



Research paper

The views on infant sleep questionnaire: A confirmatory factor analysis in an Australian context

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ARTICLE INFO

Keywords:

Infant sleep
Perinatal mental health
Parental beliefs
Infant mental health

ABSTRACT

Background: Parental beliefs about infant sleep shape caregiving practices, infant development, and parental wellbeing. The Views on Infant Sleep (VNIS) questionnaire was designed to assess these beliefs across three domains: Closeness, Independence, and Night-Waking. This study aimed to validate the questionnaire for the first time in an Australian context, in a sample of 111 pregnant women.

Methods: Women completed an anonymous online questionnaire containing the 12-item VNIS. Confirmatory factor analysis was conducted in MPlus, using a weighted least squares estimator to evaluate the proposed three-factor structure.

Results: Findings provided partial support for the three-factor model. Incremental and residual fit indices were strong (comparative fit index = 0.97; Tucker-Lewis index = 0.96; weighted root mean square residual = 0.76) and the chi-square to degrees-of-freedom ratio indicated acceptable fit (1.75). Global fit was borderline (root mean square error of approximation = 0.08, 90% confidence interval = 0.05–0.11). All items loaded significantly onto their intended factors, however item performance varied. Independence items showed consistently strong loadings, while Closeness items ranged from moderate to strong with one weaker indicator. Night-Waking items were more variable, including one item below acceptable thresholds. Inter-factor correlations were strong ($r = 0.58–0.71$), indicating substantial coherence and limited distinctiveness between components.

Conclusion: The VNIS questionnaire captures multidimensional parental beliefs about infant sleep but requires refinement to strengthen reliability and discriminant validity. Further cross-cultural and longitudinal research is needed to support its broader applicability in diverse clinical and research contexts including to fathers and non-birthing partners.

1. Introduction

The idealisation in Western culture of continuous and solitary infant sleep has informed pre-conceived parental expectations that are incongruent with the reality of caregiving in the first years of life [1]. This normalisation of an infant sleeping soundly 'through the night' with the perception of night waking as a 'problem' to be eliminated, is often reinforced by infant sleep advice from healthcare professionals [2], online, as well as from family and friends [3]. However, this perception of consolidated infant sleep overnight does not reflect the biological needs of infants, or the caregiving practices of many other cultures

[4–6]. Whilst sleep is central for infant brain development [7], the relationship between early patterns of infant sleep and later child mental health and developmental outcomes is not well-established [8], with evidence suggesting that it is only where sleep challenges persist in preschool age or interact with other parental factors that there may be longer lasting difficulties [9]. Given parental opinions about infant sleep can directly and indirectly contribute to infant sleep quality [10], as well as parental mental health [11,12] and family dynamics [13], understanding parental views of infant sleep is crucial to support parents to meet the needs of their infant and maintain their own well-being. However, this requires access to a valid and reliable measure that is

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<https://doi.org/10.1016/j.earlhumdev.2026.106684>

Received 1 July 2026; Received in revised form 14 September 2026; Accepted 5 October 2026

Available online 6 October 2026

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capable of integration into healthcare settings; the Views on Infant Sleep questionnaire [VNIS; 14] may meet this need.

Disrupted infant sleep is a major parental concern [15] driving referrals for treatment and intervention [16]. Yet the term remains poorly defined because what constitutes a sleep problem is dependent on the model used to explain infant sleep, with current models based on research in a Western context that normalises infant continuous and solitary sleep [17,18]. Commonly reported parental concerns include night-waking, signalling for parental involvement, and challenges initiating or resuming sleep independently [19,20]; many of these behaviours are biologically normative and support breastfeeding and infant-caregiver attachment [21]. In fact, shared sleep – where an infant sleeps on the same surface as the adult [22] – is well established to support the frequency and duration of breastfeeding [23], as well as increasing maternal sleep by facilitating reduced time for infant settling, generally with a lack of progression to full arousal crying [24]. Parental concerns around infant sleep often focus on the infant as the ‘problem’, overlooking the cultural and relational context in which sleep occurs [11,25], as well as the stages of infant development or variability in normative infant sleep patterns [21]. For example, 38% of mothers defined their one-month-old’s sleep as problematic [26], despite limited capacity for a four-week-old to self-settle as well as the biological need for night-time feeds [27]. These infant sleep ‘problems’ place considerable demand on paediatric services and child health practitioners, who report lack of training or tools to effectively support families around infant sleep issues [16].

Infant sleep reflects a dynamic process shaped by child-driven [28], parent-driven [28], and bidirectional [29] influences. Sleep patterns within families are interdependent, with children’s sleep shaped by parental beliefs, interactions, and bedtime routines, while parental sleep quality can influence parenting effectiveness and stress [13]. Sleep is a fundamental aspect of family life that may adversely impact on parental competence, relationship dynamics and family well-being. The emphasis on infant sleep may lead parents to question the developmental appropriateness of their child’s behaviour [30], as well as whether the perceived sleep difficulties are *caused* by something they are doing, neglecting to do, or failing to purchase [11]. When parental expectations are unmet, parents may interpret their infant to be wilfully resisting sleep, with the pursuit of continuous and uninterrupted sleep conflicting with the infant’s need for contact, comfort, and regular feeding, which are core components underscoring the early relationship.

Maternal mental health and infant sleep influence each other in a dynamic and multidimensional relationship, with the biomedical model of infant sleep having potentially significant consequences for maternal mental and physical health [31]. Maternal self-efficacy is a predictor of perinatal depression [32], an issue experienced by an estimated one in four women [33]. Yet, repeated unsuccessful attempts to settle an infant – as may be encouraged within a Western model of infant care – can diminish maternal self-efficacy [34], reinforcing beliefs around inadequacy and worthlessness which may maintain depressive and anxious symptoms [35], particularly when combined with sleep disruption [36]. The reciprocity of this relationship is further reinforced with maternal sleep deprivation and depressive symptomatology adversely impacting the maternal perception of infant sleep difficulties [37]. This pattern may prompt rigid or inconsistent responses to infant night-waking [38], reinforcing sleep difficulties and creating a self-perpetuating cycle of reduced maternal confidence and disrupted infant and maternal sleep.

Multiple questionnaires exist to assess parental views on infant sleep, including the Brief Infant Sleep Questionnaire [BISQ; 39] and the Maternal Cognitions about Infant Sleep Questionnaire [MCISQ; 40]. However, these questionnaires are limited in their cross-cultural applicability and are not suitable for use in the antenatal period [14]. Addressing this gap, the VNIS [14] assesses parental beliefs about infant sleep in the antenatal and postnatal period for all parents regardless of gender. The VNIS was designed to incorporate culturally and temporally

neutral wording, but this remains an untested assumption, as does the pre- and postnatal applicability with the original study only assessed on prenatal women. The original survey of 31 items was assessed on 971 women in the UK of at least 28 weeks of pregnancy. Two principal component analyses identified three components (‘Closeness’, ‘Independence’, and ‘Night-Waking’) with four items retained for each, yielding the final 12-item VNIS questionnaire. In the original VNIS [14], the component ‘Closeness’ related to maintaining proximity to the infant at night, as well as knowledge about safer sleep practices, which would indirectly support proximal sleeping arrangements. The component ‘Independence’ contained reverse-scored items which positively rated self-soothing, infants sleeping in a separate room from 6 months of age and sleeping through the night. Finally, the component ‘Night-waking’ examined parents’ beliefs about infant sleep physiology, including having short bouts of sleep, feeding frequently, and an infant’s ability to arouse themselves being protective against Sudden Infant Death Syndrome (SIDS) [41,42]. However, an additional study validating the VNIS is yet to be completed.

Australia has a diverse and multicultural population, with an estimated 32% of the population born outside of Australia [43]. Applying the VNIS to an Australian sample could facilitate assessment of its cultural application. For Australian services, assessment of the VNIS on an Australian population is necessary before there can be valid application to facilitate clinician insight when working with parents perinatally. Notably, however, there may be some differences when considering application of the VNIS in a UK versus Australian setting, with guidelines in Australia strictly discouraging bedsharing [44], whereas those in the UK offer conditional guidance [45]. That said, recent findings indicate similar infant sleep landscapes across the UK and Australia with behavioural sleep interventions commonly prescribed in both settings, despite being reported as unpopular with caregivers [46]. Completing this validation through confirmatory factor analysis (CFA) would enhance the VNIS’s construct validity, reinforcing its credibility as a culturally adaptable tool for assessing parental beliefs about infant sleep and informing interventions that promote the wellbeing of infants, parents, and families.

1.1. Current study

The current study aimed to confirm the factor structure identified in the initial exploratory analysis of the VNIS questionnaire within an Australian population. As proposed by Boedker et al. [14] in the original VNIS study, it was hypothesised that the CFA would replicate the three-component structure of Closeness, Independence, and Night-Waking. Specifically, this study hypothesised that the factor structure of the VNIS questionnaire would be replicated in an Australian sample of pregnant women. The completion of a CFA within this population would ensure the measure accurately reflects distinct dimensions of parental views on infant sleep and support the questionnaire’s utility in cross-cultural research which to date is yet to be tested. This is particularly relevant for antenatal women as further studies may be carried out to assess its predictive value (i.e., whether antenatal beliefs about infant sleep correlate with proximal sleeping arrangements). The CFA could confirm the VNIS’ utility for broader research and clinical application and facilitate interventions that align with diverse caregiving views and practices, thereby supporting parental wellbeing and positive caregiving experiences.

2. Method

2.1. Study design and sample

This study employed a quantitative, cross-sectional study design. Ethical approval was obtained from the Murdoch University Human Research Ethics Committee (approval number: 2025 070). Women were recruited from May 2025 to March 2026 across community and

professional settings and invited to complete an anonymous online survey hosted in Qualtrics [47]. The survey was accessible via a QR code or survey link. QR codes were distributed in local venues, including maternity and baby stores, childcare centres, cafes, and physiotherapy clinics, and the survey link was also shared through professional network emails. In addition, investigators shared the survey on social media platforms such as LinkedIn, Instagram, and Facebook. The survey was further promoted through Prolific, an online platform for research participation. All participants provided electronic informed consent prior to commencing the questionnaire.

To meet eligibility criteria for the study, participants were required to be female, pregnant, at least 28 weeks' gestation, and residing in Australia. Screening questions prevented ineligible individuals from proceeding with the survey. A total of 153 survey responses were received. Prior to analysis, all responses were reviewed for data quality and legitimacy. This included assessment for duplicate submissions, review of survey completion times to identify implausibly rapid completion, and examination of response patterns that may indicate non-genuine responding. Responses were also assessed for consistency across related variables, including age, year of migration and age at migration, parity and number of children, country of birth, ethnicity and languages other than English. Records containing incomplete, unrealistic or inconsistent responses were excluded from analysis, and the decision to exclude was agreed upon by multiple investigators. A total of 42 responses were excluded, resulting in a final sample of 111 women. There were no missing item-level data for participants included in the CFA.

Sample size for the CFA was informed by recommendations from Tabachnick and Fidell [48], who advise that adequate sample size depends largely on factors such as item correlations, communalities and factor loadings. A sample of 10–20 participants per item is generally recommended. Following exclusion of ineligible and unrealistic responses, the final analytic sample was at the lower end of the desired sample size range, however the sample was considered sufficient for the intended analyses.

2.2. Measures

The survey included demographic items capturing age, education, previous pregnancies, infant sleep environment, children living in the home, geographic location, country of birth, relationship status, first language, employment, ethnicity, and year of arrival for those not born in Australia. The 12-item VNIS, derived from the original 31-item measure, is presented in Table 1 and assesses beliefs across three domains: Closeness, Independence, and Night-Waking. Participants rated each item statement on a 5-point Likert scale (“Agree strongly”, “Agree”, “Neither agree nor disagree”, “Disagree”, and “Disagree strongly”) based on their views about infants aged from birth to 12 months. Items within the Independence domain were reverse scored prior to analysis.

2.3. Data analysis

Demographic data were analysed in Stata [49] using univariate descriptive statistics to examine maternal characteristics and VNIS item-level responses. Spearman's rho correlations were computed to examine non-parametric bivariate associations among VNIS items. CFA modelling was conducted in MPlus [50] to evaluate the hypothesised three-factor structure – Closeness, Independence, and Night-Waking – each represented by a set of observed indicator items. Each item was specified to load onto a single latent factor with no cross-loadings.

Model fit was evaluated using the chi-square goodness-of-fit test and standard fit indices: Tucker-Lewis Index (TLI >0.09) [51], Comparative Fit Index (CFI ≥ 0.95), Root Mean Square Error of Approximation (RMSEA ≤0.05), and Weighted Root Mean Square Residual (WRMR <1.0) [52]. The mean- and variance-adjusted weighted least squares (WLSMV) estimator was used, as recommended for ordinal Likert-scale

Table 1

The 12-item VNIS survey.

Factor and VNIS item	Original item number	Description
Closeness		
Item 1	1	During human evolutionary history, infants usually slept next to their mothers.
Item 2	2	All pregnant women should plan how they would share a bed safely with an infant, in case they fall asleep together accidentally.
Item 3	7	Sleeping on a sofa or armchair with an infant is unsafe.
Item 4	20	It's normal for a mother to feel anxious if she is separated from her infant at night.
Independence		
Item 5	5	Moving an infant to their own room at 6 months of age means that the parents can sleep better.
Item 6	22	An infant who doesn't sleep through the night by 6 months of age has a sleep problem.
Item 7	29	Infants whose parents soothe them when they wake at night will never learn to be independent.
Item 8	30	A mother teaches her infant to be strong by letting them cry at night.
Night-waking		
Item 9	16	During the first few months of life, most infants sleep in bouts of two to three hours.
Item 10	17	Infants need to feed frequently during the night because their brains are growing quickly.
Item 11	19	An infant's ability to wake easily during the night decreases the odds of Sudden Infant Death Syndrome.
Item 12	26	Some infants have never slept through the night by one year of age.

[^] Reverse scored items.

data, providing more accurate construct validity estimates than maximum likelihood estimation [53]. Factor loadings ≥0.40 were considered acceptable indicators of their respective latent constructs [54]. Given the sensitivity of the chi-square statistic (χ^2) to sample size and model complexity [55], the ratio of chi-square to degrees-of-freedom (χ^2/df) is often preferred [56] and was therefore also examined as an additional indicator model fit.

The data have been made publicly available and can be accessed on the OSF page <https://osf.io/4jbuk/>.

3. Results

3.1. Participants

Table 2 presents the sociodemographic and maternal characteristics of the sample of 111 pregnant women of at least 28 weeks' gestation residing in Australia ($M = 31.13$ years of age, $SD = 4.44$, range 21–42). Most women resided in metropolitan areas (70.27%), were partnered (96.40%), and were multiparous (73.87%). Overall, 74.77% had children under 16 years living in their home (54.22% aged 2–5 years). Women in the sample were generally well educated, with 89.19% holding a tertiary degree. Almost all spoke English as their first language (93.69%) and were born within Oceania (87.39%). The majority identified as Australian ($n = 96$), either solely ($n = 77$) or alongside another cultural background ($n = 19$), with the most common additional ethnicity being European ($n = 16$). Postcode data indicated 36.94% resided in Western Australia. Over half were employed in full-time, part-time, or casual work (65.77%) and almost all of the women (96.40%) reported having a separate room available for their infant to sleep in eventually.

Table 2
Sample sociodemographic and other key characteristics (N = 111).

Maternal characteristics	n (%)
Education	
Tertiary education	99 (89.19)
High school	2 (1.80)
Primary school	10 (9.01)
Parity	
0	29 (26.13)
1	49 (44.14)
2	24 (21.62)
3	7 (6.31)
4 or more	2 (1.80)
Separate room for infant to sleep in eventually	
Yes	107 (96.40)
Children living in the home	
Yes	83 (74.77)
If yes, number of children in home	
1–2 children up to 24 months of age	21 (25.30)
1–2 children between 2 and 5 years	45 (54.22)
1–2 children between 6 and 10 years	12 (14.46)
1–2 children between 11 and 16 years	5 (6.02)
Location	
Metropolitan	78 (70.27)
Regional	25 (22.52)
Rural	8 (7.21)
State (according to postcode)	
New South Wales	26 (23.42)
Victoria	22 (19.82)
Queensland	12 (10.81)
South Australia	5 (4.50)
Western Australia	41 (36.94)
Tasmania	2 (1.80)
Invalid response	3 (2.70)
Place of birth	
Oceania	97 (87.39)
Europe	4 (3.60)
Asia	4 (3.60)
Africa	3 (2.70)
North America	1 (0.90)
South America	2 (1.80)
Relationship status	
Married/de facto/cohabitating	107 (96.40)
Separated/divorced	3 (2.70)
Single/never married	1 (0.90)
First language	
English	104 (93.69)
Filipino	1 (0.90)
French	1 (0.90)
Portuguese	2 (1.80)
Swedish	1 (0.90)
Titi	1 (0.90)
Vietnamese	1 (0.90)
Employment	
Full-time work	39 (35.14)
Part-time/casual work	34 (30.63)
Other	38 (34.23)

Note. “Children living in the home” refers to people aged 16 years and younger.

3.2. VNIS item-level univariate descriptives

Descriptive statistics for individual VNIS items are presented in Table 3. Lower scores indicate greater agreement with each item.

3.2.1. Closeness

Closeness items had means ranging from 1.51 to 1.67, with positive skew (1.10–1.52) and kurtosis (3.48–5.97). This indicates that women strongly endorsed proximity-promoting beliefs (Items 1, 2, and 4) and the view that sleeping surfaces such as sofas or armchairs are unsafe (Item 3). The relatively small standard deviations ($SDs = 0.67$ – 0.80) indicate that these beliefs were consistently held, with limited variability.

Table 3
VNIS item-level descriptive and psychometric statistics (N = 111).

Factor and VNIS item	Original item number	Observed range	M (SD)	Skewness	Kurtosis
Closeness					
1	1	1–4	1.51 (0.67)	1.52	5.97
2	2	1–4	1.59 (0.76)	1.10	3.48
3	7	1–4	1.58 (0.73)	1.13	3.75
4	20	1–4	1.67 (0.80)	1.31	4.55
Independence					
5	5	1–5	3.00 (1.15)	−0.04	2.20
6	22	1–5	2.15 (1.25)	0.80	2.46
7	29	1–5	1.91 (1.08)	1.08	3.34
8	30	1–5	1.72 (1.06)	1.49	4.34
Night-waking					
9	16	1–5	2.05 (0.88)	0.97	4.25
10	17	1–5	2.13 (0.99)	0.53	2.49
11	19	1–5	2.14 (0.99)	0.47	2.43
12	26	1–5	1.89 (0.94)	1.21	4.35

Note. Lower scores indicate stronger agreement with each item.

Reverse-scored items.

3.2.2. Independence

Independence items had means ranging from 1.72 to 3.00, with skewness (−0.04–1.49) and kurtosis (2.20–4.34) indicating variability in responses. The belief that moving an infant to their own room at 6 months improves parental sleep (Item 5) showed a relatively even distribution of responses and no clear consensus. Beliefs about whether infants who do not sleep through the night by 6 months have a sleep problem (Item 6) were moderately endorsed and showed greater variability. In contrast, Items 7 and 8, capturing beliefs about promoting independence through night-time soothing (Item 7) and letting infants cry (Item 8), showed comparatively stronger endorsement. The relatively larger SDs ($SDs = 1.06$ – 1.25) indicate that beliefs regarding promoting infant autonomy were more heterogeneous than consistently endorsed Closeness items.

3.2.3. Night-waking

Night-waking items (Items 9–12) had means ranging from 1.89 to 2.14 with slight positive skew (0.47–1.21) and kurtosis (2.43–4.35). This suggests that the women generally endorsed beliefs that night-waking is developmentally typical. The SDs were moderate ($SDs = 0.88$ – 0.99), indicating modest variability in beliefs about night-waking.

3.3. Bivariate correlations between VNIS items

Spearman's rank-order correlations (Table 4) were conducted to examine associations among the 12 VNIS items.

Within-construct associations were generally moderate and positive across all three components. Independence items showed the strongest internal correlations ($\rho_s = 0.51$ – 0.70), indicating a well-defined construct with robust coherence. Closeness items were also positively intercorrelated, although Closeness Item 3 related to safe sleeping showed weak and mostly non-significant associations with other Closeness items, suggesting it captures a somewhat different aspect of the construct. Night-Waking items demonstrated weaker but mostly significant associations, indicating modest internal coherence.

Table 4
Spearman rho correlation coefficients for VNIS Items (N = 111).

VNIS item	1 (C)	2 (C)	3 (C)	4 (C)	5 (I)	6 (I)	7 (I)	8 (I)	9 (NW)	10 (NW)	11 (NW)	12 (NW)
1 (C)	1.00											
2 (C)	0.45*	1.00										
3 (C)	0.24*	0.18	1.00									
4 (C)	0.31*	0.38*	0.07	1.00								
5 (I)	0.37*	0.38*	0.03	0.32*	1.00							
6 (I)	0.45*	0.29*	0.25*	0.28*	0.51*	1.00						
7 (I)	0.43*	0.32*	0.22*	0.16	0.54*	0.68*	1.00					
8 (I)	0.43*	0.38*	0.26*	0.22*	0.59*	0.60*	0.70*	1.00				
9 (NW)	0.12	0.03	0.09	0.12	0.07	0.17	0.10	0.04	1.00			
10 (NW)	0.24*	0.15	0.17	0.27*	0.15	0.16	0.22*	0.10	0.27*	1.00		
11 (NW)	0.42*	0.30*	0.31*	0.20*	0.25*	0.46*	0.34*	0.25*	0.36*	0.36*	1.00	
12 (NW)	0.23*	0.25*	0.23*	0.23*	0.26*	0.51*	0.34*	0.39*	0.20*	0.14	0.49*	1.00

Note. C = Closeness, I = Independence, NW = Night-waking.

[^] Reverse-scored items.

* $p < .05$.

Between-construct associations ranged from very weak to moderate ($ps = 0.03$ – 0.51), suggesting that while several items discriminated well between constructs, others demonstrated overlap in variance. Closeness Item 1 correlated moderately with several Independence items, including Items 6 ($\rho = 0.45$, $p < .05$), 7 and 8 ($ps = 0.43$, $ps < 0.05$), suggesting that valuing closeness at night was compatible with endorsing independence-focused sleep practices for this sample. Independence items also showed weak-to-moderate associations with Night-Waking items, with the strongest correlation between Items 6 and 12 ($\rho = 0.51$, $p < .05$), suggesting some shared beliefs regarding infant autonomy and recognition that night-waking is developmentally typical.

3.4. Confirmatory factor analysis

A CFA was conducted using the WLSMV estimator to account for the

ordinal Likert response scale format of the VNIS (see Fig. 1).

3.4.1. Model fit indices

In this study, the χ^2/df ratio was 1.75, below the recommended threshold of 2.0 [57], indicating acceptable model fit. The CFI (0.97) and TLI (0.96) exceeded the conventional 0.95 threshold, indicating strong incremental fit [58]. In contrast, the RMSEA was 0.08 (90% confidence interval [CI] = 0.05–0.11), suggesting borderline global fit, with the lower bound indicating close fit and the upper bound exceeding recommended thresholds. The WRMR was 0.76, below the recommended cutoff of 1.0, indicating good residual fit [52]. Overall, the model demonstrated strong incremental and residual fit, and borderline global fit.

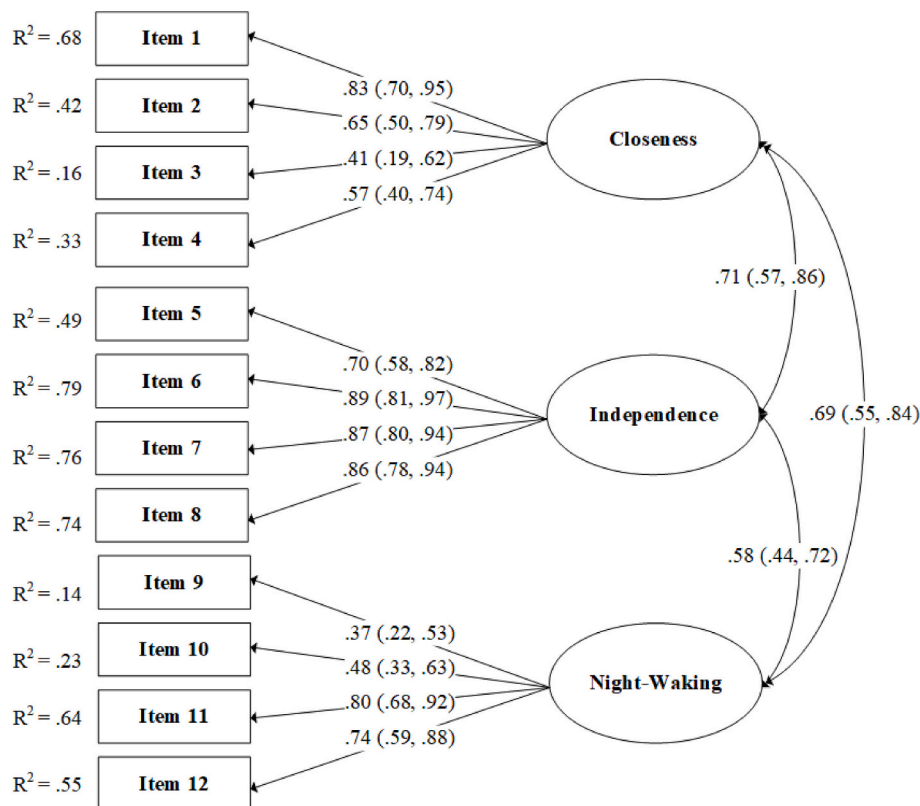


Fig. 1. WLSMV-estimated factor loadings for the 12-item VNIS using an Australian sample.

Note. Squares = observed items, circles = latent variables. Arrows indicate standardised factor loadings (λ).

3.4.2. Factor loadings and explained variance

Standardised factor loadings (λ), proportion of variance explained (R^2), and 95% CIs for each VNIS item are presented in Fig. 1. All items loaded significantly ($p < .001$) onto their hypothesised factor, although the strength and stability of these estimates varied.

For Closeness, Items 1, 2, and 4 demonstrated moderate-to-strong loadings, indicating the latent factor accounted for a substantial portion of their variance [57]. Item 1 showed strong loading ($\lambda = 0.83$; $R^2 = 0.68$), while Items 2 and 4 showed moderate loadings ($\lambda = 0.57$ – 0.65 ; $R^2 = 0.33$ – 0.42) [57]. Item 3 fell just above the minimum threshold of 0.40 ($\lambda = 0.41$; $R^2 = 0.16$), suggesting weaker alignment with the latent factor.

Independence items consistently reflected the latent construct, with loadings ranging from $\lambda = 0.70$ – 0.89 ($R^2 = 0.49$ – 0.79) with narrow confidence intervals, demonstrating strong representation across items.

Night-Waking items displayed greater variability. Items 11 and 12 were strong indicators of the latent factor ($\lambda = 0.74$ – 0.80 , $R^2 = 0.55$ – 0.64). Item 10 showed a weaker loading ($\lambda = 0.48$, $R^2 = 0.23$), reflecting lower alignment with the latent factor. Item 9 ($\lambda = 0.37$, $R^2 = 0.14$) did not meet Kline's [57] minimum threshold, suggesting it was not an acceptable indicator of the Night-Waking component.

Internal consistency reliability of the subscales was assessed using Cronbach's alpha and McDonald's omega. The Independence component demonstrated strong reliability, comparable to the original validation study ($\alpha = 0.84$ and $\omega_h = 0.85$). The Closeness and Night-Waking items showed lower reliability (Closeness: $\alpha = 0.57$ and $\omega_h = 0.60$; Night-Waking: $\alpha = 0.59$). McDonald's omega could not be estimated for the Night-Waking component, suggesting limited coherence between items. This pattern is consistent with the factor loadings observed in the CFA.

3.4.3. Inter-factor correlations

Following Cohen's [59] guidelines for interpreting correlations, all three components were found to be strongly correlated. Independence and Night-Waking showed a large correlation ($r = 0.58$, $p < .001$), as did Closeness with both Night-Waking ($r = 0.69$, $p < .001$) and Independence ($r = 0.71$, $p < .001$). This suggests substantial overlap among the three components and indicate that they capture related aspects of parental views.

3.4.4. Model modification indices

Model modification indices (MIs) showed that most potential cross-loadings were small and fell below the 3.84 threshold for a meaningful χ^2 reduction [60]. The largest MIs were observed between Independence and Night-Waking items, with Independence loading onto Item 12 (MI = 13.88, Standardised Expected Parameter Change [Std E.P.C.] = 0.46) and Night-Waking loading onto Item 6 (MI = 11.13, Std E.P.C. = 0.34). This suggests that allowing these cross-loadings to freely estimate would reduce the χ^2 value and improve statistical fit [60], although this is beyond the confirmatory scope of the paper.

4. Discussion

This study aimed to validate the VNIS questionnaire within an Australian sample of pregnant women using a CFA. Originally developed by Boedker et al. [14], the VNIS was designed to assess parental beliefs about infant sleep through culturally and temporally neutral questioning using a three-factor model: Closeness, Independence, and Night-Waking. Overall, in this sample the model demonstrated strong incremental and residual fit, while global fit was borderline. The CFA results showed that the VNIS demonstrates clear construct representation for Independence, moderate but variable representation for Closeness, and greater heterogeneity within the Night-Waking factor. While several items loaded strongly with high explained variance and stable estimates, others, particularly Closeness Item 3 and Night-Waking Item 9, demonstrated weak factor loadings, low explained variance, and wider confidence intervals, suggesting less stable representation of their latent

constructs. Consequently, the CFA provided partial support for the hypothesised factor structure within this Australian sample. The weaker performance of several items suggests that further refinement of the VNIS may be warranted before confident application within Australian research or clinical practices.

Our sample mostly reflected national perinatal trends, although characteristics indicate a more educated cohort. The mean maternal age of 31 years aligns with Australian national figures (average age at birth: 31.30 years [61]). However, this sample were disproportionately highly educated, with almost 90% holding a tertiary degree, compared with approximately half (53.70%) of Australian women aged 25–34 years [62]. Higher educational levels are associated with increased health literacy [63], stronger engagement with antenatal care [64], and greater adherence to public health recommendations [65], suggesting that findings may reflect a subgroup of mothers more inclined to endorse biomedical, independence-promoting perspectives. Equally findings may capture exposure to infant sleep information which, in an Australian context, does not endorse co-sleeping [44], with infant sleeping in a separate cot promoted as the safest sleeping environment, thereby reinforcing this notion of independence [66]. The sample was predominantly born within Oceania (87.39%), with almost three quarters residing in metropolitan areas, broadly reflecting national figures where around one-third of mothers are born overseas and 28% live in remote areas [61]. However, cultural diversity in this sample remained limited, which is relevant given that practices such as co-sleeping are more common among culturally and linguistically diverse groups [21]. Living in metropolitan areas may also have increased exposure to public health campaigns, such as the Red Nose Safe Sleep campaign [67], which could explain why almost 96% of women in the sample prepared a separate room for their infant to sleep.

Closeness emerged as a moderately coherent component of the VNIS, with most items demonstrating acceptable factor loadings and significant inter-item correlations. This indicates that emphasis on infant-mother proximity and emotional responsiveness was reliably represented within this Australian sample. These shared beliefs align with anthropological and evolutionary perspectives, where infants slept close to caregivers, supporting safety and attachment [68]. Even within Western contexts like Australia where public health messaging discourages co-sleeping (i.e., the parent and infant sleeping in close proximity but not necessarily on the same surface; [69]), parents endorsed maternal–infant proximity and the normality of maternal anxiety when separated at night. Such endorsements suggest that cultural discourses advocating independence do not entirely displace evolutionary and relational understandings of closeness; however, they may instead coexist in a multifaceted belief system. The only weaker loading was from Item 3, which addressed safety risks of sofa or armchair sleep with an infant, and fell just above the minimum threshold. This suggests that safety-focused beliefs may diverge from the proximity- and relationship-oriented beliefs underpinning this factor. Unlike other items that assess affective orientations, this item reflects a risk-avoidant stance shaped by safety discourses, which may not align psychometrically within a closeness-focused construct. The results may also reflect heightened public awareness of safe sleep messaging, which strongly emphasises the dangers of sofas and armchairs as sleep surfaces [69].

Boedker et al. [14] interpreted endorsement of Item 3 as reflecting nuanced awareness of graded risk across sleep surfaces. Advice against sofa and armchair sleep is categorical in both the UK and Australia. What differs is the framing of bedsharing, and this may shape how the item is interpreted. Where bedsharing is framed in risk-minimisation terms, endorsing the sofa item alongside planning for safe bedsharing (Item 2) may form a coherent position; where separate sleep surfaces are emphasised, the same response may equally reflect blanket avoidance of shared sleep. On this account, women who value proximity and those oriented towards separation would select the same response for different reasons, consistent with Australian review evidence that parents decouple safety concerns from proximity preferences, including using

higher-risk sofa-sharing to avoid bedsharing [70]. The item is consequently unable to discriminate along the closeness dimension. Future refinement of the VNIS could involve re-wording Item 3 to more clearly capture relational aspects of proximity, as the current wording appears to assess perceptions of infant sleep safety rather than parent-infant closeness. Additionally, it is recommended to review items representing closeness so they do not also capture components of key safety messaging such as refraining from couch or sofa sleeping at all times [55]. Alternatively, safety-focused beliefs could be considered as a separate dimension. A further option would be to re-word the item to index relative rather than absolute risk across sleeping surfaces, so that it retains discriminating power in contexts of high safe-sleep awareness.

Independence was the most psychometrically strong and conceptually coherent component within our sample. All items demonstrated strong factor loadings, suggesting that beliefs relating to infant autonomy and self-soothing formed a cohesive and reliable construct. This indicates that Independence is both a well-functioning dimension within the VNIS and one that reflects the beliefs of our sample. The salience of Independence within this context is likely established in broader sociocultural discourses that prioritise infant autonomy and self-regulation as parenting achievements. Parents in Western settings like this sample are often encouraged through guidelines, professionals, and parenting resources to promote self-settling and use separate sleep spaces [71]. Almost 96% of this sample had separate rooms prepared for infant sleep, a higher rate than the UK sample which may be influenced by cultural expectations and relative accessibility. For example, Australian homes have a higher average number of bedrooms [72] than average dwelling sizes in the UK [73], potentially shaping both sleep practices and parental beliefs about independence. Whilst these findings highlight that Independence is reliable and theoretically coherent in Australia, they also underscore the importance of culturally situated interpretation. Cross-cultural validity in the application of the VNIS requires careful consideration.

In contrast to Independence, Night-Waking displayed greater heterogeneity within its psychometrics. While Items 11 and 12 demonstrated acceptable loadings, Items 9 (relating to infant sleep patterns) and 10 (relating to infant feeding) reflected less alignment. This suggests that parental beliefs about infant waking may not represent a single, unified construct in this Australian context, but rather a set of partially overlapping perspectives. One explanation is that parents may interpret infant waking through divergent perspectives, either as developmentally normative or as a problematic disruption requiring intervention. Research positions waking as an expected feature of early infancy, with sleep typically organised into short bouts in the first months of life and consolidating gradually across the first year [74]. Items 9 and 10, which reflect this biological perspective, may have been endorsed inconsistently if parents viewed consolidated sleep as a developmental achievement that infants “should” reach earlier, reflecting cultural pressures towards sleep independence. By contrast, Items 11 and 12, which emphasise the protective and variable nature of night-waking, may have resonated more strongly with parental intuitions or knowledge of infant safety. A related possibility concerns the distinction between knowledge and belief, which Boedker et al. [14] acknowledged the VNIS cannot differentiate. Items 9 and 10 assert specific claims (e.g. most infants sleep in bouts of two to three hours), whereas Items 11 and 12 carry a normalising valence, suggesting the factor may index acceptance of night waking as much as knowledge of its physiological basis. Item 10 is further complicated by its double-barrelled structure, since a respondent may agree that infants need to feed frequently at night without attributing this to rapid brain growth. Item 9’s numeric specification compounds this, since a respondent may endorse waking as developmentally normative while disagreeing that most infants sleep in two-to-three-hour bouts. In an antenatal sample, responses to such a claim may partly reflect prior exposure to infant sleep information rather than belief orientation. Taken together, Night-Waking retains theoretical value but requires further refinement to function consistently

within the Australian context. Alternatively, these findings may reflect the demographics of this highly educated sample.

Future iterations of the VNIS could benefit from distinguishing between knowledge-based beliefs regarding the developmental normalcy of waking and emotional or behavioural responses relating to its management. Removing the numeric anchor from Item 9 and framing it as a normative statement about expected night waking frequency would align its response demands with Items 11 and 12. Such refinement would improve psychometric strength and clarify the ways in which parental beliefs about waking are situated at the intersection of developmental expectations, wellbeing, and cultural discourses.

A key finding was the strong positive correlation between Closeness and Night-Waking, indicating that beliefs regarding proximity are closely interconnected with expectations of night arousals. Theoretically, this aligns with evolutionary models, which argue that night-waking functions adaptively as a signal for parental attention, feeding, and protection [75]. Within this framework, parents who prioritise closeness may be more likely to interpret waking as biologically normative, as proximity facilitates rapid responsiveness and reduces the perceived burden of nocturnal disruptions [68]. This reflects societies where co-sleeping is normative and night-waking rarely pathologized, instead understood as developmentally appropriate [76]. Our findings suggest similar patterns are evident among our sample, indicating that mothers may normalise waking whilst endorsing proximity, even within a cultural context that simultaneously promotes independent sleeping. A moderate positive correlation also emerged between Closeness and Independence, implying that infant–parent proximity beliefs can coexist with endorsements of autonomy. This is consistent with Western parenting discourses, which simultaneously encourage responsive caregiving and the promotion of independence through practices such as separate sleep arrangements and self-soothing [71]. Parents likewise receive competing recommendations to breastfeed, given its well-established health benefits [58], and to sleep separately as the safest infant sleep practice, despite closeness being a known facilitator of breastfeeding [75]. The coexistence of these beliefs highlights the nuanced ways in which cultural values and practical considerations intersect in parental decision-making, suggesting that while theoretically distinct, these beliefs may be interrelated in practice.

The high correlations observed raised concerns regarding the distinctiveness of the VNIS factors. Although designed as separable dimensions of parental beliefs, these constructs appear to overlap. The Closeness dimension may influence how night-waking is understood, potentially attenuating the conceptual distinction between the constructs, with the correlation between Closeness and Independence revealing the nuanced ways parents may integrate beliefs of responsiveness and infant self-sufficiency. This overlap highlights a strength and a limitation – while the measure captures the interconnectedness of parental beliefs and the complexity of parenting practices, it may also constrain the discriminant validity of these factors. Greater psychometric precision may be achieved by delineating the constructs more explicitly and distinguishing knowledge-based beliefs (e.g., awareness of the developmental function of waking) from affective responses (e.g., tolerance of disruptions). Theoretically, these results support the view that parental views about infant sleep are not dichotomous but instead a simultaneous negotiation of responsiveness, safety, and autonomy. The VNIS demonstrates value in operationalising the multidimensional, context-sensitive nature of parental beliefs, but requires further refinement to enhance construct validity for each factor.

Although the present findings indicate the VNIS requires further refinement before confident application, the broader rationale for a validated measure of parental sleep beliefs remains. Such beliefs are formed early, shape caregiving practices, and contribute to the reciprocal relationship between infant sleep and maternal wellbeing [11,34,37]. A psychometrically sound VNIS may help to bring these beliefs into consideration by both parents and practitioners within antenatal and early postnatal care settings in which infant sleep is

discussed. Used in this way, the measure could identify where parental expectations diverge from the biological norms of infant sleep, indicate beliefs which may heighten distress when sleep does not consolidate as anticipated, and support care which is responsive to a family's existing orientation. Administered antenatally, the VNIS may also support practitioners to anticipate the expectations parents bring to the post-natal period, before unmet expectations diminish parental confidence. Such applications are contingent on further psychometric development, including strengthening the weaker indicators and establishing discriminant validity of the subscales to allow scores to be interpreted as distinct belief dimensions.

4.1. Limitations

Both the current and original study of the VNIS were conducted in Western, individualistic cultures, limiting the cultural generalisability of findings. Although the VNIS was designed with culturally neutral language to promote broader applicability than previously developed questionnaires, this is yet to be assessed. Investigation into whether the differences observed between the current study and Boedker et al. [14] reflect meaningful cultural variation by conducting multi-group CFA on both datasets, assessing configural, metric, and scalar invariance [77], would allow researchers to formally evaluate the comparability of the VNIS across contexts. This may address speculation on cross-cultural differences by examining cross-cultural measurement invariance between the two samples. This study reflected the views of a highly educated sample which, whilst multimodal methods of recruitment were employed, could be addressed in future research by recruitment from maternity care settings in public hospital contexts where a representative sample of the population may be attending antenatal appointments. This study also exclusively sampled pregnant individuals. While the participant inclusion criteria were selected to reflect the original study, this limits the generalisability of findings to broader parental populations, such as fathers, non-birth partners, and postnatal parents. The VNIS was also explicitly designed to capture both antenatal and post-natal parental views on infant sleep, yet to date, it has only been administered to antenatally, effectively restricting its validation to maternal, prenatal perspectives. Future research should expand recruitment to include a broader range of caregivers and relationship types to reflect diverse family contexts and ensure the measure's relevance and postnatal applicability.

A further limitation is the use of a cross-sectional design, which captures data at a single point and precludes analysis of how parental views on infant sleep may change over time. Both the current and original study examined women in pregnancy only through a cross-sectional design and included nulliparous and parous women. Therefore, the questionnaire's ability to detect developmental or experiential changes has not been tested [74], including how parental views may differ across the perinatal period from pregnancy to the postpartum, or across experiences with subsequent children. The stability and sensitivity of the VNIS to identify changes in parental beliefs following the birth remains unexplored. Given that perinatal experiences, sleep disruptions, and lived realities often reshape parental views on infant sleep [78], future studies should employ prospective longitudinal designs. This would allow for the evaluation of test-retest reliability, temporal stability, and the responsiveness to meaningful changes in parental beliefs. Such work would also assist the development of tailored interventions and clinical supports that align with evolving needs.

5. Conclusion

This study provides mixed support for the VNIS as a measure of parental beliefs about infant sleep within an Australian sample, partially replicating Boedker et al.'s [14] three-factor structure. Independence emerged as the most coherent component, reflecting culturally salient values of infant autonomy and self-soothing. Closeness demonstrated

moderate coherence, although safety-focused items diverged from relational beliefs. Night-Waking displayed heterogeneous performance, suggesting that parental interpretations of infant waking are multifaceted and influenced by competing cultural, developmental, and safety discourses. Inter-factor correlations indicated that beliefs regarding proximity and autonomy can coexist, highlighting the complexity of parental cognitions. Although these findings offer preliminary evidence for the VNIS as a measure of multidimensional parental beliefs, generalisability is limited by the small, metropolitan, highly educated, predominantly Oceania-born, and antenatal sample, as well as the cross-sectional design. Extension of validation to culturally diverse and post-natal populations inclusive of fathers or non-birthing partners, utilising a longitudinal design, and with the refinement of some items may strengthen psychometric performance. This would support the questionnaire's utility in research, clinical assessment, and family contexts, contributing to a more nuanced understanding of parental beliefs and infant sleep practices.

Studies in human

This study was performed in compliance with relevant laws, regulatory frameworks and guidelines where the research took place.

This study was approved by the Murdoch University Human Research Ethics Committee.

(Approval No. 2025/070)

CRedit authorship contribution statement

Evelyn Werner: Writing – review & editing, Writing – original draft, Formal analysis. **Ebony Schulz-Doherty:** Writing – original draft, Investigation, Data curation. **Stuart J. Watson:** Writing – review & editing, Supervision, Formal analysis. **Heather Liebrechts:** Writing – review & editing, Visualization, Data curation. **Ingrid Boedker:** Writing – review & editing, Visualization, Methodology, Conceptualization. **Sam G.B. Roberts:** Writing – review & editing. **Renita A. Almeida:** Writing – review & editing, Supervision, Investigation, Data curation. **Kelli K. MacMillan:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Investigation, Data curation.

Informed consent and patient details

Written informed consent to take part in the study and to publish the article has been obtained from all participants or their legal representatives. The privacy rights of participants have been observed.

Declaration of competing interest

No competing interests to declare.

Acknowledgements

We would like to acknowledge the support of the Women and Newborn Health Service of Western Australia in our infant sleep research, as well as the individuals who took time to participate in this study during their pregnancy. Finally, we want to thank the researchers that originally developed the VNIS for the opportunity to collaborate on this meaningful work.

Data availability

All data have been made publicly available and can be accessed on the OSF page <https://osf.io/4jbuk/>.

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