01) and ΔRMSEA (< 0.015) provided sufficient evidence for measurement invariance in factor loadings, intercepts, and residuals when comparing raters who evaluated Aboriginal Australians to those who evaluated other Australians (Chen, 2007; Cheung & Rensvold, 2002). This indicates that raters have the same underlying assumptions about the subthemes on the Hogan 360, regardless of whether they are rating Aboriginal Australians or other Australians. With preliminary evidence supporting the measurement invariance of the underlying factor structure established for both groups, we examined the mean group differences in the ratings obtained on the Hogan 360, as reported in Table 3

Table3

T-test Results, Sub-Theme Means, Standard Deviations, and Reliability Coefficients for Aboriginal and Other Australians

Model	Group	Mean	*SD*	Alpha	Omega	*t*	*df*	*d*
Integrity	Aboriginal	5.99	.50	.88	.89	25.49	20457.24	.21 (.19; .23)
	Other AUS	5.92	.49	.85	.85			
Resilience	Aboriginal	5.80	.56	.89	.89	18.53	19019.01	.14 (.12; .15)
	Other AUS	5.73	.54	.88	.88			
Communication	Aboriginal	5.60	.56	.82	.85	16.08	19275.15	.14 (.11; .15)
	Other AUS	5.59	.52	.81	.80			
People Skills	Aboriginal	5.78	.60	.92	.92	31.91	20207.59	.24 (.23; .26)
	Other AUS	5.62	.61	.91	.91			
Team Player	Aboriginal	5.65	.59	.90	.91	26.28	20354.45	.20 (.18; .21)
	Other AUS	5.52	.56	.88	.88			
Engaging	Aboriginal	5.73	.62	.86	.89	20.51	20512.47	.16 (.14; .17)
	Other AUS	5.65	.54	.84	.83			
Capability	Aboriginal	6.01	.52	.87	.87	12.96	20677.01	.10 (.08; .11)
	Other AUS	6.06	.44	.83	.84			
Efficiency	Aboriginal	5.52	.64	.89	.92	27.14	20417.44	.21 (.19; .22)
	Other AUS	5.59	.54	.88	.88			
Results	Aboriginal	5.79	.57	.93	.93	29.63	20679.10	.22 (.21; .24)
	Other AUS	5.87	.46	.91	.91			
Customer	Aboriginal	5.74	.57	.90	.90	30.00	18968.82	.24 (.22; .25)
	Other AUS	5.66	.51	.89	.90			
Accountability	Aboriginal	5.45	.63	.87	.87	25.24	20521.34	.19 (.17; .21)
	Other AUS	5.43	.49	.86	.87			
Motivation	Aboriginal	5.59	.70	.89	.92	29.18	20252.73	.22 (.20; .24)
	Other AUS	5.45	.61	.90	.90			
Strategy	Aboriginal	5.44	.68	.90	.90	17.66	20449.73	.13 (.12; .16)
	Other AUS	5.38	.52	.87	.88			
Innovation	Aboriginal	5.60	.59	.90	.90	08.00	19233.19	.06 (.04; .07)
	Other AUS	5.53	.50	.88	.88			

Note. All the effects reported were significant at the .05 level. The results are based on 295 Aboriginal Australians and 14,532 other Australian leaders' scores on the Hogan 360. The following is a brief explanation of key terms reported above.

- *Alpha: Evaluates whether multiple items that measure the same concept produce consistent results. Coefficients of 0.7 or higher are satisfactory.*
- *Omega: Is another measure of scale reliability that is often considered more robust than Alpha. It indicates how well a set of items measures a single underlying concept, and it is beneficial when items have varying levels of strength in measuring the concept. Coefficients of 0.7 or higher are satisfactory.*
- *Yuen's d: Measures the size of the difference between two groups, but it ignores extreme values that might impact the results. It provides a more accurate picture of the differences between the groups being compared, even when the data do not meet standard statistical assumptions. Values of 0.10, 0.30, and 0.50 correspond to small, medium, and large effect sizes.*

Aboriginal Australians scored statistically significantly higher on the People Skills, Team Player, Engaging, Customer, Motivation, and Strategy sub-themes. Conversely, other Australians scored statistically significantly higher on Results. However, none of these mean group differences were substantial enough (d > 0.30) to be practically noticeable. Therefore, the evidence suggests that neither Aboriginal Australians nor other Australians are at a higher risk of being adversely impacted if a similar benchmark is used to evaluate their leadership effectiveness using the Hogan 360.

Conclusion

The findings of this study indicate that there are no significant differences when raters evaluate Aboriginal Australians or other Australians on the sub-themes of the Hogan 360. Although Aboriginal Australians scored higher on most of the Hogan 360 sub-themes, the statistical effect sizes were not large enough to suggest any practically observable differences in the scores received by Aboriginal or other Australian subjects. These results suggest that the Hogan 360 does not exhibit bias based on Aboriginal descent in Australia and can be administered without statistical adjustments, such as cutoffs based on descent.

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