

Avoidant/Restrictive Food Intake Disorder Symptomatology and Its Associations with Anxiety, Depression, and Psychosocial Difficulties: A Multicenter Child and Adolescent Psychiatry Outpatient Study in Individuals Without Psychiatric Diagnoses

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ABSTRACT

Introduction: Avoidant/restrictive food intake disorder (ARFID) is a heterogeneous eating disorder characterized by sensory sensitivity, low appetite/interest, and fear of aversive consequences. Associations of subthreshold ARFID-related symptoms with anxiety, psychosocial difficulties, and neurodevelopmental traits remain unclear. We examined these symptoms dimensionally in a diagnostically subthreshold pediatric outpatient sample.

Methods: This multicenter cross-sectional study included 350 participants aged 6–18 years from five child and adolescent psychiatry outpatient clinics in Türkiye. The K-SADS-PL confirmed that no participant met DSM-5 criteria for a full-threshold psychiatric disorder; some had non-impairing subthreshold symptoms. Parents completed the Nine-Item Avoidant/Restrictive Food Intake Disorder Screen–Parent Version (NIAS-P), Revised Child Anxiety and Depression Scale–Parent Version (RCADS-P), Strengths and Difficulties Questionnaire (SDQ), and Social Responsiveness Scale–Parent Version (SRS-P). Body mass index (BMI) z-scores were age- and sex-standardized; developmental consistency was tested with age-stratified analyses (6–12/13–18 years) and age interaction terms.

Results: Based on published NIAS-P cutoffs, 101 participants (28.9%) screened

positive and scored higher on most clinical domains, most markedly SRS-P restricted and repetitive behaviors (RRB; $r=0.258$). RRB was the strongest correlate of NIAS-P total ($p=0.435$) and was independently associated with all subscales in sensitivity analyses ($\beta=0.214$ – 0.309). Fear of aversive consequences was independently associated with both anxiety and RRB, whereas low appetite/interest was associated with social responsiveness but not anxiety. Weight status did not differ by screening status (98.0% ≥ 5 th BMI percentile); associations were similar across age bands, and no age interaction survived correction.

Conclusion: ARFID-related symptoms were common in diagnostically subthreshold pediatric outpatients, with RRB as their most consistent correlate across all NIAS-P subscales. These findings support integrating neurodevelopmental evaluation with routine, dimensionally differentiated restrictive eating screening. Given the cross-sectional design, positive screens warrant comprehensive nutritional, psychiatric, and neurodevelopmental assessment rather than inferences about intervention.

Keywords: Anxiety; Autism Spectrum Disorder; ARFID; Child Psychiatry; Feeding and Eating Disorders; Neurodevelopmental Disorders

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INTRODUCTION

Avoidant/restrictive food intake disorder (ARFID) is an eating disorder defined in the DSM-5. It is characterized by persistent inadequate nutrition or energy intake, resulting in significant issues such as weight loss, stunted growth, nutritional deficiencies, dependence on tube feeding or supplements, or adverse social effects (1). Unlike other restrictive eating disorders, ARFID is not motivated by fear of weight gain, body image concerns, or an excessive focus on body weight or shape (1,2,3). ARFID is best understood as a heterogeneous condition with overlapping symptom profiles. The three primary dimensions are: sensory sensitivity, involving avoidance due to taste, smell, texture, or appearance of food; low interest in eating or appetite, marked by reduced motivation to eat or early satiety; and fear of aversive consequences, involving avoidance due to concerns about choking, vomiting, pain, allergic reactions, or other

negative outcomes (3,4,5). Evidence indicates these dimensions do not form distinct clinical categories. Many children and adolescents display mixed profiles, with varying combinations of symptoms contributing to restrictive eating severity (4,5,6). Assessing ARFID symptoms only as present or absent may overlook important clinical differences. A dimensional approach may better capture subthreshold severity, mixed profiles, and underlying mechanisms (6,7).

Anxiety and threat-processing mechanisms are particularly relevant to the fear of aversive consequences dimension. Within the Research Domain Criteria (RDoC) framework, fear, threat sensitivity, and defensive responses to potentially harmful stimuli are conceptualized as part of the Negative Valence Systems (7,8). Thomas et al. (3) proposed that fear-based ARFID symptoms may reflect alterations in negative valence

Highlights

- ARFID-related restrictive eating symptoms were elevated in 28.9% of cases.
- Restricted/repetitive behaviors were independently linked to all ARFID dimensions.
- Fear of aversive consequences had the broadest anxiety and ARFID symptom profile.
- Low appetite/interest was independently linked to social responsiveness, not anxiety.
- Neurodevelopmental screening should accompany ARFID screening in child psychiatry.

processes. In these cases, eating becomes associated with anticipated harm and avoidance is negatively reinforced. Empirical findings show that anxiety traits are associated with ARFID symptoms, particularly fear of aversive consequences. However, anxiety may also relate more broadly to restrictive eating severity and impairment (5,8). These observations support evaluating anxiety not only as a categorical comorbidity but also as a dimensional correlate and potential independent associate of ARFID-related restrictive eating symptoms.

ARFID-related symptoms in children and adolescents must also be considered within the broader context of neurodevelopmental vulnerability. A growing body of literature documents overlap between restrictive eating, autistic traits, sensory processing differences, and restricted and repetitive behaviors (RRB) (5). As a core dimension of autism spectrum disorder (ASD) presentations, RRB includes insistence on sameness, behavioral rigidity, resistance to change, and atypical sensory responses (1). In the context of eating, such characteristics may contribute to rigid food preferences, limited food repertoires, ritualized eating routines, and sensory-based food avoidance (9). Reciprocal social behavior is relevant in this context because the traits captured by social responsiveness measures, including limited social reciprocity, difficulty interpreting others' intentions, and a strong preference for predictability, may also contribute to difficulties during shared family meals. Children high on these traits often require food to be presented in an unvarying form, refuse substitutions and unfamiliar brands, eat separately from the family, and become distressed when a meal departs from the expected routine, so that mealtime conflict and restriction arise from rigidity and social discomfort rather than from any concern about weight or shape. Notably, social responsiveness difficulties and rigidity may function dimensionally across clinical populations, contributing to restrictive eating even among children who do not meet full criteria for ASD or ARFID (5).

Although anxiety and neurodevelopmental traits have each been linked to restrictive eating, they are seldom modeled together, and there are good conceptual reasons for examining them simultaneously. The two domains index different mechanisms that converge on the same observable behavior. Anxiety-driven avoidance is anchored in negative valence processes: food, or a specific act of eating, becomes a conditioned cue for anticipated harm, and avoidance is maintained by relief. Rigidity-driven restriction is anchored elsewhere: insistence on sameness, ritualized routine, and intolerance of novelty narrow the accepted food repertoire without any explicit expectation of harm. Because a child who eats only four foods may arrive at that presentation by either route, a study that measures only one domain risks attributing to anxiety what is in fact driven by behavioral inflexibility, or the reverse. The two may also act together, with anxious appraisal of an unfamiliar

food amplified in a child who is already intolerant of change. Entering anxiety and social responsiveness into the same models, and doing so separately for each restrictive eating dimension rather than for a single total score, is therefore necessary to separate their independent from their shared contributions.

Most ARFID research has been conducted in diagnosed or treatment-seeking samples (6,10). However, subthreshold ARFID-related symptoms may still be associated with anxiety, depressive symptoms, psychosocial impairment, and neurodevelopmental traits (8,11,12). The population examined here is familiar to every child and adolescent psychiatry outpatient service and is nonetheless rarely studied: children and adolescents brought for evaluation by parents concerned about mild emotional, behavioral, school-related, or peer difficulties, or about developmentally expected reactions to family or school stress, in whom a structured diagnostic interview yields no full-threshold disorder and no clinically significant functional impairment. Such presentations account for a substantial share of routine outpatient contacts, yet they fall outside most research designs, which either require a diagnosis or sample from the community. They are, however, precisely the group in which early and still subdiagnostic risk patterns would be expected to appear, and in which screening decisions are made with the least evidence. Therefore, studying such symptoms dimensionally in clinical but diagnostically subthreshold samples may clarify early risk patterns and help identify children who could benefit from closer follow-up before more severe nutritional or psychosocial consequences emerge.

The present study aimed to examine ARFID-related restrictive eating symptoms dimensionally in a diagnostically subthreshold outpatient sample of children and adolescents. Restrictive eating symptoms were assessed along the three ARFID dimensions described above; anxiety and depressive symptoms, broad psychosocial difficulties, and reciprocal social behavior together with restricted and repetitive behaviors were assessed as parent-reported dimensional constructs. Specifically, the study: (i) compared participants with and without elevated ARFID-related restrictive eating symptoms on parent-reported anxiety/depression, psychosocial difficulties, and social responsiveness; (ii) evaluated dimensional correlations between restrictive eating scores and clinical measures; and (iii) tested whether anxiety and social responsiveness were independently associated with restrictive eating severity. We hypothesized that ARFID-related restrictive eating symptoms would be associated with higher anxiety and depressive symptoms, greater psychosocial difficulties, and more pronounced social responsiveness problems. We further expected these domains to show distinct patterns of association across the three dimensions. Specifically, we hypothesized that anxiety would be most strongly associated with fear of aversive consequences, consistent with a negative valence framework, whereas social responsiveness, particularly restricted and repetitive behaviors, would be more strongly associated with picky/selective eating and low appetite or interest, consistent with a rigidity-based framework. Both domains were expected to retain independent associations with overall restrictive eating severity when entered simultaneously.

METHODS

Study Design and Setting

This was a multicenter cross-sectional observational study conducted at the Child and Adolescent Psychiatry outpatient clinics of five state/training hospitals in Türkiye (Şırnak State Hospital, Kastamonu Training and Research Hospital, Uşak Training and Research Hospital, Tatvan State Hospital and Torbalı State Hospital) between February 15, 2026 and May 15,

2026. Participants were consecutively recruited during routine psychiatric evaluation visits at each of the five sites, using an identical protocol, assessment battery, and inclusion procedure. The study was reported in accordance with the STROBE guidelines for observational studies.

Participants

Children and adolescents aged 6–18 years who presented for routine psychiatric evaluation during the study period were consecutively recruited; the final analytic sample comprised 350 participants (mean age: 12.04 ± 3.34 years). Following diagnostic confirmation by the Schedule for Affective Disorders and Schizophrenia for School-Age Children – Present and Lifetime Version (K-SADS-PL), parents completed a structured sociodemographic form and a set of standardized parent-report questionnaires.

Because the term is central to the interpretation of the findings, the criteria used to define a diagnostically subthreshold presentation are stated explicitly. A presentation was considered diagnostically subthreshold when all three of the following applied: (a) the child had been brought to the outpatient clinic for psychiatric evaluation by a parent, or referred by a school or a primary care physician, because of a concern about emotional, behavioral, school-related, or peer functioning; (b) the K-SADS-PL, administered to the child and the parent, yielded no current or lifetime DSM-5 diagnosis; and (c) symptoms that were endorsed remained below the diagnostic threshold in number, duration, or severity and were not accompanied by clinically significant impairment in academic, family, or peer functioning, as rated on the impairment probes of the K-SADS-PL. This definition therefore does not describe an asymptomatic group. It describes children who are symptomatic enough for a family to seek psychiatric assessment but who do not, at the time of assessment, meet the threshold at which DSM-5 assigns a disorder. To make the clinical texture of this group explicit rather than leaving it to inference, the distribution of parent-reported difficulties across the standard normal, borderline, and abnormal SDQ bands, together with recent psychosocial stressors and family history, is reported in the Results.

Additional inclusion criteria comprised parents' ability to understand and complete the study questionnaires, absence of any history of psychotherapy or psychiatric medication use, and voluntary agreement to participate.

Exclusion criteria were: (a) meeting DSM-5 criteria for any psychiatric disorder according to K-SADS-PL interview; (b) severe chronic medical condition or neurological or sensory disorder that could directly affect eating behavior or growth; or (c) substantially incomplete responses on study scales.

Participant flow is shown in Figure 1. Three hundred sixty-seven children and adolescents were enrolled and completed the full assessment battery. Seventeen were subsequently excluded: 16 because of a chronic medical condition that could affect eating behavior or growth (asthma or allergic asthma, $n=6$; bronchitis, $n=2$; food or environmental allergy, $n=1$; hypothyroidism, $n=1$; chronic kidney disease, $n=1$; chronic condition not further specified, $n=5$) and one because of an uncorrected visual impairment. No participant was excluded for incomplete questionnaire data, as the battery was completed in person and checked for completeness before the family left the clinic. The final analytic sample comprised 350 participants. We did not prospectively record the number of children assessed during the recruitment window, the number found to meet criteria for a full-threshold DSM-5 disorder, or the number of families who declined participation; therefore, participant flow begins at enrolment.

No a priori sample size calculation was performed; the sample consisted of all consecutive eligible presentations during the three-month

recruitment window. The achieved sample provides adequate precision for the effect sizes of interest: with $N=350$ and a two-sided α of 0.05, correlations of $|\rho| \geq 0.15$ are detectable with 80% power, a single predictor accounting for $\geq 2.2\%$ of unique variance is detectable in a four-predictor regression model, and the comparison of the 249 screen-negative and 101 screen-positive participants is powered to detect standardized differences of $d \geq 0.33$ ($r \geq 0.15$). Associations smaller than these values may have gone undetected.

Procedure

Psychiatric diagnostic screening was performed using the K-SADS-PL. All interviews were conducted by child and adolescent psychiatrists who had completed the standardized K-SADS-PL training program provided centrally in Türkiye by the Turkish Association of Child and Adolescent Psychiatry and who held the corresponding certification, and all sites applied the same interview and impairment-rating procedure. Formal inter-rater reliability was not quantified, as each interview was conducted by a single certified clinician; this is acknowledged as a limitation.

Following diagnostic confirmation, parents completed a structured sociodemographic form developed by the research team and a battery of standardized parent-report questionnaires, including the Nine-Item Avoidant/Restrictive Food Intake Disorder Screen-Parent Version (NIAS-P), Revised Child Anxiety and Depression Scale-Parent Version (RCADS-P), Strengths and Difficulties Questionnaire-Parent Version (SDQ), and Social Responsiveness Scale-Parent Version (SRS-P). All questionnaires were administered in person during outpatient visits.

Trained clinical staff collected anthropometric measurements, including height and weight, during the same outpatient visit with the child in light clothing and without shoes, using the calibrated stadiometer and scale available in each participating clinic. Body mass index (BMI; kg/m^2) was calculated from these measurements. Because raw BMI is not directly comparable across the 6–18 year range, BMI was additionally converted to age- and sex-standardized z-scores and percentiles using the CDC 2000 growth reference (13), and weight status was classified as underweight ($<5\text{th}$ percentile), healthy weight (5th–84th percentile), overweight (85th–94th percentile), or obesity ($\geq 95\text{th}$ percentile). Raw BMI is retained in the tables for comparability with earlier reports, but all BMI-related comparisons and correlations are based on the standardized values.

Instruments

Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children–Present and Lifetime Version DSM-5 (K-SADS-PL)

The K-SADS-PL is a semi-structured diagnostic interview developed to assess current and lifetime psychopathology in children and adolescents (14). The instrument has been updated in accordance with DSM-5 criteria and validated for Turkish child and adolescent populations (15). In the present study, the K-SADS-PL was administered to both participants and their parents to verify the absence of any psychiatric diagnosis in the study sample. The interview includes a screening module for feeding and eating disorders, and no participant met DSM-5 criteria for ARFID or for any other feeding or eating disorder.

Revised Child Anxiety and Depression Scale–Parent Version (RCADS-P)

The RCADS-P is a 47-item parent-report measure evaluating symptoms of anxiety and depression in children and adolescents, originally developed in accordance with DSM-IV diagnostic criteria (16). Items are rated on a 4-point Likert-type scale (0=never to 3=always). The scale comprises six subscales covering specific anxiety disorders, obsessive-compulsive disorder, and major depressive disorder, and yields total

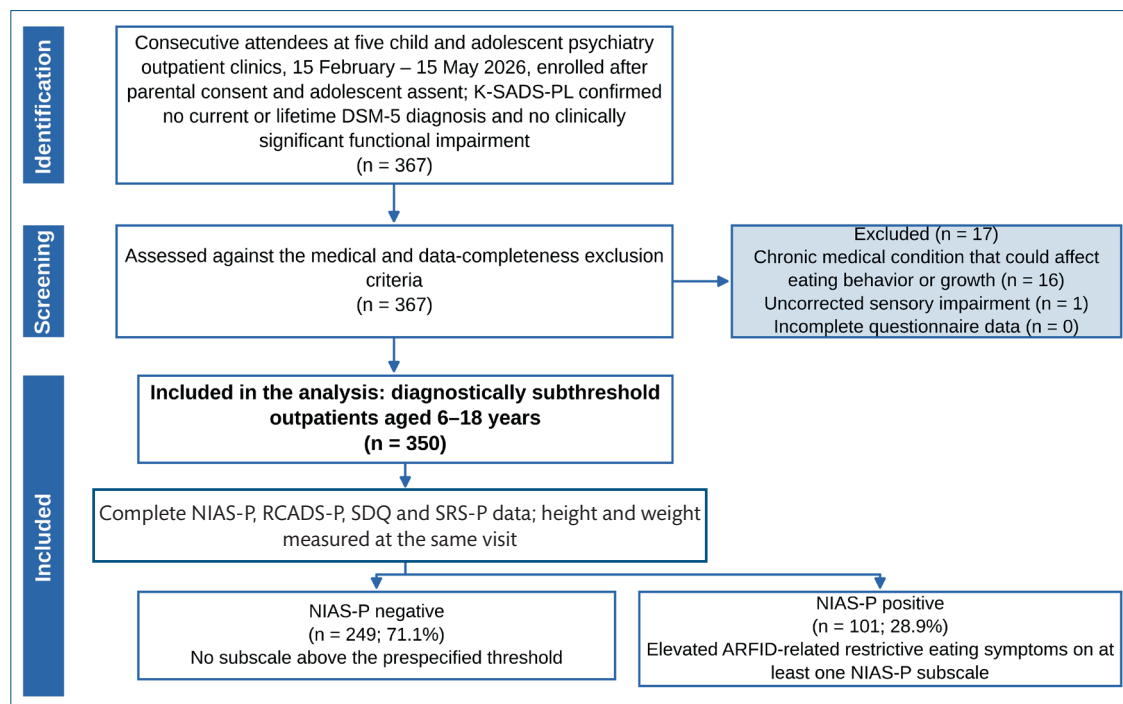


Figure 1. Participant flow. (Flow of participants from enrollment to the analytic sample and to NIAS-P screening classification. NIAS-P positive was defined as scoring above the prespecified threshold on at least one NIAS-P subscale: picky/selective eating ≥ 10 , low appetite/interest ≥ 9 , or fear of aversive consequences ≥ 10 . Screening positivity denotes elevated ARFID-related restrictive eating symptoms and is not equivalent to an ARFID diagnosis. NIAS-P: nine-item avoidant/restrictive food intake disorder screen–parent version; K-SADS-PL: kiddie schedule for affective disorders and schizophrenia for school-age children–present and lifetime version).

anxiety and combined anxiety/depression scores. The Turkish version has demonstrated adequate validity and reliability (17). In the current sample, Cronbach's $\alpha=0.965$.

Nine-Item Avoidant/Restrictive Food Intake Disorder Screen–Parent Version (NIAS-P)

The NIAS-P is a brief parent-report measure developed to evaluate ARFID-related symptoms across three subscales: picky/selective eating (items 1–3), low appetite or limited interest in eating (items 4–6), and fear of aversive consequences (items 7–9) (18). Each item is scored on a 6-point Likert-type scale (0=not at all to 5=very much), yielding subscale scores ranging from 0 to 15 and a total score ranging from 0 to 45. Previously established cutoff values for elevated ARFID-related restrictive eating symptoms are ≥ 10 for selective eating, ≥ 9 for low appetite, and ≥ 10 for fear of aversive consequences (19). The Turkish validation of the NIAS-P in children aged 6–12 years was conducted by Ögütü et al. (20). Because the present sample spans 6–18 years, psychometric support across the full age range is required. Akçay et al. (21) validated the Turkish NIAS parent-report form in 268 children and adolescents aged 2–18 years, reporting adequate internal consistency and the expected three-factor structure, and Barnhart et al. (22) demonstrated measurement invariance of the NIAS across parent reports of children and of adolescents in a large international sample, indicating that the instrument is interpreted comparably at both developmental stages. Internal consistency in the present sample was additionally examined separately in the 6–12 and 13–18 year age bands; the estimates are reported in the Results. In the current sample, Cronbach's α coefficients were 0.863 for the NIAS-P total score, 0.857 for picky/selective eating, 0.812 for low appetite/interest, and 0.871 for fear of aversive consequences.

Strengths and Difficulties Questionnaire–Parent Version (SDQ)

The SDQ is a 25-item parent-report behavioral screening measure assessing emotional and behavioral difficulties in children and

adolescents through five subscales: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior (23). It also yields total difficulties and internalizing/externalizing indices. The Turkish version has demonstrated adequate reliability and validity (24). For the descriptive characterization of the sample, total difficulties and subscale scores were additionally classified using the standard three-band parent-report cut-offs (normal, borderline, abnormal) (25). In the current sample, Cronbach's $\alpha=0.876$.

Social Responsiveness Scale–Parent Version (SRS-P)

The SRS-P is a 65-item parent-report instrument assessing reciprocal social behavior, social communication, and autism-related behavioral characteristics in children and adolescents (26). Higher scores indicate greater difficulties in social responsiveness and more pronounced autism-related traits. Subdomains include social awareness, social cognition, social communication, social motivation, and autistic mannerisms (restricted and repetitive behaviors; RRB). Turkish applicability of the scale has been supported in school-age samples (27). In the current sample, Cronbach's $\alpha=0.951$.

Statistical Analysis

Statistical analyses were performed using IBM Statistical Package for Social Sciences (SPSS) program version 28.0 and R version 4.6.0. Descriptive statistics were calculated for sociodemographic and clinical variables. Continuous variables were summarized using means and standard deviations as well as medians and interquartile ranges, whereas categorical variables were presented as frequencies and percentages. Given the non-normal and right-skewed distributions of several NIAS-P and clinical scale scores, rank-based nonparametric methods were used where appropriate.

Participants were classified as NIAS-P positive if they scored above the prespecified threshold on at least one NIAS-P subscale: picky/selective eating ≥ 10 , low appetite/interest ≥ 9 , or fear of aversive consequences

≥10. This classification is used throughout as a descriptive indicator of elevated ARFID-related restrictive eating symptoms on a screening instrument, and not as a proxy for an ARFID diagnosis or for clinically significant ARFID. Group comparisons between NIAS-P-positive and NIAS-P-negative participants were conducted using Mann-Whitney U tests for continuous variables and chi-square or Fisher's exact tests for categorical variables, as appropriate. Internal consistency of the study scales was evaluated using Cronbach's alpha.

Dimensional associations between NIAS-P total/subscale scores and RCADS-P, SDQ, and SRS-P dimensions were examined using Spearman rank-order correlations. False discovery rate (FDR) correction was applied to account for multiple testing. To examine independent associations with restrictive eating symptoms, multivariable linear regression models were estimated for NIAS-P total score and each NIAS-P subscale using heteroscedasticity-consistent standard errors (HC3). Continuous variables were standardized before model estimation, and age and sex were retained as covariates. Primary models included RCADS-P total anxiety and SRS-P total; sensitivity models replaced SRS-P total with SRS-P restricted/repetitive behaviors.

Three sets of analyses were added to address developmental comparability across the 6–18 year range. First, the sample was stratified into a school-age band (6–12 years) and an adolescent band (13–18 years), and internal consistency, screen-positive rates, correlations, and regression models were re-estimated within each band; the correlations obtained in the two bands were compared using Fisher *r*-to-*z* tests for independent samples. Second, age moderation was tested directly by adding anxiety × age and social responsiveness × age interaction terms to each regression model, with FDR correction applied across the resulting 16 interaction tests. Third, weight status was compared between screening groups using standardized BMI values. Because the number of recruiting centers was small (five), multilevel models and cluster-robust standard errors would rest on an unstable estimate of the between-site variance component, and site was therefore not modeled as a random effect.

Finally, exploratory symptom profiles were derived using *k*-means clustering based on standardized NIAS-P subscale scores. These profile analyses were considered hypothesis-generating. Statistical significance was set at *p* < 0.05. An AI tool (Claude, Anthropic, San Francisco, CA, USA) was used to assist with language editing and structural refinement of the manuscript text, as detailed in the Use of Artificial Intelligence statement.

Ethics

The study was approved by the Non-Interventional Clinical Research Ethics Committee of Şırnak University (Approval No: E-74546226–204.01.07–160151; Date: 12/02/2026) and conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from legal guardians, and adolescents provided assent following a comprehensive explanation of the study procedures.

RESULTS

Sample Characteristics and NIAS-P Screening Classification

The primary analytic sample comprised 350 participants (mean age=12.04 years, *SD*=3.34; range: 6–18 years) of whom 197 were girls (56.3%) and 152 boys (43.4%); sex was not recorded for one participant. Descriptive characteristics are presented in Table 1, with full descriptive statistics for all continuous variables provided in Supplementary Table S1. Based on prespecified thresholds (picky/selective eating ≥10, low appetite/interest ≥9, fear of aversive consequences ≥10), 101 participants (28.9%) were classified as NIAS-P positive and 249 (71.1%) as NIAS-P negative. Screen-

positive rates were similar in girls and boys (29.9% vs 27.6%; $\chi^2(1)=0.13$, *p*=0.723). Internal consistency was acceptable to excellent across all measures (Cronbach's α =0.812–0.965; full estimates in Supplementary Table S2).

The clinical context of the sample is summarized in Table 2. Most participants attended state schools (90.6%), lived in urban districts (97.4%), and came from nuclear families (89.1%); 48.0% of mothers were employed and 50.3% of mothers and 57.4% of fathers had completed university education. A psychosocial stressor within the preceding three months was reported for 33 participants (9.4%), most commonly peer bullying (3.4%), a change of home, school, or city (2.3%), the birth of a sibling (1.7%), parental divorce (1.4%), and loss or illness in the family (1.4%). A family history of psychiatric disorder was reported for 13 participants (3.7%) and a family history of chronic medical illness for 47 (13.4%). Perinatal complications were reported for 24 participants (6.9%), and developmental milestones were within expected limits (first word 11.4±4.8 months; independent walking 12.9±2.9 months; toilet training 28.3±8.2 months). None of these characteristics differed between the screening groups (all *p* ≥ 0.695).

Although no participant met full DSM-5 criteria for any psychiatric disorder, parent-rated difficulties were not uniformly within the normal range. On SDQ total difficulties, 273 participants (78.2%) fell in the normal band, 24 (6.9%) in the borderline band, and 52 (14.9%) in the abnormal band. Scores at or above the borderline band were most frequent in the peer relationship domain (38.3%), followed by conduct problems (21.7%), emotional symptoms (21.4%), and hyperactivity/inattention (16.9%). The sample is therefore best described as symptomatic but subdiagnostic rather than asymptomatic, with subthreshold difficulties concentrated in the peer and emotional domains.

Standardized anthropometric indices were unremarkable. The mean BMI *z*-score was 0.03±0.87 (median 0.07 [−0.69, 0.79]; *n*=348), corresponding to a mean BMI percentile of 51.3. Seven participants (2.0%) fell below the 5th percentile, 299 (85.9%) were within the healthy weight range, 42 (12.1%) were in the overweight range, and none met the criterion for obesity. Weight status did not differ between screening groups ($\chi^2(2)=2.32$, *p*=0.314), nor did BMI *z*-scores (*U*=12,185.0, *p*=0.735, *r*=0.018), and BMI *z*-scores were not correlated with NIAS-P total score (*p*=0.037, *p*=0.488) or with any subscale (*|p|* ≤ 0.074, all *p* ≥ 0.171). Of the 101 participants who screened positive, only two (2.0%) were below the 5th BMI percentile.

Group Differences by NIAS-P Screening Status

Group comparisons by NIAS-P screening status are presented in Table 3, with full comparisons across all clinical measures provided in Supplementary Table S3. NIAS-P-positive participants had significantly higher RCADS-P total anxiety and RCADS-P total anxiety/depression scores than NIAS-P-negative participants. SDQ total difficulties and SRS-P total scores were also significantly higher in the NIAS-P-positive group (all *ps* ≤ 0.003). The corresponding distributions are shown in Figure 2. SRS-P restricted/repetitive behaviors showed the largest group difference (*r*=0.258, *p* < 0.001). Age and BMI did not differ significantly between groups (both *ps* > 0.25).

Dimensional Associations Between NIAS-P and Clinical Domains

Selected Spearman correlations between NIAS-P dimensions and clinical measures are presented in Table 4 and Figure 3. NIAS-P total score was positively correlated with all selected clinical domains: RCADS-P total anxiety (*p*=0.250, *p* < 0.001), RCADS-P depression (*p*=0.280, *p* < 0.001), SDQ total difficulties (*p*=0.209, *p* < 0.001), SRS-P total (*p*=0.223, *p* < 0.001), and SRS-P restricted/repetitive behaviors (*p*=0.435, *p* < 0.001). Among NIAS-P subscales, fear of aversive consequences showed the broadest

Table 1. Sample characteristics and main scale distributions (N=350)

Variable	n	Mean ± SD	Median [IQR]	Min	Max
Sociodemographic					
Age, years	349	12.04±3.34	12.00 [9.00, 15.00]	6.00	18.00
BMI, kg/m ²	350	18.18±1.05	18.07 [17.52, 18.62]	14.85	24.20
BMI z-score	348	0.03±0.87	0.07 [-0.69, 0.79]	-2.20	1.63
BMI percentile	348	51.32±28.05	52.72 [24.39, 78.38]	1.40	94.89
Number of siblings	350	1.93±1.05	2.00 [1.00, 3.00]	0.00	7.00
NIAS-P					
Total score	350	11.81±8.87	11.00 [4.00, 18.00]	0.00	37.00
Picky/selective eating	350	5.08±4.13	5.00 [2.00, 8.00]	0.00	15.00
Low appetite/interest	350	4.06±3.81	3.00 [0.00, 7.00]	0.00	15.00
Fear of aversive consequences	350	2.49±3.23	1.00 [0.00, 3.00]	0.00	15.00
RCADS-P					
Total anxiety	349	18.59±16.00	15.00 [7.00, 24.00]	0.00	86.00
Total anxiety/depression	349	22.91±20.28	17.00 [9.00, 30.00]	0.00	116.00
SDQ					
Total difficulties	349	9.27±6.39	8.00 [4.00, 12.00]	0.00	30.00
SRS-P					
Total score	350	45.98±22.24	43.00 [31.00, 53.00]	5.00	152.00
Restricted/repetitive behaviors	350	5.52±5.36	4.00 [1.00, 9.00]	0.00	31.00

Values are presented as mean ± SD and median [IQR]. Body mass index z-scores and percentiles were derived from the CDC 2000 growth reference for age and sex; they could not be computed for two participants with missing age or sex. BMI: body mass index; NIAS-P: nine-item avoidant/restrictive food intake disorder screen-parent version; RCADS-P: revised child anxiety and depression scale-parent version; SDQ: strengths and difficulties questionnaire; SRS-P: social responsiveness scale-parent version.

pattern of associations, correlating with RCADS-P depression ($p=0.345$, $p < 0.001$), RCADS-P total anxiety ($p=0.279$, $p < 0.001$), SDQ internalizing difficulties ($p=0.309$, $p < 0.001$), SDQ total difficulties ($p=0.294$, $p < 0.001$), SRS-P restricted/repetitive behaviors ($p=0.406$, $p < 0.001$), and SRS-P total ($p=0.381$, $p < 0.001$). Low appetite/interest was similarly associated with RCADS-P total anxiety ($p=0.236$, $p < 0.001$), SDQ total difficulties ($p=0.218$, $p < 0.001$), SRS-P restricted/repetitive behaviors ($p=0.408$, $p < 0.001$), and SRS-P total ($p=0.228$, $p < 0.001$). Picky/selective eating showed a more circumscribed profile, correlating with SRS-P restricted/repetitive behaviors ($p=0.315$, $p < 0.001$) and RCADS-P anxiety indices ($p=0.144$ – 0.152 , $ps \leq 0.007$), but not with SDQ total difficulties or broader SRS-P dimensions after FDR correction.

Multivariable Robust Regression and Sensitivity Analyses

HC3 heteroscedasticity-consistent regression models were estimated for NIAS-P total score and each NIAS-P subscale, with RCADS-P total anxiety, SRS-P total, age, and sex entered simultaneously as predictors (Table 5). In the model predicting NIAS-P total score, RCADS-P total anxiety ($\beta=0.154$, $p=0.049$) and SRS-P total ($\beta=0.173$, $p=0.019$) were both independently associated with the outcome ($R^2=0.086$). For low appetite/interest, SRS-P total showed an independent association ($\beta=0.168$, $p=0.016$), whereas RCADS-P total anxiety was not significant ($p=0.106$). For fear of aversive consequences, SRS-P total was independently associated ($\beta=0.323$, $p < 0.001$), and this model had the highest explained variance ($R^2=0.166$). In the picky/selective eating model, neither predictor reached statistical significance. Sensitivity analyses replacing SRS-P total with SRS-P restricted/repetitive behaviors are presented in Supplementary Table S4. In these models, SRS-P restricted/repetitive behaviors showed independent associations with NIAS-P total ($\beta=0.309$, $p < 0.001$), picky/selective eating ($\beta=0.214$, $p=0.012$), low appetite/interest ($\beta=0.276$, $p < 0.001$), and fear of aversive consequences ($\beta=0.251$, $p=0.001$).

Exploratory NIAS-P Symptom Profiles

Exploratory k-means cluster analysis based on standardized NIAS-P subscale scores yielded five symptom profiles (N=350). Profile-specific sample sizes, raw means, and descriptive labels are presented in Supplementary Table S5 and Figure 4.

Developmental Sensitivity and Age Moderation Analyses

The sample comprised 193 participants in the school-age band (6–12 years; 58.0% girls; mean age 9.41 ± 1.78 years) and 156 in the adolescent band (13–18 years; 53.8% girls; mean age 15.25 ± 1.44 years); age was unavailable for one participant. Internal consistency of the NIAS-P was comparable across bands (total score $\alpha=0.871$ and 0.853 ; subscale $\alpha=0.785$ – 0.877 ; Supplementary Table S6), and screen-positive rates did not differ significantly (31.6% vs 25.6%; $\chi^2(1)=1.22$, $p=0.270$).

Correlations between NIAS-P dimensions and clinical measures were re-estimated separately within each band (Supplementary Table S7). Restricted and repetitive behaviors remained the strongest correlate of NIAS-P total score in both the school-age ($p=0.426$) and adolescent ($p=0.419$) bands, and none of the 11 correlations differed significantly between bands (Fisher r -to- z , all $p \geq 0.105$). Regression models estimated within each band (Supplementary Table S8) reproduced the overall pattern: restricted and repetitive behaviors were independently associated with NIAS-P total score in both the school-age ($\beta=0.319$, $p < 0.001$) and adolescent ($\beta=0.287$, $p=0.048$) bands, with associations in the same direction for the individual subscales in the sensitivity models, though with the wider confidence limits expected at these smaller subsample sizes.

Age moderation was tested directly by adding anxiety $\times$ age and social responsiveness $\times$ age interaction terms to all eight regression models (Supplementary Table S9). Of the 16 interaction terms, only one was

Table 2. Sociodemographic characteristics, clinical context, and distribution of parent-rated difficulties in the diagnostically subthreshold sample (N=350)

Characteristic	n (%)
Sociodemographic	
Girls	197 (56.3)
Boys	152 (43.4)
Sex not recorded	1 (0.3)
Age band 6–12 years	193 (55.1)
Age band 13–18 years	156 (44.6)
Age not available	1 (0.3)
State school	317 (90.6)
Private school	32 (9.1)
Not currently attending school	1 (0.3)
Urban residence	341 (97.4)
Rural residence	9 (2.6)
Nuclear family	312 (89.1)
Extended family	21 (6.0)
Single-parent family	16 (4.6)
Other family structure	1 (0.3)
Cared for by both parents	319 (91.1)
Mother employed	168 (48.0)
Father employed	323 (92.3)
Mother university-educated	176 (50.3)
Father university-educated	201 (57.4)
Household income below minimum wage	15 (4.3)
Household income at minimum wage	41 (11.7)
Household income 1–3 × minimum wage	117 (33.4)
Household income 3–5 × minimum wage	96 (27.4)
Household income >5 × minimum wage	81 (23.1)
Bilingual	82 (23.4)
Migration background	12 (3.4)
Developmental and family history	
Perinatal complications	24 (6.9)
Age at first word, months, mean ± SD	11.37±4.84
Age at independent walking, months, mean ± SD	12.85±2.88
Age at toilet training, months, mean ± SD	28.26±8.23
Family history of chronic medical illness	47 (13.4)
Family history of psychiatric disorder	13 (3.7)
Psychosocial stressor in the preceding three months	
Any stressor	33 (9.4)
Peer bullying	12 (3.4)
Change of home, school, or city	8 (2.3)
Birth of a sibling	6 (1.7)
Parental divorce	5 (1.4)
Loss or illness in the family	5 (1.4)
Parent-rated difficulties, SDQ bands	
Total difficulties, normal band	273 (78.2)
Total difficulties, borderline band	24 (6.9)
Total difficulties, abnormal band	52 (14.9)
Peer problems, borderline or abnormal band	134 (38.3)
Conduct problems, borderline or abnormal band	76 (21.7)
Emotional symptoms, borderline or abnormal band	75 (21.4)
Hyperactivity/inattention, borderline or abnormal band	59 (16.9)
Weight status, CDC 2000 reference	
Underweight (<5th percentile)	7 (2.0)
Healthy weight (5th–84th percentile)	299 (85.9)
Overweight (85th–94th percentile)	42 (12.1)
Obesity (≥95th percentile)	0 (0.0)

Values are n (%) unless otherwise stated. Percentages are calculated over the full analytic sample (N: 350) except for the SDQ bands (n: 349) and weight status (n: 348), where percentages reflect participants with available data. No participant met DSM-5 criteria for any psychiatric disorder on the K-SADS-PL. Strengths and difficulties questionnaire bands are the standard three-band parent-report cut-offs. None of the characteristics listed differed significantly between NIAS-P-positive and NIAS-P-negative participants (all $p \geq 0.695$); SDQ: strengths and difficulties questionnaire; K-SADS-PL: kiddie schedule for affective disorders and schizophrenia for school-age children–present and lifetime version; CDC: centers for disease control and prevention; NIAS-P: nine-item avoidant/restrictive food intake disorder screen–parent version.

Table 3. Group comparisons by NIAS-P screening status

Variable	NIAS-P negative (n=249)	NIAS-P positive (n=101)	U	p	r
Anxiety and depression					
RCADS-P total anxiety	14.00 [6.00, 23.00]	18.00 [11.00, 32.00]	9,698.0	<0.001	0.177
RCADS-P total anxiety/depression	16.00 [7.00, 27.25]	23.00 [13.00, 37.00]	9,401.0	<0.001	0.196
RCADS-P depression	2.00 [0.00, 6.00]	4.00 [2.00, 9.00]	9,074.5	<0.001	0.218
Psychosocial difficulties					
SDQ total difficulties	7.00 [4.00, 12.00]	9.00 [7.00, 13.00]	9,968.0	0.003	0.160
SDQ internalizing	3.00 [1.00, 5.00]	4.00 [2.00, 6.00]	9,903.5	0.002	0.165
SDQ externalizing	4.00 [2.00, 7.00]	5.00 [3.00, 7.00]	10,861.5	0.051	0.105
Social responsiveness					
SRS-P total	40.00 [29.00, 51.00]	48.00 [35.00, 68.00]	9,895.0	0.002	0.167
SRS-P social communication index	35.00 [26.00, 51.00]	41.00 [32.00, 57.00]	10,193.0	0.005	0.149
SRS-P restricted/repetitive behaviors	3.00 [0.00, 7.00]	6.00 [3.00, 12.00]	8,453.0	<0.001	0.258
Demographics and anthropometry					
Age, years	12.00 [9.21, 15.00]	11.08 [9.00, 14.67]	13,424.0	0.292	0.056
BMI, kg/m ²	18.11 [17.61, 18.67]	18.00 [17.46, 18.56]	13,536.5	0.262	0.060
BMI z-score	−0.01 [−0.68, 0.78]	0.22 [−0.73, 0.79]	12,185.0	0.735	0.018

NIAS-P positive was defined as scoring above the prespecified threshold on at least one NIAS-P subscale: picky/selective eating ≥ 10 , low appetite/interest ≥ 9 , or fear of aversive consequences ≥ 10 . This classification indicates elevated ARFID-related restrictive eating symptoms on a screening instrument and is not equivalent to an ARFID diagnosis. Continuous variables were compared using Mann-Whitney U tests. Values are medians [IQR]. Effect size $r = Z/\sqrt{N}$. Strengths and difficulties questionnaire internalizing: emotional + peer problems; SDQ externalizing: conduct + hyperactivity-inattention. Body mass index z-scores were derived from the CDC 2000 growth reference (n: 247 and n: 101). RCADS-P: revised child anxiety and depression scale–parent version; SDQ: strengths and difficulties questionnaire; SRS-P: social responsiveness scale–parent version; SCL: social communication index; RRB: restricted/repetitive behaviors; BMI: body mass index.

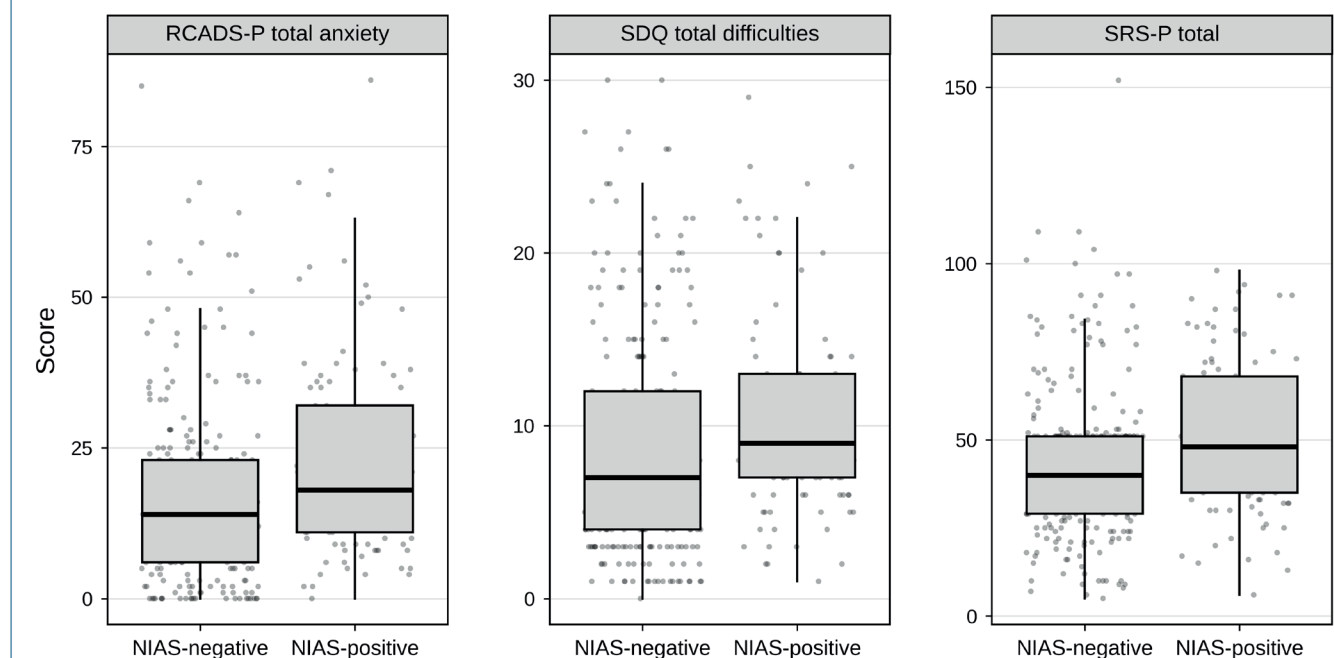
Clinical dimension scores by NIAS-P risk status

Figure 2. Clinical dimension scores by NIAS-P screening status. (Boxplots with jittered individual observations show RCADS-P total anxiety, SDQ total difficulties, and SRS-P total scores according to NIAS-P screening status. NIAS-P positive was defined as scoring above the prespecified threshold on at least one NIAS-P subscale: picky/selective eating ≥ 10 , low appetite/interest ≥ 9 , or fear of aversive consequences ≥ 10 . The center line represents the median, boxes represent the interquartile range, and whiskers represent values within 1.5 times the interquartile range. RCADS-P: revised child anxiety and depression scale–parent version; SDQ: strengths and difficulties questionnaire; SRS-P: social responsiveness scale–parent version; NIAS-P: nine-item avoidant/restrictive food intake disorder screen–parent version).

Table 4. Selected Spearman correlations between NIAS-P dimensions and clinical measures

NIAS-P dimension	RCADS-P MDD	RCADS-P TA	RCADS-P TAD	SDQ total	SDQ INT	SDQ EXT	SRS-P RRB	SRS-P SCI	SRS-P total
NIAS-P total	0.280***	0.250***	0.266***	0.209***	0.177***	0.192***	0.435***	0.191***	0.223***
Picky/selective eating	0.137*	0.144**	0.152**	0.047	0.003	0.073	0.315***	-0.010	0.026
Low appetite/interest	0.266***	0.236***	0.253***	0.218***	0.167***	0.210***	0.408***	0.194***	0.228***
Fear of aversive consequences	0.345***	0.279***	0.296***	0.294***	0.309***	0.236***	0.406***	0.373***	0.381***

Values represent Spearman ρ coefficients. Statistical significance reflects FDR-adjusted p-values. n: 349–350. Correlations estimated separately in the 6–12 and 13–18 year age bands are presented in Supplementary Table S7. TA: total anxiety; TAD: total anxiety/depression; MDD: major depressive disorder subscale; INT: internalizing; EXT: externalizing; RRB: restricted/repetitive behaviors; SCI: social communication index. RCADS-P: revised child anxiety and depression scale–parent version; SDQ: strengths and difficulties questionnaire; SRS-P: social responsiveness scale–parent version. * pFDR <0.05. ** pFDR <0.01. *** pFDR <0.001.

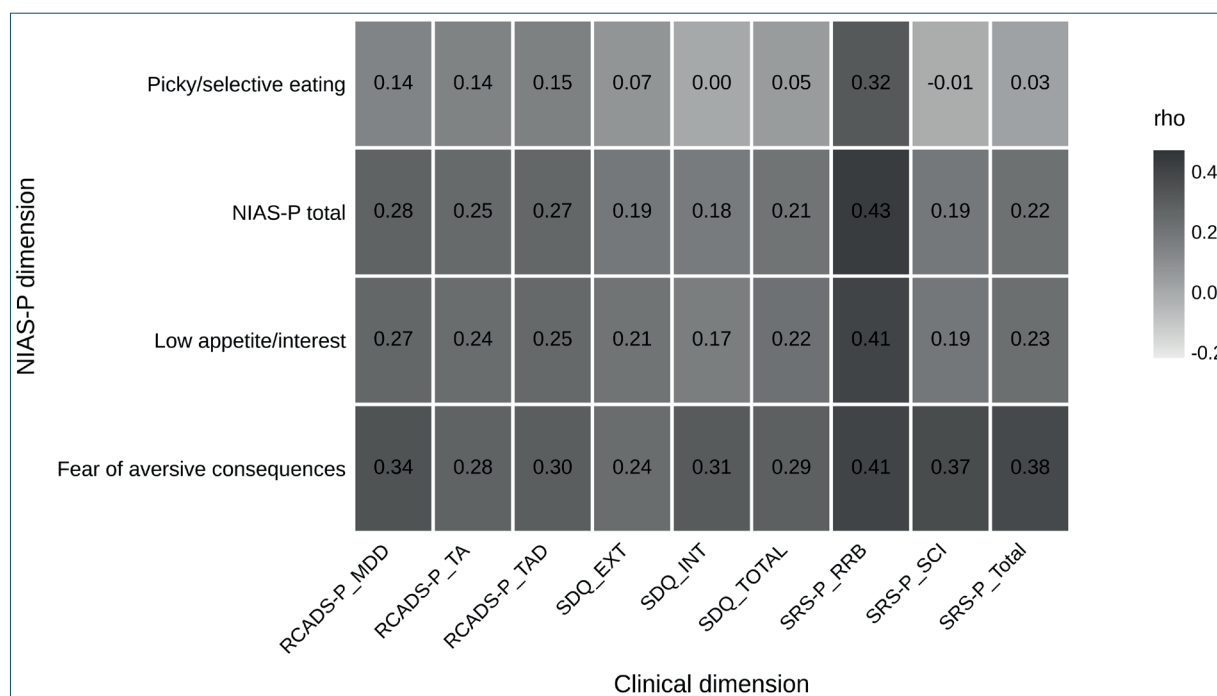


Figure 3. Selected Spearman correlations with NIAS-P dimensions. (The heatmap displays theoretically central Spearman ρ coefficients between NIAS-P dimensions (rows) and selected clinical measures (columns). Darker cells indicate stronger positive associations. Clinical measures include RCADS-P depression (MDD), RCADS-P total anxiety (TA), RCADS-P total anxiety/depression (TAD), SDQ externalizing (EXT), SDQ internalizing (INT), SDQ total difficulties (TOTAL), SRS-P restricted/repetitive behaviors (RRB), SRS-P Social Communication Index (SCI), and SRS-P total. RCADS-P: revised child anxiety and depression scale–parent version; SDQ: strengths and difficulties questionnaire; SRS-P: social responsiveness scale–parent version).

nominally significant (restricted and repetitive behaviors $\times$ age predicting fear of aversive consequences, $\beta = -0.159$, $p = 0.015$), and this did not survive FDR correction ($q = 0.240$); no other interaction approached significance (all $p \geq 0.082$). Age therefore did not moderate the associations between anxiety, social responsiveness, and restrictive eating symptoms across the 6–18 year range.

DISCUSSION

This study examined ARFID-related restrictive eating symptoms dimensionally in a diagnostically subthreshold pediatric outpatient sample. Three main findings emerged. First, 28.9% of the sample showed elevated ARFID-related restrictive eating symptoms, linked to small but consistent increases in anxiety, psychosocial difficulties, and social responsiveness, even without a full-threshold psychiatric disorder. Second, restricted and repetitive behaviors (RRB) showed the strongest and most consistent associations across all three restrictive eating dimensions, suggesting a possible refinement of the three-dimensional

neurobiological model, in which RRB may operate as a cross-cutting correlate of symptom severity (3). Third, the three dimensions displayed distinct, partially separate transdiagnostic profiles. These patterns were comparable in school-age children and adolescents and were not accompanied by differences in weight status.

The clinical composition of the sample deserves comment first, because every subsequent interpretation depends on it. A diagnostically subthreshold outpatient sample is neither a community sample nor a patient sample in the conventional sense, and the descriptive data make its position clear. These children were brought for psychiatric evaluation and roughly one in five carried parent-rated difficulties in the borderline or abnormal SDQ range, most often in the peer and emotional domains, yet none met DSM-5 criteria for a disorder on a structured interview and none showed clinically significant functional impairment. Recent psychosocial stressors were reported in fewer than one in ten, so the presentations were not, for the most part, acute crisis referrals. This is the population that occupies a large part of routine outpatient practice

Table 5. Linear regression models predicting NIAS-P dimensions (N=348)

Outcome	Predictor	β	HC3 SE	t	p	R ²	Adj. R ²
NIAS-P total	RCADS-P total anxiety	0.154	0.078	1.97	0.049	0.086	0.075
	SRS-P total	0.173	0.074	2.35	0.019		
	Age	-0.048	0.052	-0.92	0.356		
	Sex	-0.020	0.104	-0.20	0.845		
Picky/selective eating	RCADS-P total anxiety	0.137	0.076	1.82	0.070	0.020	0.008
	SRS-P total	-0.035	0.070	-0.49	0.622		
	Age	-0.071	0.052	-1.36	0.175		
	Sex	0.019	0.108	0.18	0.860		
Low appetite/interest	RCADS-P total anxiety	0.118	0.073	1.62	0.106	0.067	0.056
	SRS-P total	0.168	0.070	2.41	0.016		
	Age	-0.069	0.054	-1.28	0.203		
	Sex	-0.104	0.106	-0.98	0.329		
Fear of aversive consequences	RCADS-P total anxiety	0.111	0.071	1.56	0.120	0.166	0.157
	SRS-P total	0.323	0.073	4.39	<0.001		
	Age	0.041	0.045	0.91	0.365		
	Sex	0.042	0.098	0.43	0.670		

Continuous predictors and outcomes were standardized before model estimation; coefficients can therefore be interpreted as standardized associations, except for sex when coded as a binary covariate. All models include RCADS-P total anxiety, SRS-P total, age, and sex as simultaneous predictors. HC3: heteroscedasticity-consistent standard errors. R² and adjusted R² values apply to the full model and are reported once per outcome block. Sensitivity models replacing SRS-P total with SRS-P restricted/repetitive behaviors are presented in Supplementary Table S4; models estimated separately in the 6–12 and 13–18 year age bands are presented in Supplementary Table S8, and age interaction terms in Supplementary Table S9.

Exploratory NIAS-P symptom profiles

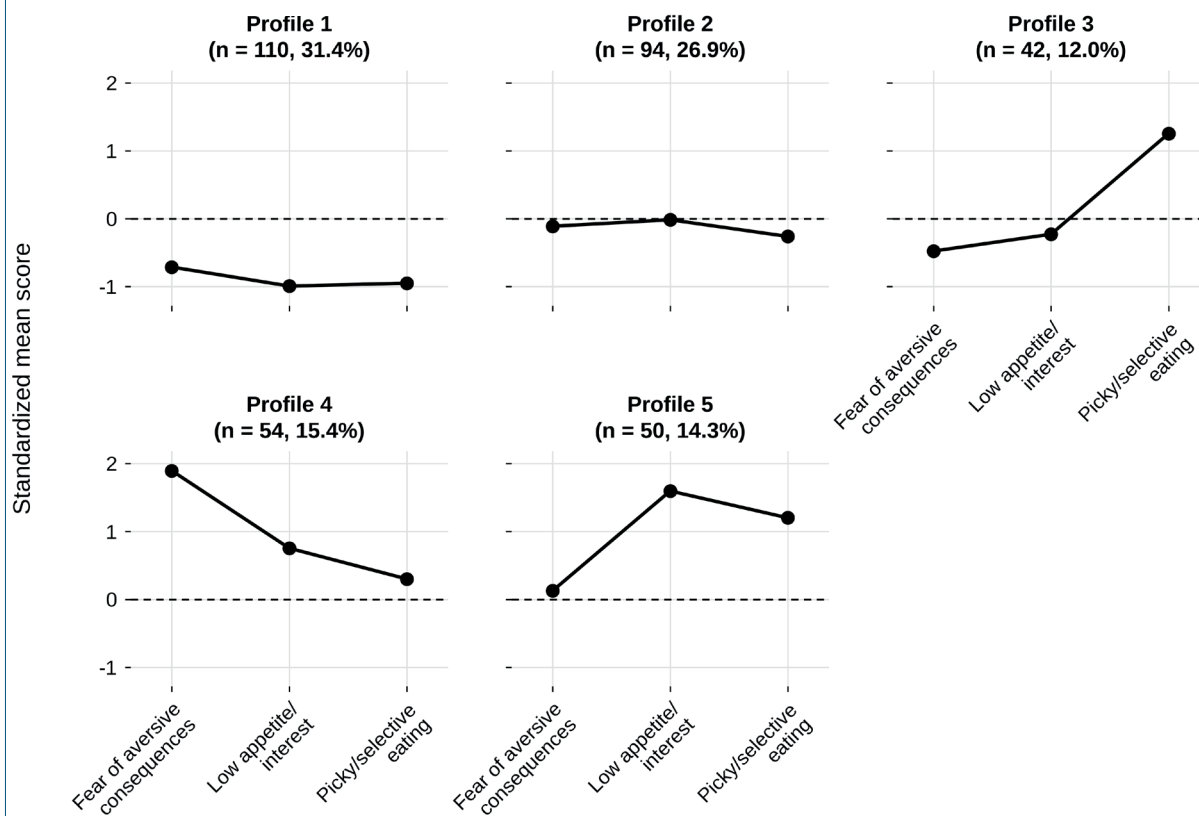


Figure 4. Exploratory NIAS-P symptom profiles based on standardized NIAS-P subscale scores. (Profiles were derived using k-means clustering applied to standardized NIAS-P subscale scores (N: 350). Each panel displays mean standardized subscale scores (fear of aversive consequences, low appetite/interest, and picky/selective eating) for one of five profiles. The horizontal dashed line represents the sample mean of zero after standardization. Profile labels include sample size and percentage. This analysis was exploratory and findings should be interpreted as hypothesis-generating rather than as a definitive typology. NIAS-P: nine-item avoidant/restrictive food intake disorder screen-parent version).

and that is systematically absent from the ARFID literature, which has been built on diagnosed and treatment-seeking samples. The findings reported here should be read as applying to that intermediate group and not as generalizing either to the general population or to children with established diagnoses.

The finding that 28.9% of participants exceeded at least one NIAS-P cutoff should not be interpreted as an ARFID prevalence estimate, but rather as evidence that elevated ARFID-related restrictive eating symptoms are reported for a substantial proportion of child psychiatry outpatients who do not meet full diagnostic criteria, consistent with patterns observed in gastroenterology, inpatient, and outpatient psychiatric settings (8,10,12), and with population-based data highlighting strong neurodevelopmental associations (11). These symptoms are associated with anxiety, psychosocial challenges, and neurodevelopmental traits even below diagnostic thresholds, supporting dimensional screening for restrictive eating alongside neurodevelopmental evaluation.

The distance between an elevated screening score and the disorder itself can be quantified in these data, and it is considerable. None of the 350 participants met DSM-5 criteria for ARFID on the K-SADS-PL, and the anthropometric data indicate why: 98.0% of the sample, and 98.0% of those who screened positive, were at or above the 5th BMI percentile, weight status was unrelated to screening status, and standardized BMI was uncorrelated with restrictive eating severity. In other words, participants who screened positive exhibited behavioral features of restrictive eating, such as a narrow food repertoire, low appetite, or fear-driven avoidance, but did not have the nutritional consequences, including significant weight loss or faltering growth, nutritional deficiency, or dependence on supplementary feeding, or the marked psychosocial interference required by DSM-5 Criterion A. This is the sense in which the term “elevated ARFID-related restrictive eating symptoms” is used throughout, and it is the reason the 28.9% figure must not be read as a prevalence estimate. Whether these behavioral features precede nutritional consequences in a subset of children is a question that only longitudinal data can answer.

The most notable finding was the consistent association of RRB across NIAS-P subscales. Restricted and repetitive behavior (RRB) showed the largest, though still modest, group difference ($r=0.258$) and the strongest dimensional correlation with overall restrictive eating severity, remaining an independent correlate across all three dimensions in sensitivity analyses, including picky/selective eating, a dimension usually framed in terms of sensory perception (3). Thomas et al. (3) proposed that the three ARFID presentations map onto distinct neurobiological substrates; our data suggest a refinement, with RRB acting as a cross-cutting correlate across all three. This aligns with Zickgraf et al. (9), who found cognitive and behavioral rigidity independently predicted selective eating across four developmental samples, and with Koomar et al. (28), who found that restricted and repetitive behaviors showed the broadest association with elevated ARFID-related symptom scores across all NIAS factors in a large autism cohort. At a population level, Nyholmer et al. (11) identified autism spectrum disorder ($OR=13.7$) and attention-deficit/hyperactivity disorder (ADHD) ($OR=9.4$) as the strongest ARFID-associated conditions in a Swedish cohort. While most of this literature uses atypical eating to signal an underlying neurodevelopmental diagnosis (29), our findings offer a complementary perspective: in a sample without any full-threshold psychiatric diagnosis, a subclinical neurodevelopmental trait, RRB, was still associated with restrictive eating severity. This suggests that elevated RRB may be accompanied by more marked restrictive eating symptoms even without a formal diagnosis. Dinkler et al. (30) support this, finding that early neurodevelopmental problems predicted later ARFID more effectively than early feeding problems. Because RRB and restrictive eating may overlap behaviorally, these associations should be viewed as evidence of shared neurodevelopmental features rather than a causal pathway. However, available prospective evidence supports the

possibility that neurodevelopmental vulnerabilities may precede, rather than simply accompany, later ARFID symptoms.

Among the three dimensions, fear of aversive consequences demonstrated the widest range of associations with anxiety, internalizing difficulties, RRB, and social responsiveness. In the primary model, social responsiveness was the strongest independent correlate of fear-based symptoms, rather than anxiety. Sensitivity analyses revealed a different pattern: when RRB replaced the broader social responsiveness measure, both RRB and anxiety became independently significant (Supplementary Table S4). This indicates that the anxiety-fear relationship depends on how social responsiveness is defined, a finding also reported by Kambanis et al. (8) and Watts et al. (5). Similar results appear in autism research. Koomar et al. (28) reported that, after RRB, internalizing problems – a Vineland subscale capturing anxiety, worry, fear, and eating-related difficulties – showed the next strongest associations across all NIAS factors, particularly the Fear Factor, leading the authors to suggest that interventions targeting either RRB or anxiety/fear might alleviate ARFID-related symptoms. Within the three-dimensional neurobiological model (3), fear-based ARFID is conceptualized within the Negative Valence Systems domain of RDoC (6,7), and its concurrent link with RRB points to a rigidity-driven component – avoidance that becomes ritualized and resistant to change, echoing the overlap between fear conditioning and behavioral inflexibility described in the neurodevelopmental literature (9).

At the same time, fear of aversive consequences may not be uniformly tied to RRB-driven mechanisms. Mayes and Zickgraf (29) noted that concern about aversive consequences of eating did not characterize their autism sample, suggesting that this driver may arise from a partly distinct, anxiety-related pathway that happens to co-occur with RRB in some children rather than being a direct expression of it. Notably, in a Turkish pediatric ADHD sample, Kaşak et al. (31) similarly found no significant association between fear-related ARFID symptoms and anxiety severity, raising the possibility that this link may be more variable across neurodevelopmental populations than previously assumed. Of the three ARFID dimensions, this one may be the most transdiagnostically complex, combining negative valence threat-processing with RRB-related behavioral rigidity.

Low appetite/interest showed the clearest divergence from our initial expectations. We expected both anxiety and social responsiveness to independently relate to this dimension, reflecting broad internalizing comorbidity in ARFID. However, anxiety was not significant in either the primary or sensitivity models, even though this dimension is typically associated with blunted interoceptive signaling and reduced hedonic drive (3). Instead, social responsiveness dimensions, especially RRB, remained significant, suggesting that homeostatic appetite dysregulation may be more relevant than anxiety-based avoidance. This aligns with Koomar et al. (28), who found the Appetite factor had fewer associations with core autism and anxiety-related domains than other NIAS factors. Thomas et al. (32) identified a possible neural correlate: lack of interest severity correlated inversely with hypothalamic activation, while fear-based avoidance was linked to amygdala hyperactivation, indicating potentially distinct neurobiological pathways, though these findings are preliminary. Datta and Lock (33) also observed that adolescents with ARFID and low appetite have poor interoceptive accuracy. Future research should assess whether anxiety-focused interventions alone are sufficient for this dimension.

Picky or selective eating had by far the most limited profile, with current anxiety and social responsiveness measures explaining little variance ($R^2=0.020$); RRB was the only significant independent associate in sensitivity analyses (Supplementary Table S4), and bivariate anxiety associations did not survive multivariate adjustment. This suggests picky/selective eating may be more closely associated with behavioral rigidity

and ritualized food routines than with anxiety or social communication difficulties. Mayes and Zickgraf (29) found that atypical eating behaviors, especially limited food preferences and texture-related sensitivities, are significantly more common in children with autism than in those with ADHD or typical development. This supports the broader observation that restricted food repertoires are particularly prominent in neurodevelopmental contexts. Similarly, Kaşak et al. (31) found that in children with ADHD, oral sensory reactivity and ADHD symptom burden were the strongest correlates of selective eating (32.6% of variance), whereas broader sensory sensitivity and anxiety showed comparatively weaker contributions. A small fMRI study by Thomas et al. (32) offers a tentative parallel: contrary to disgust-based models, the ARFID-sensory sensitivity phenotype was characterized by hyperactivation of multisensory integration regions rather than the insula, suggesting that sensory-based food avoidance may reflect disrupted multisensory processing. Taken together, these findings point to oral and multisensory reactivity as plausible transdiagnostic profiles behind picky eating, with mealtime dynamics, feeding history, and sensory processing warranting future examination.

A further question is whether these associations are developmentally stable, since the sample spans the transition from school age to late adolescence, a period during which eating autonomy, peer influence, and parental observation of eating all change substantially. Including age as a covariate does not answer this question, and the stratified analyses were therefore informative. Internal consistency of the NIAS-P, screen-positive rates, the rank ordering of correlations, and the dominance of restricted and repetitive behaviors were all reproduced in the 6–12 and 13–18 year bands, no correlation differed significantly between them, and no age interaction survived correction for multiple testing. The one nominal interaction, involving fear of aversive consequences, is best regarded as a chance finding at this number of tests, although the possibility that fear-based avoidance becomes less tied to rigidity with age is worth examining in an adequately powered design. For present purposes, the observed associations appear to hold across the age range studied rather than being driven by one developmental stage.

Overall, the three NIAS-P dimensions appeared to show partially distinct but overlapping clinical profiles: fear of aversive consequences was characterized by a combined anxiety-rigidity profile, low appetite/interest by a more neurodevelopmental and interoceptive profile, and picky/selective eating by a narrower rigidity-sensory profile. The exploratory k-means profiles provide additional, hypothesis-generating insight. One profile combined high fear of aversive consequences with low appetite/interest, suggesting overlap between anxiety-based and neurodevelopmental factors, while two other profiles reflected sensory-behavioral and neurodevelopmentally dominant presentations with minimal fear (Supplementary Table S5; Figure 4). These patterns broadly align with empirically derived subclasses reported by Richson et al. (6) and Schmidt et al. (34). This five-profile solution tentatively extends prior work by suggesting the potential utility of profiling restrictive eating dimensions beyond total scores, though replication in larger samples is needed.

Clinically, these findings suggest that assessment should not be limited to appetite, weight, or anxiety-related avoidance, but should also include food-related rigidity, insistence on sameness, restricted food repertoires, oral sensory reactivity, and broader restricted and repetitive behaviors. Because a positive screen in this population identified behavioral restriction without nutritional compromise, the appropriate clinical response is not immediate intervention but a structured second step: a fuller nutritional, psychiatric, and neurodevelopmental assessment to establish whether DSM-5 criteria are met and whether growth or intake is at risk.

The study uses a relatively large multicenter sample with K-SADS-PL-confirmed diagnostically subthreshold status, reducing confounding related to full-threshold ARFID diagnoses or prior treatment exposure.

Simultaneous assessment of anxiety, psychosocial difficulties, and social responsiveness across three NIAS-P subscales offers a more comprehensive perspective than most previous studies. The use of false discovery rate correction, robust standard errors, and sensitivity analyses using an alternative social responsiveness indicator enhances methodological rigor. The addition of standardized weight status, age-stratified estimation, and formal tests of age moderation place the findings on a firmer developmental and nutritional footing.

The cross-sectional design prevents causal inference; observed associations between RRB, anxiety, and restrictive eating may reflect shared neurodevelopmental factors, bidirectionality, or unmeasured variables. Several further limitations should be considered. First, although recruitment followed an identical protocol at all five sites, the analysis dataset did not include a variable identifying the recruiting center, so participants could not be attributed to individual sites and center-specific effects could not be evaluated; with only five centers, moreover, site could not have been modeled as a random effect with acceptable precision even had the identifier been available. Residual differences between sites in referral profile and case mix therefore cannot be excluded.

Second, because screening, ineligibility, and refusal were not logged prospectively, the proportion of clinic attendees who entered the study cannot be quantified, and selection at the point of recruitment cannot be excluded as an influence on the composition of the sample. Third, the specific reason for each presentation was not recorded in a standardized format, so the sample is characterized by its symptom profile, stressor history, and diagnostic status rather than by referral question; a prospectively coded referral taxonomy would sharpen the description of this population in future work. Fourth, each K-SADS-PL interview was conducted by a single certified clinician and inter-rater reliability was not formally quantified.

Fifth, weight status was derived from the CDC 2000 reference; national Turkish growth references may yield slightly different percentile placements, although the very low proportion of underweight participants makes this unlikely to alter the conclusions. Sixth, NIAS-P positivity is a screening classification and not a diagnosis, and the cut-offs were derived in samples that differ from the present one. Reliance on parent-reported measures introduces shared-method variance and may under-detect eating behavior in older adolescents, who eat more meals outside parental observation. Exclusive recruitment from child psychiatry outpatient settings limits generalizability, and the modest explained variance indicates a need for broader biopsychosocial models, including sensory profiles and family feeding practices.

As a result, ARFID-related restrictive eating symptoms were frequently observed and showed small to modest but consistent associations with anxiety, psychosocial difficulties, and social responsiveness in this diagnostically subthreshold pediatric outpatient sample. Restricted and repetitive behaviors were the most consistent correlate of restrictive eating severity across picky/selective eating, low appetite/interest, and fear of aversive consequences, and this pattern held in both school-age children and adolescents. The distinct clinical profiles of the three restrictive eating dimensions support a dimensionally differentiated understanding of ARFID-related symptoms. Because the design is cross-sectional and no intervention was examined, these findings support routine dimensional screening for restrictive eating in child and adolescent psychiatry outpatient settings, followed, when the screen is positive, by a comprehensive nutritional, psychiatric, and neurodevelopmental assessment, rather than providing direct guidance for intervention planning.

SUPPLEMENTARY MATERIAL

https://www.noropsikiyatriarsivi.com/uploads/NPA_29494_EN_SUPPL.pdf

Ethics Committee Approval: The study was approved by the Non-Interventional Clinical Research Ethics Committee of Şırnak University (Approval No: E-74546226–204.01.07–160151; Date: 12/02/2026) and conducted in accordance with the Declaration of Helsinki.

Informed Consent: Written informed consent was obtained from legal guardians, and adolescents provided assent following a comprehensive explanation of the study procedures.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept- NÖ, EA, HS, ZBÖ, HGO, MEÖ; Design- NÖ, EA, HS, ZBÖ, HGO, MEÖ; Supervision- NÖ, MEÖ; Data Collection and/or Processing- NÖ, EA, HGO, HS, ZBÖ; Analysis and/or Interpretation- NÖ, MEÖ; Literature Search- EA, HS, NÖ; Writing- EA, HS, NÖ.

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