The Indonesian Food Neophobia Scale Revisited: A Two-Year Rasch-Based Study and Differences in Family Eating Habits

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Abstract. Food neophobia has been linked to nutritional adequacy, metabolic risk factors, limited food choices, picky eating behaviours, dietary outcomes, and parental feeding practices. Building on the initial Rasch-based validation of the Indonesian Food Neophobia Scale (ID-FNS) conducted in 2023, this research assesses the psychometric stability, measurement invariance, and temporal validity of the ID-FNS using data from 2023 and 2025. It also investigates variations in food neophobia in relation to family eating practices and their impact on the interpretation of DIF items among Indonesian adults. This cross-sectional study involves 621 adults (M = 26.011, SD = 7.144) from 24 provinces across Indonesia. Participants completed the 10-item Indonesian Food Neophobia Scale (ID- FNS) online and reported their daily family meal practices. To assess the stability of the ID-FNS's psychometric properties over two years, we applied an equating process within the Rasch Model, anchoring the previous 10-item ID-FNS (2023) to the latest dataset (2025). We also conducted an analysis of variance (ANOVA) to compare food neophobia scores between families with traditional and modern eating habits. Our findings from the equating process indicate no significant changes in the characteristics of the 10-item ID-FNS administered to 1632 participants in 2023, compared with those administered to 621 participants in 2025. The 10-item ID-FNS also demonstrated measurement invariance across gender and adequate construct validity. A significant difference was identified in food neophobia scores between families adopting traditional eating patterns and those with modern habits ($p < .05$; Cohen's $d = .20$). Families with traditional eating habits exhibited higher mean food neophobia scores (-.70 logit) compared with those with modern eating habits (-.96 logit). Several technical notes are included as key findings of this study. Our research confirms the two-year stability of the ID-FNS. It also addresses food neophobia, including dietary diversification, food acceptance, and nutrition in both traditional and modern families.

Keywords: Food neophobia; Rasch linking and equating; Item Drift; Differential item functioning; FNS re-validation

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1 Introduction

1.1 Revisiting Food Neophobia as a Stable Psychological Construct in a Rapidly Changing Food Environment

Many culinary innovations, such as alternative proteins and high-tech foods, encounter resistance because people prefer familiar foods and develop an early, relatively stable tendency to reject new foods [1-3]. Food neophobia, defined as the reluctance to accept novel foods [4], remains a pertinent construct across various cultures and time periods [5]. In public health, food neophobia has implications beyond resistance to innovative foods, as it influences the diversity and adequacy of essential nutrient intake. Recent research indicates that food neophobia is correlated not only with novel food acceptance but also with the consumption patterns of fruits, vegetables, and "core foods," thereby obstructing efforts to enhance dietary quality among children and adults [6, 7]. A systematic review focusing on children and adolescents further substantiates that food neophobia can precipitate micronutrient deficiencies and contribute to persistent nutritional disorders if not effectively addressed [8].

While food neophobia is often viewed as a stable trait that develops with an individual, it is not unchangeable. Research indicates that repeated exposure, nutritional education, and positive food-related activities can reduce food neophobia [6, 9-11]. Given its implications for nutrition and health, a reliable, psychometrically validated measurement tool is essential for assessing food neophobia. The claim that food neophobia is stable is only valid if the measurement method shows consistency over time, enabling this trait to be effectively monitored for nutritional risks, chronic diseases, and behavioural interventions. Such interventions should be initiated early, repeated, and focused on fostering positive food experiences.

1.2 The Necessity of Psychometric Stability and Temporal Validity for Interpreting Food Neophobia Across Time

Over the past 30 years, research on food neophobia has primarily used the Food Neophobia Scale (FNS), developed by Pliner and Hobden in 1992 [4], across various countries (see Rabadán and Bernabéu, 2021). A systematic review by Rabadán and Bernabéu (2021) summarised international data indicating that mean food neophobia scores have generally decreased over time across countries [12]. This trend is often linked to broader globalisation processes and changes in food environments. However, much of the available evidence comes from cross-sectional studies that lack longitudinal data, making it difficult to determine whether observed changes reflect true psychological shifts or measurement artefacts.

The stability of the FNS construct cannot be separated from that of its measurement instrument, because claims of score changes are only meaningful if the instrument is shown to be psychometrically stable. Without measurement invariance and temporal validity, cross-time comparisons lose their inferential basis, so food neophobia risks

being treated as a dynamic phenomenon without evidence that these changes are not due to shifts in item meaning.

Rangka et al. (2023) first measured food neophobia in Indonesia using the Rasch Model. The mean food neophobia score among the Indonesian sample (n = 1632 participants, M = 26.4 years, and SD = 1.04) was -.74 logits, falling within the moderate category. Nevertheless, the average food neophobia score among Indonesian adults ranks fifth highest in the world [13]. This position raises significant questions about the characteristics of food neophobia in the Indonesian context. Without longitudinal data, Indonesia's standing in the global landscape remains provisional. Moreover, a single assessment does not permit an evaluation of the stability of the item and/or individual parameters. Consequently, policy decisions, intervention strategies, and nutritional risk assessments derived from the food neophobia score become inherently fragile. Additionally, assertions of moderation or cultural specificity may be speculative without longitudinal or equating evidence.

Psychometric stability and temporal validity of the Indonesian version of FNS are epistemic prerequisites for interpreting changes in food neophobia. In the Rasch Model, the common-item equating design and item displacement analysis provide an appropriate evaluation framework for this issue, serving as a methodological convergence point [14, 15].

1.3 Family Eating Habits and the Contextual Expression of Food Neophobia

Variations in food neophobia scores do not necessarily reflect differences in the degree of neophobia alone but also indicate variations in individuals' interpretations of the items within their social context. From infancy through adolescence, parents influence the availability of food at home, set eating guidelines, and serve as behavioural models; this, in turn, shapes children’s preferences, eating habits, and long-term nutritional status [16, 17].

Several studies indicate that family eating practices constitute a social ecology and are fundamental to expressing food neophobia. For example, children are less neophobic if they frequently eat with their family and see their parents or siblings enjoying a variety of foods, especially fruits and vegetables [18, 19]. Conversation studies at the dining table show that a child's “like/dislike” is used as a bargaining tool, a means of rejection, or a complaint; this is where rights and obligations regarding eating are negotiated between the child and the parents [20, 21]. An affectionate, non-threatening eating environment with a pleasant atmosphere reduces negative associations with new foods and decreases food neophobia [22].

Research does not always directly track the “family menu”. However, it consistently shows that limited variety and exposure to new foods within the family environment are associated with higher food neophobia [23, 24]. A monotonous family diet with low variety is often linked to higher levels of food neophobia [25]. In traditional families,

food often follows recipes passed down through generations and uses local, region-specific ingredients. This can be a strength (identity, nutrition, sustainability), but it can also be limiting if the repertoire is very narrow and rejects anything new. Meanwhile, a modern diet that is truly 'open' to a range of cross-cultural cuisines and new trends tends to reduce food neophobia and increase dietary variety [12, 26, 27]. The challenge is to ensure that ultra-processed foods do not dominate this exploration and that it includes a variety of fresh ingredients, fruits, vegetables, whole grains, and healthy protein sources [28, 29].

In our view, the difference between traditional and modern dietary habits does not necessarily alter the latent structure of the food neophobia construct. Instead, it influences how certain items within the FNS are interpreted. The differing functions of these items in this context do not indicate a failure of the instrument; rather, they reveal layered, enriched dynamics of meaning that deepen understanding of the food neophobia construct in specific contexts.

1.4 The Present Study

This study addresses the temporal limitations of food neophobia research and the lack of evidence regarding its stability in Indonesia. By examining the stability of item parameters and score metrics across repeated administrations, the analysis evaluates the temporal robustness of the food neophobia measure rather than individual-level longitudinal change.

Accordingly, this study pursues three interrelated objectives. First, it evaluates the psychometric stability and measurement invariance of the ID-FNS in a subsequent, temporally separated administration. Second, it examines the scale's temporal validity using Rasch-based equating procedures and item displacement statistics across two measurement occasions. Third, it analyses differences in food neophobia in relation to family eating practices, with particular attention to how the family context informs the interpretation of Differential Item Functioning as contextually meaningful variation rather than solely as measurement bias.

2 Method

2.1 Food Neophobia Scale

The Food Neophobia Scale (FNS) is the primary instrument for measuring the tendency to reject new foods in humans and has been used for over 30 years. First developed by Pliner & Hobden in 1992, it was a 10-item paper-based scale measuring reluctance to eat or avoid novel foods [4]. In Indonesia, the FNS has been formally translated and validated as the Indonesian Food Neophobia Scale (ID-FNS). The ID-FNS was administered to 1,632 adult participants (aged 18–60 years) across 28 provinces (see Rangka et al., 2023). The results indicated adequate psychometric properties, and all

10 original items of the FNS by Pliner & Hobden in 1992 were retained; no items were removed due to misfit [13].

2.2 Family Dietary Practices

Data on family dietary practices in this study are drawn from self-reports and reflect general family-level eating habits. These dietary practices are broadly classified into two categories: traditional and modern. Traditional patterns involve adherence to inherited recipes and cooking techniques passed down through generations, as well as consuming foods characteristic of the family's regional heritage. Conversely, modern patterns are distinguished by openness to diverse cross-cultural cuisines, a willingness to experiment with new dishes, the adoption of contemporary culinary trends, and frequent patronage of restaurants offering innovative or exotic cuisines. Participants responded with “yes” or “no” to indicate their conformity with each dietary pattern type.

2.3 Participants

This study involved two separate samples. First, the ID-FNS dataset, comprising 1,632 adults (M = 26.40, SD = 1.04) from 28 provinces in Indonesia, was published in 2023 and obtained with permission from the original source [13]. Second, the ID-FNS dataset, comprising 621 adults (M = 26.01, SD = 7.14) from 24 Indonesian provinces, was administered in 2025 and collected online via convenience sampling.

2.4 Procedures

To assess the stability of the ID-FNS psychometric properties over 2 years of use, we applied an equating process within the Rasch Model, anchoring the previous 10-item ID-FNS (2023) to the latest dataset (2025). Methodologically, the 2023 dataset is no longer an active research sample but serves as a metric reference (metric baseline). Meanwhile, the 2025 dataset addresses a temporal question: whether the established measurement structure remains stable when used again in a different temporal context. Next, we use only the 2025 dataset to describe differences in food neophobia based on family dietary practices.

2.5 Data Analysis

The invariance measurement for ID-FNS (2025) used parameters to determine reliability indices, fit statistics, unidimensionality, local item dependence, rating-scale diagnosis, response-level scoring, differential item functioning (DIF) by gender, and item difficulty indices [30, 31].

Statistical displacement analysis was used to investigate the Drift Shift in the Rasch Item Calibration for ID-FNS (2023) and ID-FNS (2025) using Winsteps Software

version 5.1 [15]. Meanwhile, an analysis of variance (ANOVA) was conducted to compare food neophobia scores between families with traditional and modern eating habits.

3 Results

3.1 Rasch Item Calibration and Model Fit of Current ID-FNS

Given that the psychometric properties of the 2022 ID-FNS dataset have been reported elsewhere (see Rangka et al., 2023), the present analysis focuses on assessing the stability of item calibration in the most recent administration (2025), using the previously published parameters as anchors for equating. However, before reporting the equating results, we present the ID-FNS (2025) calibration and assess model fit using Rasch parameters.

Our findings demonstrate that ID-FNS (2025) has perfect item reliability (R_i = 1.00) and an excellent separation index (G_i = 22.67), indicating a highly stable scale with an extensive measurement range (RMSE = .07; SD = 1.62). Additionally, the person reliability estimate is high (R_p = .82), and the item separation index falls within a reasonable range (G_i = 2.12; RMSE = .56; SD = 1.19). This indicates that ID-FNS (2025) exhibits strong internal consistency and effectively differentiates between individuals with high food neophobia (neophobics) and those with low levels (neophiles).

Furthermore, the ID-FNS satisfied the unidimensionality assumption, as evidenced by the proportion of raw variance explained by the Rasch measures, which reached 59.8%, exceeding the commonly accepted threshold for unidimensional measurement (> 40%) [30]. This result provides robust evidence that the ID-FNS assesses a single latent construct. In addition, item fit statistics showed that none of the ID-FNS items exhibited misfit, with Outfit Mean Square (MNSQ) values ranging from .73 to 1.33, all within the acceptable range. Analysis of local item dependence further confirmed that the items functioned independently, as no item pairs exceeded the critical threshold for local dependence and all residual correlations remained below .70 [32].

The rating-scale diagnosis reveals no evidence of "category disordering" in the scale (1 = strongly disagree to 5 = strongly agree). The average scores and Andrich thresholds for each category increase consistently and monotonically, indicating that participants can reliably differentiate among the answer choices in the ID-FNS. Additionally, response-level scoring shows no miscoded data, as responses align with the intended meaning of each item and exhibit positive point-biserial correlations ($r_{p\beta is}$) ranging from .35 to .72. Finally, DIF analysis conducted on the gender and family dietary practices subgroups indicates that the ID-FNS does not display DIF in these groups. Although the separation index for item ID-FNS shows a wide range (G_i = 22.67), for practical

purposes, we classify item difficulty into two categories: the most difficult to agree upon and the easiest to agree upon.

Table 1 ranks the 10-item ID-FNS from most difficult (top) to easiest (bottom). Items labelled "Easy to Agree" had a mean item measure of −2.03 (SE = .82; Outfit MNSQ = 1.02), indicating they are relatively easy to endorse. Conversely, "Hard to Agree" items had a higher mean measure of .87 (SE = .32; Outfit MNSQ = .96), indicating greater difficulty in endorsement. The difference between these categories was statistically significant, as confirmed by Welch's t-test (two-sided p = .046; Cohen's d = 2.83), indicating a very large, standardised difference and a clear separation in endorsement difficulty.

Table 1. Item measure of the ID-FNS Dataset for 2025 (I=10, N=621)

No.	Items	Measure	Categories
1	I am constantly sampling new and different foods (R) / *Saya rutin mencicipi makanan baru dan berbeda-beda (R)*	1.77	Hard to Agree
6	At dinner parties, I will try new foods (R) / *Saat berada di pesta makan malam, saya akan mencoba makanan baru (R)*	1.67	Hard to Agree
4	I like foods from different cultures (R) / *Saya suka makanan dari budaya yang berbeda-beda (R)*	1.55	Hard to Agree
10	I like to try new ethnic restaurants (R) / *Saya suka mencoba restoran baru khas daerah (R)*	1.08	Hard to Agree
9	I will eat almost anything (R) / *Saya akan makan apa saja yang ada (R)*	.24	Hard to Agree
5	Ethnic food looks too weird to eat / *Menurut saya makanan khas daerah terlihat terlalu aneh untuk dimakan*	.17	Hard to Agree
2	I don't trust new foods / *Saya tidak percaya makanan baru*	-.38	Hard to Agree
7	I am afraid to eat things I have never had before / *Saya takut makan makanan yang belum pernah saya makan sebelumnya*	-1.10	Easy to Agree
3	If I don't know what a food is, I won't try it / *Jika saya tidak tahu makanan apa itu, maka saya tidak akan mencobanya*	-1.34	Easy to Agree
8	I am very particular about the foods I eat / *Saya sangat memperhatikan setiap makanan yang saya makan*	-3.66	Easy to Agree

To verify the results in Table 1, we created a Wright map to illustrate the range of ID-FNS items from the most difficult (Item 1) to the easiest to agree with (Item 8) and to compare them with the participant distribution by gender, as shown in Figure 1. The male group, with 281 participants (45.25%), exhibited a higher mean measure of food

neophobia (mean = −.76; SE = .08; Outfit MNSQ = .96; person reliability = .82) than the female group, which included 340 participants (54.75%) and had a mean measure of −.93 (SE = .07; Outfit MNSQ = 1.00; person reliability = .81). However, the difference in mean measures between the male and female groups was not statistically significant, as indicated by the two-tailed Welch test (p = .126; Cohen's d = .12).

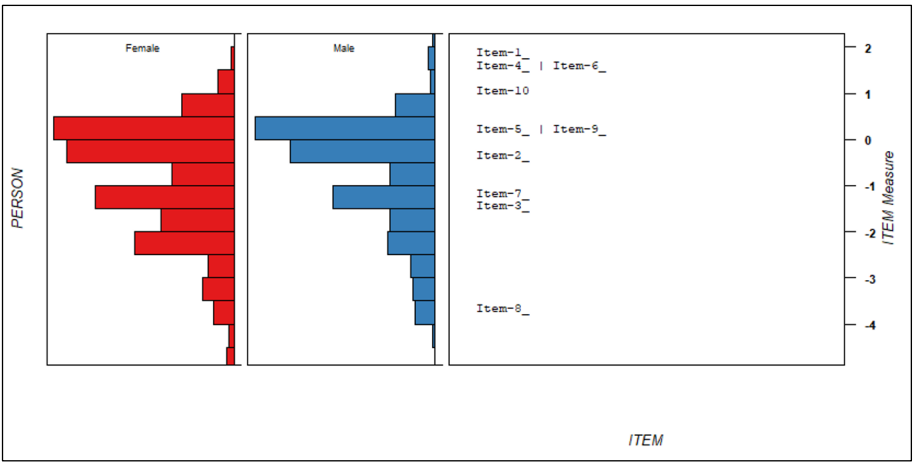


Figure 1. The Wright map of the 2025 ID-FNS dataset based on gender

Overall, the results presented in Section 3.1 demonstrate that, following the second calibration, the ID-FNS (2025) exhibits dependable and consistent psychometric characteristics, as evidenced by satisfactory item fit, a unidimensional measurement structure, and appropriate rating scale functioning.

3.2 Item Displacement and Drift Shifts in ID-FNS Over Time

In practice, item difficulty can change over time [14]. To assess this, we conducted an equating analysis to determine whether ID-FNS items differed significantly across the two testing periods. We calibrated all Study 2 items using an anchoring approach based on Study 1's parameters.

The analysis showed that none of the items exhibited statistically significant shifts beyond the recommended tolerance limits (displacement statistics ≤ .50 logit), indicating that they did not become easier or more difficult. Displacement statistics represent the difference between item difficulty estimates from the anchored dataset (2023) and those from the current dataset (2025). These findings suggest that the items are stable over time. Furthermore, this equating confirms the consistency of item parameters and supports the longitudinal validity of the ID-FNS for assessing food neophobia, as illustrated in Table 2.

The estimated item difficulty of the ID-FNS remains relatively consistent across two administrations. The measure differences are slight, indicating a stable pattern of item difficulty between the 2023 Study 1 Dataset and the 2025 Study 2 Dataset. However, displacement statistics reveal some variation in difficulty shifts, with six items becoming more challenging and four easier in the latest administration. These changes include both increases and decreases, typically close to zero.

For example, Item 8 (*I am very particular about the foods I eat / Saya sangat memperhatikan setiap makanan yang saya makan*) shows a .50 logit increase in difficulty in the latest dataset, indicating that the item is relatively more difficult to approve than in the previous administration. Conversely, Item 1 (*I am constantly sampling new and different foods (R) / Saya rutin mencicipi makanan baru dan berbeda-beda (R)*) shows a decrease in difficulty of −.43 logits. Nevertheless, this item remains the most difficult at both administration times. Overall, the observed displacement magnitude falls within acceptable tolerance limits and is not accompanied by any indications of model misfit, as indicated by the Outfit MNSQ value.

Table 2. Displacement statistics indices of the ID-FNS over time

Items	Dataset Study 1 (2023) (n = 1632; i = 10)			Dataset Study 2 (2025) (n = 621; i = 10)			Displace-ment
	Measure	S. E	Outfit MNSQ	Measure	S. E	Outfit MNSQ	
1	1.66	.04	.83	1.77	.08	1.010	-.43
2	-.35	.03	.89	-.38	.07	.740	.06
3	-1.35	.03	1.10	-1.34	.07	1.056	.36
4	1.52	.04	.87	1.55	.08	.791	-.44
5	-.03	.04	1.14	.17	.07	1.139	.14
6	1.63	.04	.78	1.67	.08	.732	-.47
7	-1.03	.03	.88	-1.10	.07	.867	.22
8	-2.94	.04	1.31	-3.66	.08	1.143	.50
9	-.09	.04	1.18	.24	.07	1.327	.24
10	.99	.04	.87	1.08	.07	.993	-.24

Given the findings in Sections 3.1 and 3.2, which indicate that the ID-FNS has a good model fit, a unidimensional structure, and stable parameters across time points, this scale can be used reliably for in-depth analysis. With this solid measurement basis established, the next step is to examine differences in food neophobia among participants, focusing on variations in family eating habits, as detailed in Section 3.3.

3.3 Assessing Food Neophobia Variations through Family Eating Habits

Once a robust measurement basis is established, this section analyses differences in food neophobia scores across family eating habit groups, highlighting the social context that may influence attitudes towards new foods. Given the family's role in shaping food

attitudes, this section also examines variations in neophobia scores among participants with different family eating backgrounds.

Our findings show that 355 participants (57.17%) follow modern family eating habits, while 266 (42.83%) stick to traditional practices. Comparing the mean person measures of food neophobia reveals that the modern group has a lower mean (measure = -.96; SE = .07; Outfit MNSQ = 1.00) than the traditional group (measure = -.70; SE = .07; Outfit MNSQ = .96). The average difference between the groups is -.26 logits, which is statistically significant according to the two-tailed Rasch-Welch test ($p < .05$). Nonetheless, the effect size is small (Cohen's d = .20).

Given the observed disparities in food neophobia between the two groups, the next step was to assess whether these differences genuinely reflect variation in the construct or are attributable to differences in item performance across groups. Accordingly, we conducted a Differential Item Functioning (DIF) analysis, with particular emphasis on familial eating habits. Beyond identifying potential group-level biases, DIF analysis also helps determine whether an item retains its standard level of difficulty within one group while appearing more challenging in the other [15, 33, 34].

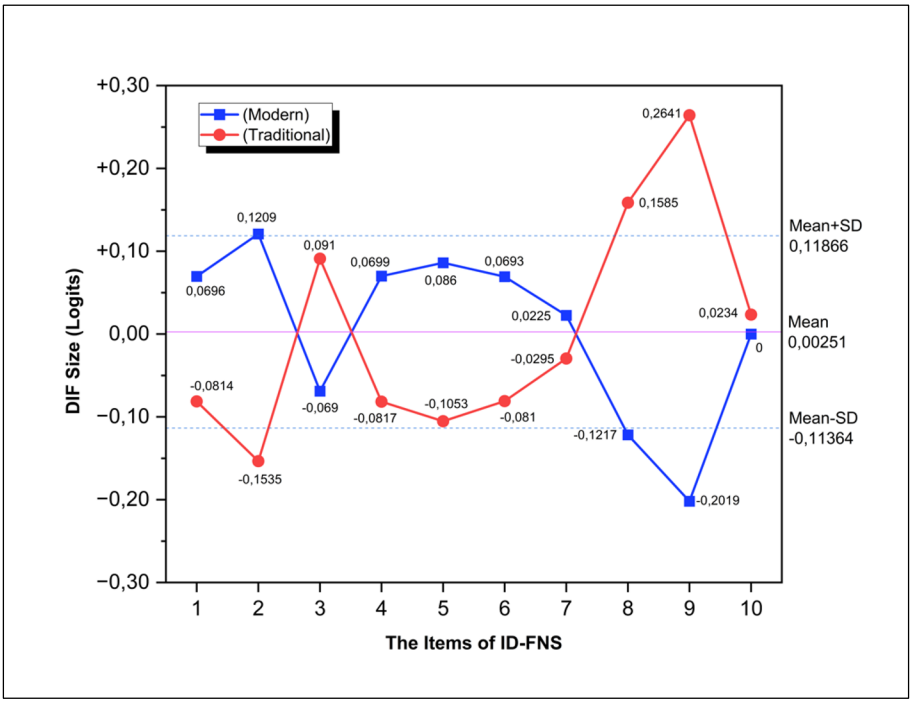


Figure 2. DIF analysis of the 2025 ID-FNS dataset based on family eating habits

In the DIF analysis by family eating habits (modern vs. traditional) shown in Figure 2, most ID-FNS (2024) items functioned similarly across both groups. However, three

items displayed calibration differences indicating statistically significant DIF: Item 2 (I don't trust new foods / *Saya tidak percaya makanan baru*), Item 8 (I am very particular about the foods I eat / *Saya sangat memperhatikan setiap makanan yang saya makan*), and Item 9 (I will eat almost anything [R] / *Saya akan makan apa saja yang ada* [R]), all with Rasch-Welch DIF prob. < .05. Adolescents from families practising modern eating habits found it more difficult to endorse Item 2 than those from traditional eating habits families. Conversely, adolescents from traditional-eating-habits families found it more difficult to endorse Items 8 and 9 than those from modern-eating-habits families.

To complement the statistical significance test, the magnitude of family-eating-habits DIF was evaluated against the ETS classification criteria: |DIF contrast| < .43 logits = Category A (negligible), .43 ≤ |DIF contrast| < .64 logits = Category B (slight-to-moderate), and |DIF contrast| ≥ .64 logits = Category C (moderate-to-large) [35]. Based on these criteria, Items 2 and 8 fell within Category A, indicating that although the family-eating-habits group differences were statistically detectable, their practical magnitude was negligible and unlikely to threaten measurement invariance across modern and traditional family eating practice groups. In contrast, Item 9 (I will eat almost anything [R]) fell within Category B, reflecting a slight-to-moderate — though not severe — differential response pattern between the two-family eating-habits groups. Accordingly, Items 2 and 8 may be retained without revision, whereas Item 9 warrants closer substantive review of its functioning across family eating-habit contexts.

4 Discussion

This research enhances understanding of food neophobia and its assessment instruments, which have seen increased scholarly use in Indonesia since 2023. The ID-FNS has demonstrated reliable measurement stability in 2023 and 2025 and has improved its longitudinal validity through equating within the Rasch model. The absence of drift, an indicator of trait stability, suggests that item parameters in the ID-FNS remain stable across the two measurement periods, reinforcing the view that food neophobia is a relatively consistent tendency rather than a temporary phenomenon. This temporal stability indicates that the construct of food neophobia is inherently stable, thereby making the generated scores trustworthy for long-term decision-making [36].

This study confirms that food neophobia is a strong, unidimensional trait, representing a single coherent latent disposition—specifically, “reluctance towards new foods"—rather than a set of separate constructs. This interpretation aligns with current perspectives, which describe food neophobia as a global trait characterised by reluctance or avoidance of unfamiliar foods, rather than a “package” of separate elements such as technology, food categories, or cultural attitudes [12, 37]. In our view, factors such as technology, culture, and food categories act as contextual influences on attitudes rather than as independent latent dimensions.

The difficulty ranking of item ID-FNS indicates that food neophobia has a structured internal validity, not just randomness or uniformity. For example, Item 1 (I am constantly sampling new and different foods [R] / *Saya rutin mencicipi makanan baru dan berbeda-beda [R]*) is the most challenging, as it reflects the active exploration effort required to try new foods. In contrast, Item 8 (I am very particular about the foods I eat / *Saya sangat memperhatikan setiap makanan yang saya makan*) is the least difficult, illustrating cautiousness and avoidance behaviour towards new foods. This is consistent with the current literature, which suggests that food neophobia results from an individual's failure to initiate food exploration rather than from rejecting unfamiliar foods [38].

The apparent contrast between "Hard to Agree" and "Easy to Agree" demonstrates that expressions of food neophobia vary in their psychological impact. This observation has significant implications for interventions and educational strategies that should not be overlooked, as food neophobia extends beyond mere dislike. Instead, it requires a paradigm shift in interventions, from simply encouraging eating to promoting courage, safety, and skills for exploring new foods. Several studies indicate that school programmes that consistently provide small portions of fruits and vegetables, accompanied by attractive presentation and praise, effectively reduce neophobia scores and augment consumption among students [6, 39]. Establishing a positive, secure environment through rewards, peer modelling, and the "food explorer" narrative effectively diminishes neophobia and enhances liking, particularly for fruit and vegetable categories [40]. Moreover, multisensory exploration methods (such as Sapere, mindfulness, and sensory education), which encourage children to touch, smell, see, hear, and subsequently taste, have been demonstrated to improve exploration of novel foods. However, these approaches do not invariably lead to an immediate increase in willingness to independently try new foods [9, 41, 42], making exploration resistance a more complex intervention target that warrants further investigation.

The difference in food neophobia scores between modern and traditional families illustrates a socio-cultural gradient that shapes attitudes towards novel foods, underscoring the significance of family. However, given the small effect size, this difference warrants cautious interpretation. Families adhering to modern dietary practices tend to have a lower mean neophobia score than those following traditional routines. The DIF analysis provides both methodological and conceptual insights, as familial eating habits influence the selection of certain items. For example, modern family groups have difficulty agreeing with Item 2 ("I don't trust new foods / *Saya tidak percaya makanan baru*"), suggesting that distrust of new foods does not necessarily align with their actual experiences. Conversely, traditional family groups are reluctant to agree with Item 8 ("I am very particular about the foods I eat / *Saya sangat memperhatikan setiap makanan yang saya makan*") and Item 9 ("I will eat almost anything [R] / *Saya akan makan apa saja yang ada [R]*"), indicating a more limited acceptance of foods within their familial and cultural norms. Regarding the DIF findings, the substantive interpretation of Item 9 is more meaningful when linked to this grouping variable: families with traditional eating habits tend to have a more

uniform and culturally specific food repertoire, often centred on local or ethnic cuisine. Consequently, agreeing with the statement *I will eat almost anything* [R] becomes more challenging, as their daily diet typically excludes foods beyond their traditional choices. This reflects not only a psychometric issue but also how the construct interacts with the cultural context of family eating practices.

Our findings indicate that disparities in food neophobia scores between modern and traditional family groups are not solely attributable to differences along a single, homogeneous latent continuum. Instead, they also reflect group-specific interpretations of item content, shaped by everyday familial eating experiences. Although food neophobia is conceptualised as a unidimensional trait, its expression is influenced by family eating practices and varies with characteristic attitudes and evaluations of unfamiliar foods. These patterns align with the ecological food environments in which individuals are socialised. This perspective is consistent with social identity theory and cross-cultural research, which show that food practices serve as symbolic markers of group membership. Within this framework, food choices and attitudes towards novelty are governed by shared norms, traditions, and expectations within the group, thereby shaping individuals' perceptions and responses to food neophobia [43, 44].

5 Study Limitations

Although substantial evidence supports measurement invariance and longitudinal stability, this study has several substantive limitations that constrain causal inference and emphasise the need for more nuanced, context-aware investigations of food neophobia.

Firstly, the data utilised in this research were collected via self-report methods, which are susceptible to social desirability bias, social influences, and post-decision rationalisation when reporting attitudes toward novel foods. These factors have empirical implications, as the food neophobia scores represent reported attitudes rather than actual behaviours when encountering new foods. In light of these limitations, integrating behaviour-based measures, such as food-choice tasks, experiments involving exposure to new foods, or direct observations in family settings, would enhance ecological validity and deepen understanding of the relationship between attitudes and actual eating behaviours.

Secondly, categorising family eating practices into a binary classification (traditional versus modern) fails to capture the complexity of real-world eating behaviours, which are often hybrid, situational, and culturally layered. Consequently, we propose developing a multidimensional family food ecology scale that integrates factors such as exposure frequency, family norms, the symbolic meanings of food, and cross-contextual practices at home and outside the home to enrich understanding of the interplay between social environments and the manifestation of food neophobia.

Thirdly, the ID-FNS employed in this investigation conceptualises food neophobia as an individual trait. By contrast, family variables are treated as external contextual factors rather than as elements of an active, dynamic relational system. This approach does not fully capture interactional processes, such as parental modelling, emotional regulation during meals, or negotiations over food preferences within the family, which may mediate or moderate neophobia.

6 Conclusion

This study uses Rasch analysis with the equating procedure to show that the ID-FNS maintains measurement stability and invariance, as evidenced by a good fit to the Rasch model, high item and person reliability, and a consistent unidimensional structure across both studies. Slight changes in item difficulty are symmetrical and remain within acceptable psychometric thresholds.

The disparity in food neophobia scores more accurately reflects the family's social environment when interpreting novel foods than any changes in the construct's underlying structure. Differential item functioning (DIF) analysis shows that multiple items are perceived differently by contemporary and traditional family groups, particularly those related to trust, selectivity, and food acceptance. Nonetheless, these discrepancies do not indicate the construct's multidimensional nature; rather, they reflect variations in how items are expressed and interpreted, shaped by daily familial eating experiences.

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†Deceased.

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