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A network cross-cultural validation of the Multidimensional Scale of Perceived Social Support (MSPSS) among Aboriginal and Torres Strait Islander and non-Indigenous Australian adults

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ABSTRACT

Objective: This study aimed to assess cross-cultural measurement invariance of the Multidimensional Scale of Perceived Social Support (MSPSS), between Aboriginal and Torres Strait Islander and non-Indigenous Australian adults, focusing on its applicability in diverse cultural contexts.

Method: We analysed 24-month follow-up data from a longitudinal cohort study on oral HPV infection and oropharyngeal cancer (HPVOPC) with 729 Aboriginal and Torres Strait Islander adults and baseline data from the Dental Care and Oral Health Study (DCOHS), encompassing 4,086 non-Indigenous South Australians. Using network analysis and permutation testing, we examined configural and metric invariance.

Results: The MSPSS maintained its three-dimensional structure in both cultural groups (configural invariance). However, three items showed weaker loadings in the Aboriginal and Torres Strait Islander network models compared to models for non-Indigenous participants. These differences had minimal impact on total scores, but may affect sub-scale comparisons.

Conclusion: The MSPSS demonstrates robust psychometric properties for cross-cultural research on social support among both Aboriginal and Torres Strait Islander people and non-Indigenous Australians. While partial invariance suggests the need for caution in interpreting sub-scale scores, the MSPSS provides valuable insights into social support dimensions across populations.

KEY POINTS

What is already known about this topic:

- (1) Perceived social support is vital for mental and physical health, especially in culturally diverse populations like Aboriginal and Torres Strait Islander Communities.
- (2) The Multidimensional Scale of Perceived Social Support (MSPSS) is validated in various cultural settings, including for Aboriginal and Torres Strait Islander adults.
- (3) The MSPSS has not been cross-culturally validated between Aboriginal and Torres Strait Islander and non-Indigenous adults, raising concerns about its broader applicability.

What this topic adds:

- (1) This study validates the MSPSS's cross-cultural measurement invariance for total scores, supporting its use for comparing social support perceptions.
- (2) Findings highlight cultural differences in how certain items are interpreted, reflecting unique patterns of social support.
- (3) Aboriginal and Torres Strait Islander participants were less likely to select "strongly agree", potentially reflecting cultural differences in interpretation or experiences.

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Perceived social support; psychometric validation; network analysis; cross-cultural measurement invariance; Aboriginal and Torres Strait Islander Communities

Background

Social support is a cornerstone of health and well-being (Asante & Karikari, 2022; Reti et al., 2022), particularly within Aboriginal and Torres Strait Islander communities (Dudgeon et al., 2014). Grounded in cultural frameworks such as kinship

ties, collective responsibility, and relationality, Aboriginal and Torres Strait Islander social support systems extend far beyond immediate family to include Elders, extended kin, and the broader community (Gee et al., 2014; Ristevski et al., 2020). These social frameworks foster emotional, spiritual, and

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practical assistance, contributing to resilience and cultural identity.

Central to many Aboriginal and Torres Strait Islander cultures, kinship systems create an intricate web of relationships that define social roles, obligations, and responsibilities. These systems ensure collective care and shared resources, promoting the wellbeing of individuals within a broader community context (Dudgeon et al., 2014, pp. 5, 59). A related concept, Relationality, emphasises interconnectedness and reciprocity, framing individual identity within a communal lens (Tynan, 2021). Relationality not only structures social interactions but also influences mental health and wellbeing, shaping how social support is perceived, mobilised, and valued. Unlike Western frameworks that often prioritise individualism, Relational systems support resilience through collective strength and shared responsibilities.

While kinship and Relational frameworks remain vital for resilience and healing, the legacy of colonisation has significantly disrupted these systems (Family is Culture, 2019). Policies of assimilation, forced child removal, and systemic discrimination have eroded traditional practices, contributing to intergenerational trauma and ongoing health disparities in Aboriginal and Torres Strait Islander communities (Menzies, 2019). Despite these challenges, Aboriginal and Torres Strait Islander cultural frameworks endure as protective mechanisms, offering emotional and social support that buffers the effects of trauma and strengthens community resilience (Lakey & Cohen, 2000).

Given the importance of social support in promoting resilience and wellbeing, it is critical to better understand and quantify how it is perceived and experienced within Aboriginal and Torres Strait Islander communities (Gee et al., 2014). Psychometric tools like the *Multidimensional Scale of Perceived Social Support* (MSPSS) are widely used to measure perceived social support. Developed by Zimet et al. (1988), the MSPSS measures perceptions of social support across three domains: *Family*, *Friends*, and a *Significant Other*. Validated in diverse contexts, including Asia (Laksmi et al., 2020), Europe (Calderón Garrido et al., 2021; Tsilika et al., 2019), the Middle East (Ebrahim & Alothman, 2022), and Africa (Aloba et al., 2019), the MSPSS has consistently demonstrated its reliability and adaptability. However, the measure's application and relevance to Aboriginal and Torres Strait Islander communities, with their unique relational frameworks, remain underexplored.

Recent work has validated the MSPSS for use with Aboriginal and Torres Strait Islander adults, confirming its dimensional structure, strong reliability, and measurement invariance across demographic factors such

as age, sex, and residential location (McCormick et al., 2025). While this represents an important step forward, cross-cultural measurement invariance has not yet been addressed, raising concerns about whether any observed differences between Aboriginal and Torres Strait Islander and non-Indigenous Australians reflect genuine variations in perceived social support or cultural bias. Cross-cultural validation is therefore essential to ensuring the MSPSS remains relevant both within Aboriginal and Torres Strait Islander communities and across the broader Australian population. By comparing the measure between groups, it is possible to confirm whether MSPSS items are interpreted consistently across them (Jamison et al., 2022). This ensures that observed differences reflect genuine cultural variation rather than methodological bias. Validating the MSPSS in this context also reduces the risk of cultural bias distorting findings or perpetuating inequities in health outcomes (Hedges et al., 2023).

Building on this need for cross-cultural validation, this research aims to evaluate the cross-cultural measurement invariance of the MSPSS between Aboriginal and Torres Strait Islander and non-Indigenous Australians. Specifically, it examines whether the MSPSS measures social support equivalently across these groups by addressing key aspects of invariance, including structure, connectivity, and parameter consistency. Using network analytical methods, this study adopts a novel approach to assessing cross-cultural measurement invariance by focusing on the associations between variables rather than their relationships to an unobserved "latent" trait (Jamison et al., 2022). This approach provides a nuanced understanding of how social support functions across diverse cultural groups. By addressing these aspects, this research aims to contribute to the validation of the MSPSS as a suitable tool for cross-cultural research and practice. Our findings are expected to inform culturally responsive psychological research and practice, with the potential to support efforts aimed at improving health outcomes and strengthening social support systems within Aboriginal and Torres Strait Islander communities.

Materials and methods

The study design, materials, and interpretation of the statistical analysis results were conducted in consultation with the Senior Indigenous Research Officer (JH), a Yamatji woman specialising in fieldwork and community engagement for oral health research, to ensure cultural relevance and appropriateness. As a keeper of Aboriginal knowledge, JH ensured that the study was conducted in a culturally respectful and appropriate

manner. By incorporating her expertise and perspectives, this study aimed to align its findings with the cultural contexts and lived experiences of Aboriginal and Torres Strait Islander communities. This approach not only strengthened the cultural safety of the research but also enhanced the validity and applicability of the study's conclusions.

Participants and procedure

This study utilised MSPSS data collected from two distinct sources: the Longitudinal Oral HPV Infection and Oropharyngeal Cancer Cohort (HPVOPC) study (2020–2021) and the Dental Care and Oral Health Study (DCOHS) baseline survey (2015–2019). Both datasets were chosen to enable cross-cultural validation of the MSPSS across Aboriginal and Torres Strait Islander and non-Indigenous populations, despite differences in their primary aims and recruitment methods. These studies received ethical approval from the University of Adelaide Human Research Ethics Committee (H-2016–246 and H-288–2011, respectively) and the Aboriginal Health Research Ethics Committee (APP1120215; HPVOPC study only).

The HPVOPC study aimed to investigate oral HPV infection and oropharyngeal cancer in Aboriginal and Torres Strait Islander adults. Recruitment and data collection were informed by culturally safe and community-centred, adhering to principles of the CONSIDER statement (CONSolIDated critERtia for strengthening the reporting of health research involving Indigenous Peoples; Huria et al., 2019). These processes were further guided by the Indigenous Oral Health Unit Aboriginal Reference Group (IOHU-ARG), which approved the use of psycho-social measures, such as the MSPSS, to assess the broader determinants of health and wellbeing. While this specific cross-cultural analysis was not separately reviewed, the overarching goal of validating the MSPSS aligns with the IOHU-ARG's input and approval of the original studies.

Recruitment leveraged pre-existing partnerships with Aboriginal Community Controlled Health Organizations. Details of the study design, recruitment protocols, data collection, and results have been published elsewhere (Hedges et al., 2022; Jamieson et al., 2018, 2020, 2021; Ju et al., 2023). All participants provided informed consent prior to their involvement in the study, with information about the research provided in culturally appropriate ways. At the 24-month follow-up, 729 participants (68.6% female) aged between 19 and 81 years ($M = 43.6$, $SD = 14.5$) completed the MSPSS. The scale was administered in-person in English within the participant's community

under the direct guidance of JH. In rare instances where translation into Language was required, a local community member provided interpretive support with the participant's approval.

At baseline, the DCOHS included 12,245 adults (≥ 18 years) residing in South Australia who were randomly selected from the Australian Electoral Roll. Survey data were collected by self-complete questionnaires and included information related to demographics, socio-economic factors, oral health, general health, and psychosocial variables, including perceived social supports. From the valid MSPSS response sample ($n = 4,494$), only those who self-identified as non-Indigenous ($n = 4,185$) were included in this study. These included study participants were mostly female (56.3%) aged between 18 and 86 years ($M = 53.5$, $SD = 16.0$).

Materials

The MSPSS is a widely used 12-item measure assessing perceived adequacy of social support from three sources: *Significant Other*, *Family*, and *Friends* (Zimet et al., 1988). For both the HPVOPC and DCOHS studies, the original 7-point Likert response scale was modified to a 5-point scale (1 = "Strongly Disagree", 2 = "Disagree", 3 = "Neither agree or disagree", 4 = "Agree", 5 = "Strongly Agree"). In the HPVOPC study, this change was made in consultation with the Senior Indigenous Research Officer and the IOHU-ARG to enhance the measure's cultural appropriateness during in-person interviews, ensuring participants could respond meaningfully and with greater ease. In the DCOHS study, a 5-point scale was also employed, although the rationale was not explicitly documented. Notably, prior research suggests that, in some contexts, reducing the number of response options can minimise cognitive burden and improve response reliability and validity (Abulela & Khalaf, 2024; Lozano et al., 2008), with similar modifications to the MSPSS being successfully implemented (H. Chen et al., 2007; Özçelik Bozkurt 2022; van Borkulo, van Bork, et al., 2023).

In consultation with the Senior Indigenous Research Officer and the IOHU-ARG, the term "significant other" in the MSPSS was replaced with "special person" for the HPVOPC study group. The purpose of this modification was to improve the instrument's cultural relevance. This adaptation addressed the limited applicability of Western linguistic conventions in Aboriginal and Torres Strait Islander communities. By using "special person", the revised scale better reflected participants' interpersonal relationship dynamics while retaining the original intent of the MSPSS items and domains. Preliminary validation (McCormick et al., 2025) supports

the psychometric robustness of these adaptations, indicating that they maintained reliability and validity while improving cultural resonance. Notably, the original MSPSS terminology was retained for the non-Indigenous group, thus preserving comparability with previous studies in this population.

The full wording and organisation of MSPSS items, including the adaptation of “significant other” to “special person” for Aboriginal and Torres Strait Islander participants, are presented in Figure 1.

Statistical analysis

Statistical software

All statistical analysis was conducted using packages in R software (R Core Team, 2022) using R packages: EGAnet (Golino & Christensen, 2019), psychometric (Epskamp,

2021), NetworkComparisonTest (van Borkulo, Epskamp, et al., 2023) and qgraph (Epskamp et al., 2012). The R syntax may be found at https://osf.io/4bgve/?view_only=12883f95a5084539a2c55a0555becaea.

Missing data

Following Graham (2009), where missingness was less than 5% across each of the items, the analysis was conducted with complete-case samples.

Network model estimation, configural invariance, and stability

To examine configural invariance across cultural groups, we employed Gaussian graphical models (GGM) to independently estimate network models, where nodes represent items and edges signify partial correlations between them. Configural invariance was assessed by verifying if the same nodes were

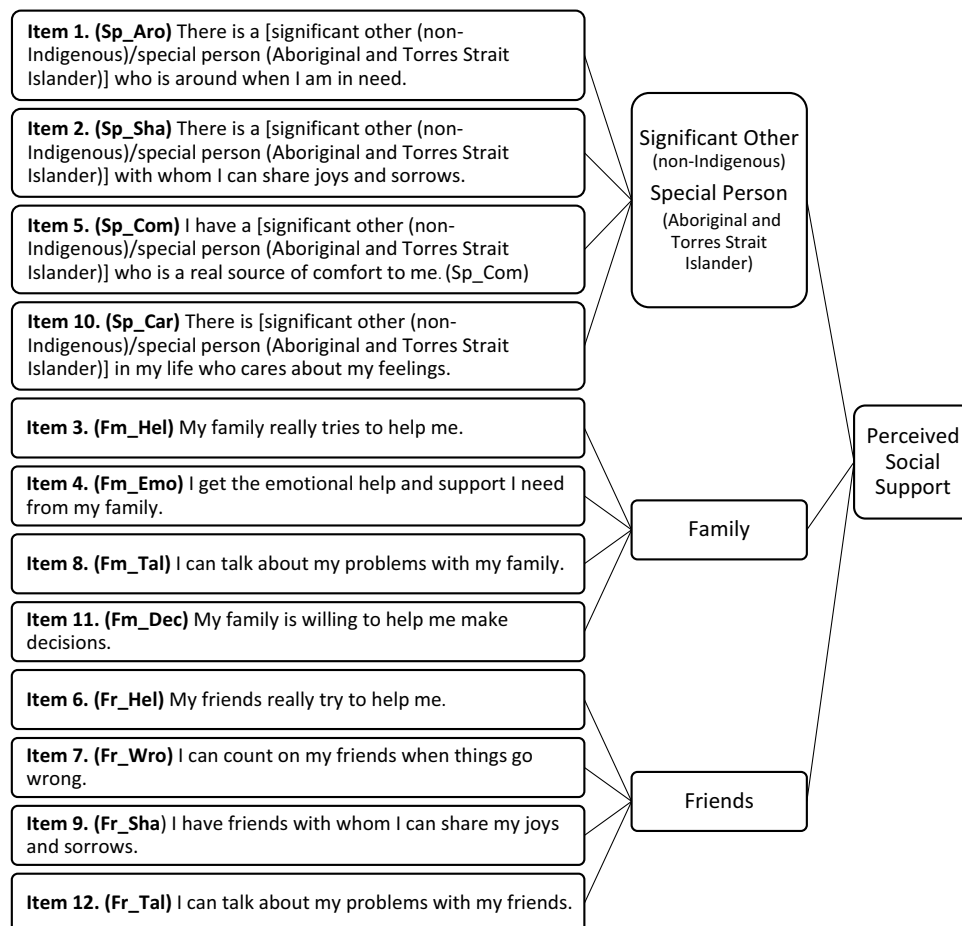


Figure 1. The Multidimensional Scale of Perceived Social Support (MSPSS), adapted by replacing significant Other with special person for Aboriginal and Torres Strait Islander populations to enhance cultural relevance. In this context, significant other is used for non-indigenous participants, while special person reflects the cultural adaptation for Aboriginal and Torres Strait Islander participants. Abbreviated node names are provided in parentheses following each item number and description. The scale items are organised into three subscales—Significant Other/Special Person, Family, and Friends – which collectively define the construct of perceived social support. Abbreviated node labels (in parentheses) follow each item number and correspond to the coding structure used in analyses and the figures.

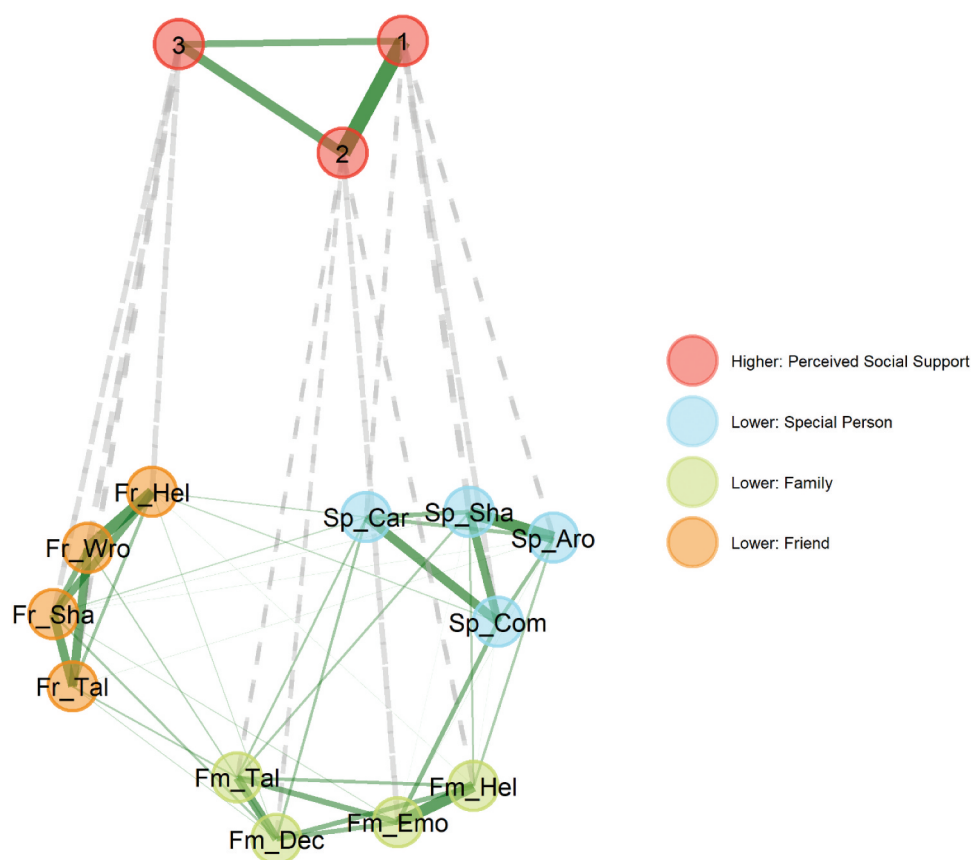


Figure 2. Hierarchical network structure of the MSPSS for Aboriginal and Torres Strait islanders showing the higher- and lower-order domains estimated by McCormick et al. (2025). The nodes of the lower-order domain are clustered into three communities (*Special Person*, *Family*, and *Friends*) and the nodes of the higher-order domain clustered into a single community (perception of social support). Solid edges (coloured green) represent the partial correlation between nodes, with the intensity of line (thickness/opacity) indicating the relative strength of that edge. Dashed lines represent the belongingness of each lower-order node to their respective higher-order community. Full descriptions of MSPSS items are provided in Figure 1.

consistently clustered into the same communities across 1,000 non-parametric bootstrap samples.

For the Aboriginal and Torres Strait Islander MSPSS network model, we report again the structure and stability previously evaluated by McCormick et al. (2025), as illustrated in Figure 2. The non-Indigenous group MSPSS model was estimated in the same way using the Graphical Least Absolute Shrinkage and Selector Operator (GLASSO) method, with the tuning parameter determined through Extended Bayesian Information Criterion (EBIC) minimisation. To account for the ordinal nature of the items, the polychoric correlation matrix was used as input for network analysis. Network communities were identified using the Louvain algorithm, with structural consistency and item stability evaluated across 1,000 non-parametric bootstrap samples. Visual representations of the “typical” network structures were generated using the

Fruchterman-Reingold algorithm, with layouts averaged to facilitate visual comparisons.

Model fit and internal consistency

McCormick et al. (2025) previously assessed the internal consistency and fit of the Aboriginal and Torres Strait Islander MSPSS network model. Their results are reported alongside our findings for the non-Indigenous cohort. Internal consistency for the non-Indigenous responses were evaluated using McDonald’s coefficient ω , with sum scores calculated for the identified network communities (*Significant Other/Special Person*, *Family*, and *Friends*). Model fit was evaluated using Root Mean Squared Error of Approximation (RMSEA) and Comparative Fit Index (CFI; Kan et al., 2020), following thresholds of $CFI \geq 0.95$ and $RMSEA < 0.05$ for good fit (Kline, 2015). Due

to the small sample size (in the HPV sample), models were evaluated on the same data used for estimation, likely inflating fit indices (Fokkema & Greiff, 2017).

Global and edge strength invariance

Using the methodology of van Borkulo, van Bork, et al. (2023), we tested the equivalence of network models across groups, assessing edge strength and global strength invariance between the Aboriginal and Torres Strait Islander and non-Indigenous MSPSS networks. Permutation testing (10,000 iterations) was used to evaluate global strength (S , the weighted absolute sum of all edges) and individual edge strength invariance (E), with a focus on edges connecting the *Family* and *Significant Other/Special Person* communities. Meaningful differences were defined as partial correlation differences of ≥ 0.05 . To control for family-wise error, the Bonferroni-Holm procedure was applied, ensuring robust and reliable conclusions.

Metric invariance

Metric invariance, i.e., assessing whether network cross-loadings were equivalent across groups, was tested after establishing configural invariance. Permutation testing (Jamison et al., 2022) compare observed network loading differences against a bootstrapped null distribution. To minimise the False Discovery Rate, both uncorrected p -values and Benjamini – Hochberg corrected p -values (p_{BH} ; Benjamini & Hochberg, 1995) were calculated. Non-invariance was identified when items were flagged by both the uncorrected and corrected p -values.

Partial measurement invariance was identified when certain items showed inconsistent network loadings across groups. To address this, we compared a partially invariant model (all items retained) with a fully invariant model (items with inconsistent loadings excluded) (F. F. Chen, 2008; Cheung & Rensvold, 1998). This comparison is helpful if there is strong evidence that both models – with and without the inconsistent items – rank people similarly on the MSPSS sub-scales and overall scores. If this similarity between the models is significantly strong (i.e., correlation $r \geq .95$), the practical impact of these inconsistent items may be minimal. In such cases, researchers may confidently use either the partially invariant or the fully invariant model for reporting purposes.

However, if the ranking results differ meaningfully between the two models, this can offer valuable insights into how the inconsistent items influence scores (Putnick & Bornstein, 2016). Exploring these differences further can help

researchers determine which model is more appropriate for reporting MSPSS scores, particularly between Aboriginal and Torres Strait Islander and non-Indigenous adults.

Group differences

After establishing cross-cultural invariance (full or partial), we examined differences in the distribution of MSPSS total and sub-scale scores between groups using Kernel Density Estimation (KDE).

Results

Descriptive statistics

A minimal proportion of missing values was observed, with missingness below 1% across all items within each study. Consistent with Graham's (2009) recommendations, analyses used the complete case of 711 Aboriginal and Torres Strait Islander adults (68.8% female, aged 19–81 years, $M = 43.5$, $SD = 14.4$) and 4,086 non-Indigenous adults (56.2% female, aged 18–86 years, $M = 53.1$, $SD = 16.0$). Likert score distributions are shown in Figure 3(A). Respondents in both groups generally agreed with all statements. For Aboriginal and Torres Strait Islander participants, the highest agreement was with the *Special Person* community, followed by *Family* and *Friends*. A similar pattern was observed for non-Indigenous participants. Individual item and subscale score distributions are detailed in Tables 1, 2, and 3.

Network model estimation, configural invariance, and stability

Polychoric correlation and covariance matrices for Aboriginal and Torres Strait Islander (HPVOPC study) and non-Indigenous (DCOHS study) responses to the MSPSS are presented in Tables 1 and 2, respectively. Figure 3(B) displays the item network loadings for both models (see Supplementary Table S1 for numerical values). All items showed significant loadings within their theoretical dimensions, with no cross-loadings exceeding 0.15.

Similar to the Aboriginal and Torres Strait Islander MSPSS, the non-Indigenous MSPSS exhibited a robust three-dimensional structure (Figure 4). Stability analysis confirmed this structure, consistently identifying the same three communities – *Significant Other/Special Person*, *Family*, and *Friends* – across 100% of bootstrapped samples. Item scores were also consistently assigned to their respective communities, with replication rates of 100%, as shown in Figure 3(c).

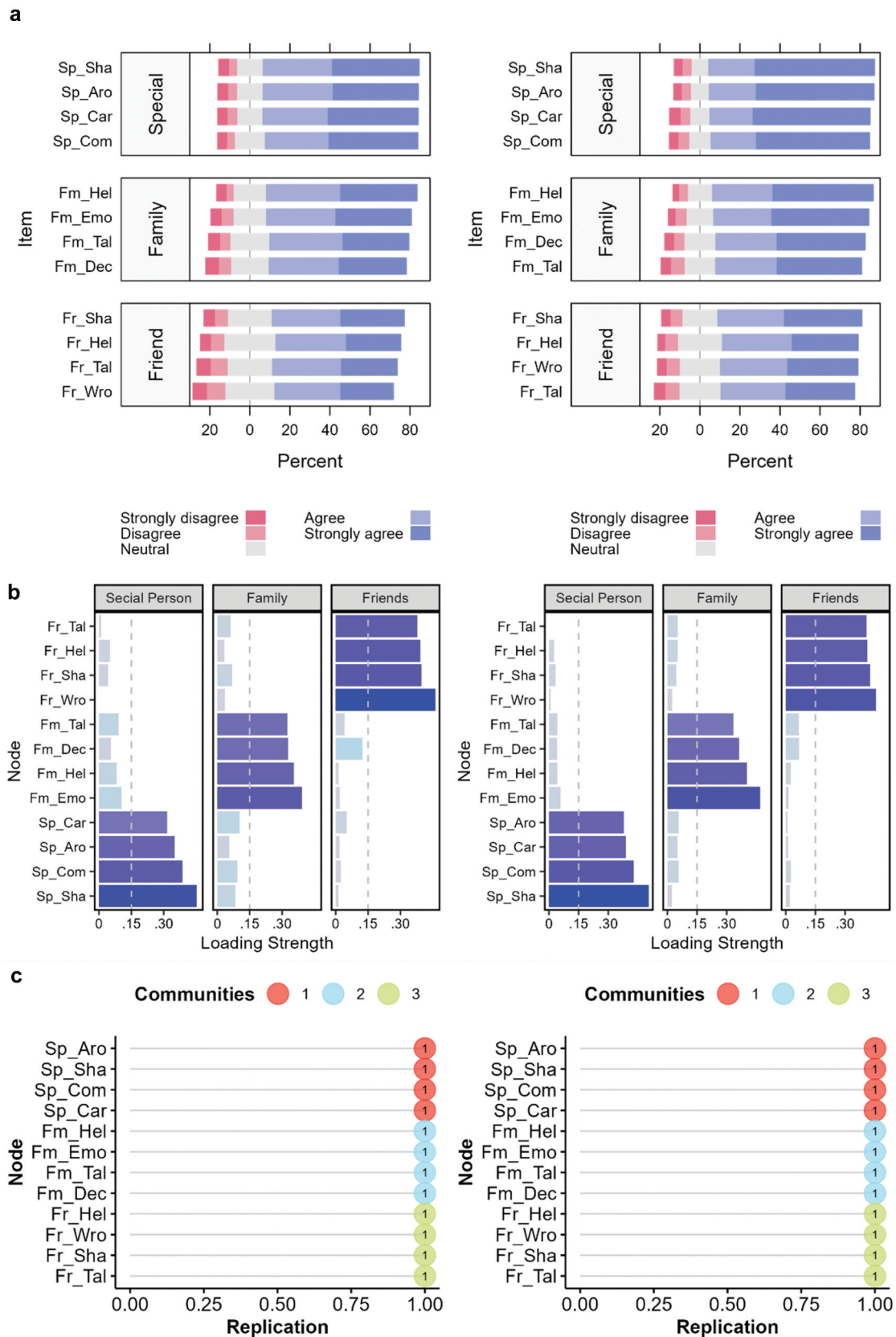


Figure 3. Distribution of MSPSS item responses (panel a), network loadings (panel b), and network stability (panel c) of the MSPSS for Aboriginal and Torres Strait Islander (figures on the left) and non-indigenous (figures on the right) participants. The dashed line in the distribution of network loadings (panel b) represents the threshold defining “small” loading magnitude (see Christensen & Golino, 2021). Within the two network structures (panel c), the nodes coloured orange (significant Other (non-Indigenous)/Special Person (Aboriginal and Torres Strait Islander)), light blue (family), and green (Friends), represent the variables (items) of the MSPSS survey. Full descriptions of MSPSS items are provided in Figure 1.

Table 1. Summary of polychoric correlations, covariances, means, standard deviations, kurtosis, and percentage of missingness for item responses by Aboriginal and Torres Strait Islander Australians.

Items	1	2	3	4	5	6	7	8	9	10	11	12
1. Sp_Aro		0.94	0.68	0.70	0.83	0.53	0.52	0.67	0.56	0.77	0.65	0.55
2. Sp_Sha	.81		0.72	0.75	0.91	0.51	0.53	0.75	0.56	0.85	0.67	0.55
3. Fm_Hel	.59	.62		0.92	0.70	0.56	0.56	0.81	0.60	0.64	0.83	0.55
4. Fm_Emo	.59	.63	.79		0.79	0.58	0.59	0.89	0.62	0.72	0.90	0.57
5. Sp_Com	.72	.80	.61	.67		0.58	0.55	0.72	0.58	0.90	0.71	0.56
6. Fr_Hel	.46	.46	.49	.49	.51		1.01	0.54	0.92	0.64	0.69	0.89
7. Fr_Wro	.42	.44	.45	.47	.45	.80		0.61	0.99	0.58	0.74	0.03
8. Fm_Tal	.55	.62	.69	.73	.60	.48	.50		0.63	0.75	0.94	0.66
9. Fr_Sha	.48	.51	.51	.54	.51	.77	.77	.53		0.64	0.75	0.01
10. Sp_Car	.69	.74	.56	.60	.78	.53	.45	.62	.54		0.77	0.60
11. Fm_Dec	.54	.56	.70	.72	.59	.58	.58	.75	.62	.63		0.71
12. Fr_Tal	.45	.46	.46	.47	.47	.72	.78	.53	.77	.48	.58	
Rank	4	3	5	6	2	10	12	7	9	1	8	11
<i>M</i>	4.05	4.07	4.00	3.93	4.07	3.73	3.63	3.86	3.80	4.08	3.83	3.68
<i>SD</i>	1.08	1.07	1.05	1.11	1.07	1.08	1.16	1.10	1.11	1.09	1.14	1.15
<i>K</i>	1.00	1.12	0.94	0.40	0.93	0.01	-0.35	0.36	0.05	0.91	0.19	-0.21
% missing	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0

Notes: *M* = Mean; *SD* = Standard deviation; *K* = Kurtosis. Polychoric correlations are presented below the diagonal and covariances are presented above the diagonal. Rank indicates ranking of items according to their mean scores from highest to lowest. Full descriptions of MSPSS items are provided in Figure 1, with item abbreviations (e.g., Sp_Aro, Fm_Hel) corresponding to the node labels in Figure 1.

Table 2. Summary of polychoric correlations, covariances, means, standard deviations, kurtosis, and percentage of missingness item responses for by non-indigenous Australians.

Items	1	2	3	4	5	6	7	8	9	10	11	12
1. Sp_Aro		0.98	0.58	0.63	0.93	0.51	0.52	0.61	0.53	0.92	0.60	0.51
2. Sp_Sha	.88		0.56	0.62	1.00	0.52	0.53	0.63	0.56	0.98	0.59	0.52
3. Fm_Hel	.58	.57		0.91	0.57	0.54	0.54	0.84	0.52	0.56	0.86	0.49
4. Fm_Emo	.59	.59	.85		0.67	0.57	0.58	0.94	0.56	0.63	0.91	0.54
5. Sp_Com	.80	.85	.57	.61		0.57	0.56	0.67	0.58	1.08	0.63	0.55
6. Fr_Hel	.48	.49	.54	.55	.51		0.97	0.63	0.90	0.55	0.62	0.92
7. Fr_Wro	.46	.47	.52	.52	.48	.85		0.64	0.96	0.56	0.63	0.97
8. Fm_Tal	.54	.56	.72	.78	.58	.56	.54		0.67	0.66	0.95	0.66
9. Fr_Sha	.48	.51	.51	.52	.51	.79	.82	.58		0.58	0.63	1.04
10. Sp_Car	.78	.83	.54	.57	.86	.48	.46	.56	.49		0.66	0.56
11. Fm_Dec	.56	.55	.76	.77	.57	.57	.55	.77	.56	.57		0.65
12. Fr_Tal	.44	.45	.47	.49	.46	.79	.80	.55	.84	.45	.56	
Rank	2	1	5	6	4	11	10	8	9	3	7	12
<i>M</i>	4.28	4.29	4.20	4.13	4.21	3.87	3.88	3.99	3.96	4.23	4.04	3.83
<i>SD</i>	1.06	1.06	1.01	1.06	1.11	1.05	1.09	1.12	1.08	1.14	1.10	1.13
<i>K</i>	1.76	1.90	1.30	0.81	1.15	0.11	0.12	0.32	0.37	1.34	0.62	0.00
Missing (%)	0.9	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5

Notes: *M* = Mean; *SD* = Standard deviation; *K* = Kurtosis. Polychoric correlations are presented below the diagonal and covariances are presented above the diagonal. Rank indicates ranking of items according to their mean scores from highest to lowest. Full descriptions of MSPSS items are provided in Figure 1, with item abbreviations (e.g., Sp_Aro, Fm_Hel) corresponding to the node labels in Figure 1.

Table 3. Group comparisons of MSPSS total and subscale scores across full (12-item) and reduced (9-item) models for Aboriginal and Torres Strait Islander and Non-Indigenous adults.

Characteristic	Total Scores	Sub-scale Scores		
		Significant Other/Special Person ^a	Family	Friends
Full model scores				
Aboriginal and Torres Strait Islander (<i>M</i> , <i>SD</i>)	46.8 (10.4)	16.3 (3.9)	15.6 (3.9)	14.9 (4.1)
Non-Indigenous (<i>M</i> , <i>SD</i>)	49.0 (10.2)	17.0 (4.1)	16.4 (3.9)	15.6 (4.0)
Mean difference [95% CI]	2.2 [1.0, 2.3]	0.7 [0.4, 0.8]	0.8 [0.2, 0.5]	0.7 [0.4, 1.0]
<i>t</i>	5.19	4.95	4.02	4.32
<i>p</i>	<.001	<.001	<.001	<.001
Reduced model scores				
Aboriginal and Torres Strait Islander (<i>M</i> , <i>SD</i>)	34.8 (7.88)	12.2 (3.0)	7.7 (2.1)	14.9 (4.1)
Non-Indigenous (<i>M</i> , <i>SD</i>)	36.4 (7.79)	12.8 (3.1)	8.0 (2.1)	15.6 (4.0)
Mean difference [95% CI]	1.6 [1.4, 3.0]	0.6 [0.4, 1.1]	0.3 [0.3, 1.1]	0.7 [0.4, 1.0]
<i>t</i>	5.23	4.70	4.64	4.32
<i>p</i>	<.001	<.001	<.001	<.001
Intraclass Correlation Coefficient (ICC), Two-Way Mixed Effects Model, Single Rater, Absolute Agreement (ICC(3,1))				
Non-Indigenous (ρ)	.99	.96	.91	1.00
Aboriginal and Torres Strait Islander (ρ)	.99	.95	.88	1.00

Note: ^aAboriginal and Torres Strait Islander MSPSS included "Special Person" and non-Indigenous MSPSS included "Significant Other".

Model fit and internal consistency reliability

The Aboriginal and Torres Strait Islander MSPSS demonstrated strong fit ($\chi^2(26) = 67.86$, CFI = 0.994, RMSEA = 0.048, 95% CI = [0.034, 0.062]), as did the non-Indigenous MSPSS ($\chi^2(24) = 211.73$, CFI = 0.996, RMSEA = 0.044, 95% CI = [0.039, 0.050]). Subscales demonstrated excellent reliability for both the Aboriginal and Torres Strait Islander MSPSS (*Friends* $\omega = 0.93$; *Family* $\omega = 0.91$; and *Special Person* $\omega = 0.92$) and the non-Indigenous MSPSS (*Friends* $\omega = 0.94$; *Family* $\omega = 0.95$; and *Significant Other* $\omega = 0.95$).

Global and edge strength invariance

Upon visual examination, the network models suggested that, within the Aboriginal and Torres Strait Islander network, edges connecting nodes within the *Family* and *Special Person* communities seem to exhibit greater strength compared to their counterparts in the non-Indigenous network (see Figure 4). However, the test for global strength invariance did not reveal any significant overall differences between the two networks ($S = .22$, $p = .440$). It is important to note that global strength reflects the total connectivity within the network and does not capture specific variations in the structure or distribution of edge weights (van Borkulo, van Bork, et al., 2023). Therefore, identical global strength does not necessarily imply structural similarity between the networks. Consistent with this observation, we identified significant variations in edge strength between the *Family* and *Significant Other/Special Person* communities in the two cultural groups. Specifically, three edges demonstrated significantly greater strength in the Aboriginal and Torres Strait Islander MSPSS network model compared to the non-Indigenous model: (1) between *Sp_Sha* and *Fm_Hel* ($E = .08$, $p = .019$); (2) between *Sp_Sha* and *Fm_Tal* ($E = .09$, $p = .007$); and (3) between *Sp_Com* and *Fm_Emo* ($E = .10$, $p < .001$).

Metric invariance

The magnitude of differences in network loadings (effect sizes) between the Aboriginal and Torres Strait Islander and non-Indigenous MSPSS models ranged from 0.05 to 0.09 (Table 4). Metric invariance held for nine of the twelve variables but not for *Sp_Car* ("There is a [significant other/special person] who cares about my feelings"), *Fm_Hel* ("My family really tries to help me"), and *Fm_Emo* ("I get the emotional help and

support I need from my family"), which had significantly weaker loadings in the Aboriginal and Torres Strait Islander group (p and $p_{BH} < .05$). Although these differences were statistically significant, the effect sizes were small, ranging from 0.062 to 0.093 (i.e., < 0.15).

Due to the observation of partial invariance, a nine-item reduced MSPSS model—excluding the three non-invariant items—was evaluated for model fit across both cultural groups. The reduced model retained the original three-dimensional structure (see Supplementary Figure S1), demonstrated perfect structural consistency and item stability (see Supplementary Figure S2), and showed excellent fit: for the Aboriginal and Torres Strait Islander group, $\chi^2(9) = 17.31$, CFI = 1.000, RMSEA = .036, 95% CI [.006, .061], $p = .800$; for the non-Indigenous group, $\chi^2(7) = 560.49$, CFI = 1.000, RMSEA = .000, 95% CI [.000, .039], $p = 1.000$.

Comparisons between the MSPSS total scores derived from the full 12-item MSPSS and the reduced 9-item version (i.e., excluding three non-invariant items) revealed a very strong correlation ($r = .99$) and near-perfect alignment in Q-Q plots (see Supplementary Figure S3), suggesting that these two instruments are interchangeable in their ordering of respondents according to their total scores. Correlations between sub-scale scores ranged between $r = .88$ and $r = .95$, and Q-Q plots (Supplementary Figure S3) demonstrated strong distributional similarity; however, minor deviations – particularly for the *Family* subscale – indicate that interchangeability between the instruments at the sub-scale level requires further investigation.

Group differences

Scores from the Aboriginal and Torres Strait Islander group were consistently lower than those from the non-Indigenous group across total and sub-scale scores (Table 3). The magnitude of score differences was consistent across models. Kernel Density Estimation (KDE) revealed additional differences in the shape and spread of score distributions (Figure 4). For all sub-scales, the Aboriginal and Torres Strait Islander group showed broader, flatter distributions, with similarities to the non-Indigenous group across the lower and middle score ranges, including comparable peak and trough positions. However, a notable divergence was observed in the uppermost score range, where the non-Indigenous group displayed substantially higher peaks for all sub-scales and the total scale.

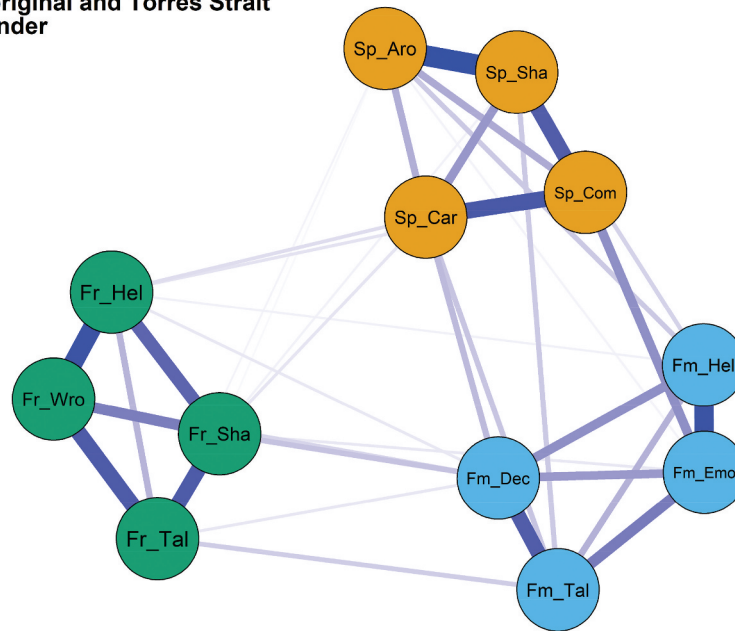
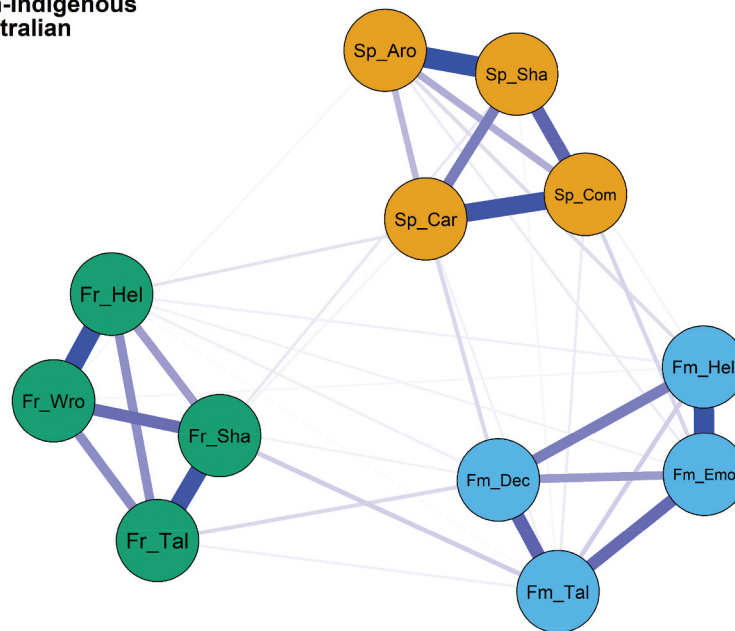
**Aboriginal and Torres Strait
Islander**

**Non-Indigenous
Australian**


Figure 4. Gaussian graphical model (GGM) network structures of the MSPSS for Aboriginal and Torres Strait Islander (above) and non-Indigenous Australian (below) participants. The layout of the graphs was averaged across the two groups for comparability. Nodes represent MSPSS items: *Significant Other* (non-Indigenous)/*Special Person* (Aboriginal and Torres Strait Islander) items are tinted orange, *Family* items light blue, and *Friends* items green. Edges (dark blue) indicate partial correlations between items, with greater thickness and opacity representing stronger associations. Full item descriptions are provided in Figure 1.

Discussion

Achieving configural invariance was a critical step in the cross-cultural validation of the MSPSS. Configural invariance ensures that the overall dimensional structure is consistent and equivalent across network models. Our findings confirmed that the assignment of items within the *Family*, *Friends*, and *Significant Other* (non-

Indigenous)/*Special Person* (Aboriginal and Torres Strait Islander) dimensions was consistent for both Aboriginal and Torres Strait Islander and non-Indigenous populations. This finding suggests that both groups conceptualised and interpreted the MSPSS (original and adapted) items in alignment with its intended structure, providing a robust foundation for further analyses.

Table 4. Analysis of metric cross-cultural invariance of MSPSS.

Item	Membership	$\Delta\lambda$	p	p_{BH}^b	Direction
Sp_Aro	Special	0.035	.176	.302	
Sp_Sha	Special	0.045	.082	.164	
Sp_Com	Special	0.046	.048	.144	
Sp_Car ^a	Special	0.093	.002	.024	Indigenous ^c < non-Indigenous
Fm_Hel ^a	Family	0.062	.008	.032	Indigenous < non- Indigenous
Fm_Emo ^a	Family	0.091	.004	.024	Indigenous < non- Indigenous
Fm_Tal	Family	0.013	.618	.674	
Fm_Dec	Family	0.051	.066	.158	
Fr_Hel	Friends	0.022	.368	.442	
Fr_Wro	Friends	0.005	.862	.862	
Fr_Sha	Friends	0.027	.252	.336	
Fr_Tal	Friends	0.029	.220	.330	

Notes: ^aNon-invariant items. ^bAdjusted p -values are calculated using the Benjamini & Hochberg multiple comparisons procedure (1995). ^c“Indigenous” refers to Aboriginal and Torres Strait Islanders. Items are labelled with their corresponding abbreviated node name, as detailed in Figure 1.

However, achieving complete metric invariance remains a challenge in both factor analysis (Byrne et al., 1989) and network modelling (Jamison et al., 2022). By examining invariance at the item level, we identified three items – Sp_Car, Fm_Hel, and Fm_Emo – that demonstrated weaker loadings in the Aboriginal and Torres Strait Islander group, when compared to corresponding loadings in the non-Indigenous group. These variations may reflect distinct cultural understandings of relational support. For example, within Aboriginal and Torres Strait Islander communities, familial and emotional support is often perceived as embedded within broader kinship networks, rather than as individualised assistance (Salmon et al., 2018). Such findings underscore the importance of exploring how cultural frameworks influence responses to psychometric tools.

Cultural differences in MSPSS network structures

The network models (Figure 4) visually displayed distinct cultural patterns. The Aboriginal and Torres Strait Islander MSPSS model showed stronger connections between domains compared to the non-Indigenous model, particularly between *Family* and *Special Person*, likely reflecting cultural nuances. In Aboriginal and Torres Strait Islander contexts, relational systems such as *Kanyirninpa*, a Martu term signifying care, nurture, and respect (McCoy, 2008), emphasise interdependence and shared responsibilities within extended family and community networks. Kinship systems expand the concept of family to include cousins, ceremonial relationships, and connections to Land, Spirituality, and Cultural Heritage (Fejo-King, 2013; Salmon et al., 2018). These frameworks likely explain the stronger interconnectedness between the

Family and *Special Person* domains in the Aboriginal and Torres Strait Islander MSPSS network. In contrast, the weaker inter-community connections in the non-Indigenous network align with a Western nuclear family model, where relationship boundaries are more distinct. These contrasts emphasise the importance of complementing findings from quantitative methods with qualitative exploration, which can more readily embed the data within broader historical and social contexts. As such, further qualitative exploration is needed to better understand how relational constructs manifest across different cultural groups.

Implications of partial invariance and score comparisons

Partial invariance introduces important considerations for interpreting MSPSS scores. While differences in model parameters were statistically significant, they were small and had minimal impact on total MSPSS scores (Table 1). Respondents' rank scores remained stable even when the three non-invariant items were excluded, suggesting that the overall validity of the MSPSS was not compromised. However, even a reduced model – though statistically invariant – might fail to capture the nuanced and holistic interpretations of social support that are often characteristic of Aboriginal and Torres Strait Islander contexts. For instance, differences in response patterns, such as the preference for “agree” among Aboriginal and Torres Strait Islander participants versus “strongly agree” among non-Indigenous participants (Figure 5), likely reflect meaningful cultural distinctions rather than measurement artefacts (Walter & Suina, 2018). These differences may stem from culturally distinct ways of expressing agreement or relational nuance (Eades,

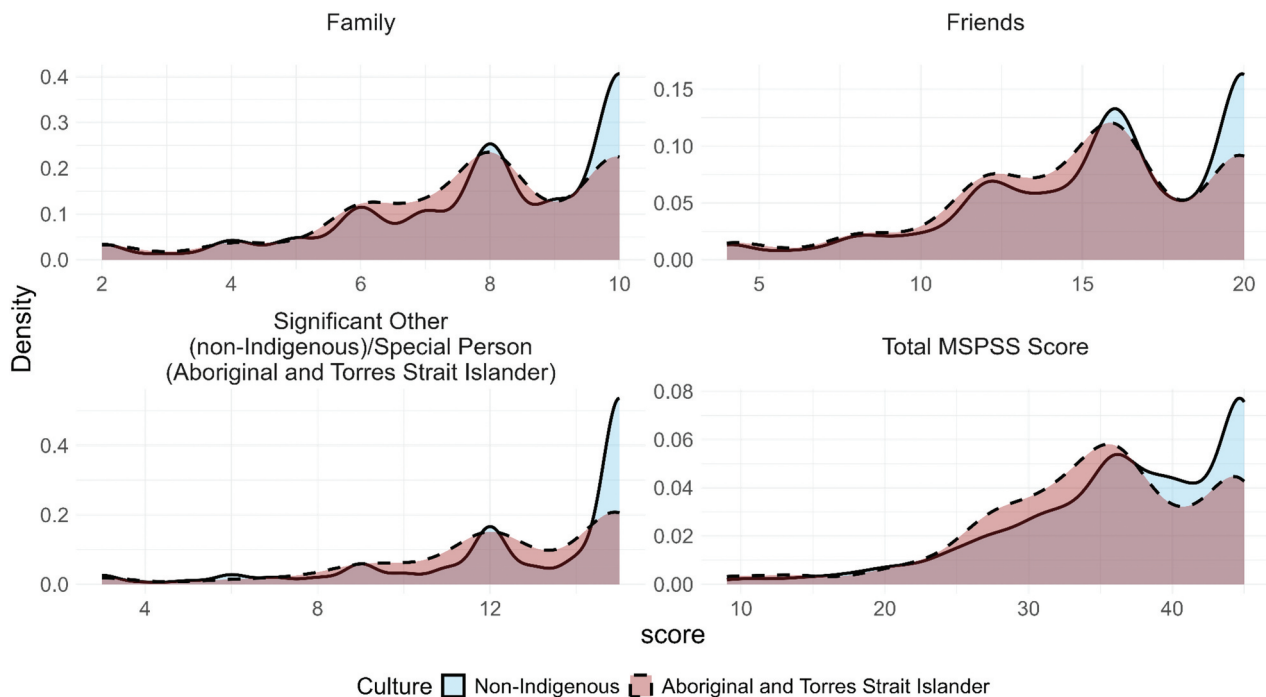


Figure 5. Kernel density estimation of MSPSS (reduced model) Aboriginal and Torres Strait Islander and non-Indigenous sub-scale (family, Friends, significant Other/Special Person) scores and total MSPSS score.

2013). For example, Aboriginal and Torres Strait Islander participants may use more measured responses, such as “agree”, to convey a balanced perspective or to reflect community-focused views of social support. Such patterns align with holistic and relational approaches to understanding social networks within these communities (Yunkaporta, 2009).

Additionally, the broader social and historical contexts in which these groups exist, including the ongoing impacts of colonisation and systemic inequities, may shape relational networks and perceptions of support. These contextual factors are crucial for understanding the lived experiences underlying the observed trends. The results highlight the importance of complementing quantitative approaches with qualitative research to explore how social support is valued and expressed across diverse cultural contexts. This ensures that measures like the MSPSS are interpreted in ways that are culturally responsive, providing deeper insights into the relational dynamics within Aboriginal and Torres Strait Islander communities.

Practical applications and cross-cultural utility of the MSPSS

The cross-cultural validation of the MSPSS has important implications for health interventions and policy development. By ensuring cultural validity, the tool provides a reliable framework for assessing perceived social

support in Aboriginal and Torres Strait Islander communities while also making meaningful comparisons with non-Indigenous populations. At the individual level, the MSPSS allows psychologists to assess perceived social support without requiring cultural adjustments to total scores, making it an effective tool for identifying individuals at risk of low social support. At the community level, it supports the evaluation of interventions aimed at improving social and emotional wellbeing (SEWB). Programs that strengthen kinship ties, foster community cohesion, or reduce social isolation can be assessed for their effectiveness and tailored to meet the unique relational dynamics of Aboriginal and Torres Strait Islander contexts. The tool’s cross-cultural measurement invariance also allows non-Indigenous groups to serve as a control group when assessing interventions in Aboriginal and Torres Strait Islander communities. This ensures that changes in social support are attributable to the intervention rather than broader environmental factors.

Future directions

Future research should prioritise the development of a culturally grounded model of social support, led by Aboriginal and Torres Strait Islander researchers and communities, to better reflect constructs such as kinship and connection to Land and Country. Qualitative studies investigating perceived social

support in Aboriginal and Torres Strait Islander communities can inform refinements to the MSPSS or guide the creation of a new culturally grounded instrument. Ongoing validation efforts should also assess the predictive validity, test-retest reliability, and interchangeability of full and reduced MSPSS versions.

Conclusion

This study demonstrates the MSPSS as a validated tool for assessing perceived social support across Aboriginal and Torres Strait Islander and non-Indigenous populations. Its configural invariance and partial metric invariance supports its use in cross-cultural research, enabling meaningful comparisons. However, findings of partial invariance, particularly in the *Family* and the *Significant Other/Special Person* domains, highlight the importance of cultural context in interpreting social support. While differences in item invariance have minimal impact on total MSPSS scores, caution is advised when comparing sub-scale scores across groups. Future research should refine the MSPSS or develop culturally informed models to better capture unique relational frameworks, enhancing its sensitivity and utility for diverse populations.

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KMM: Formal analysis, Methodology, Software, Validation, Visualization, Writing (original draft, review and editing); PHRS: Conceptualization, Investigation, Methodology, Supervision, Validation, Writing (original draft, review and editing); SS: Conceptualization, Investigation, Writing – review & editing; GZ: Conceptualization, Investigation, Writing – review & editing; LJ: Funding acquisition, Resources, Conceptualization, Investigation, Writing – review & editing; JH: Keeper of Aboriginal knowledge, Conceptualization, Project administration, Supervision, Investigation, Writing – review & editing. JH's role as a keeper of Aboriginal knowledge ensured that the study was conducted in a culturally respectful and appropriate manner, and her insights were integral to shaping the interpretation of results, editing, and responding to reviewer's comments. During the preparation of this work KMM occasionally used ChatGPT v3.5 in order to ensure the consistent use of inclusive and plain language. After using this tool/service, KMM then reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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