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Exploring the role of maternal–adult–child relationship, early maladaptive schemas, and difficulties in emotion regulation in symptoms of avoidant/restrictive food intake disorder among Iranian students

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Abstract

Purpose Avoidant Restrictive Food Intake Disorder (ARFID) is a relatively new diagnostic classification, and the DSM-5 has called for further studies and evidence in this field. This study explored the role of maternal–adult–child relationship, early maladaptive schemas, and difficulties in the emotion regulation of ARFID symptoms and their presentations, such as sensory sensitivity, lack of interest in eating and food, and fear of aversive consequences. We also investigated the role of demographic characteristics in predicting ARFID symptoms.

Methods In this cross-sectional study, 791 college students (females = 74.8%, mean age = 21.3, SD = 2.26, male = 25.2%, mean age = 21.1, SD = 1.97) were selected through cluster random sampling in 2024 from a major university in the northwest of Iran (Urmia University). ARFID symptoms was assessed using the Nine Item Avoidant/Restrictive Food Intake disorder screen (NIAS), the quality of parent–adult–child relationship (PACR) was evaluated using the Parent–Child Relationship Questionnaire (PCRS), difficulties in emotion regulation (DER) were measured using the Difficulty in Emotion Regulation Scale (DERS) and early maladaptive schemas (EMS) through the Young Schema Questionnaire-Short Form (YSQ-SF).

Results Hierarchical regression analysis revealed that gender and field of study 3.9%, maternal–adult–child relationship (MACR) (1.3%), DER 7.3% and EMS 7.6% were identified as factors in predicting ARFID symptoms. The field of study and EMS predicted 11.3% variance of sensory sensitivity. Gender, field of study, DER, and EMS were significant in predicting lack of interest in food or eating, with a variance of 14.2%. The field of study, MACR, and EMS predicted 12.6% variance of fear of adverse consequences.

Discussion Our findings suggest that ARFID symptoms is related to parental and emotional factors. EMS formed during development, along with adverse parent–child relationships and psychological factors, such as difficulty in emotion regulation, may be associated with ARFID symptoms. In addition, DER played the biggest role in predicting ARFID symptoms, fewer variables were able to predict sensory sensitivity, demographic characteristics, SEM, and DER had the biggest role in predicting the presentation lack of interest in eating or food. Effective treatment and collaborative support are essential to address ARFID.

Introduction

Avoidant/Restricted Food Eating Disorder (ARFID) is a new diagnostic category in the DSM-5 [1] and ICD-11 [2]. ARFID is an eating disorder characterized by persistent insufficient nutritional and/or energy intake [3]. It is characterized by significant negative consequences, such as weight loss, developmental delays, nutritional deficiencies, reliance

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on tube feeding or supplements, and impaired psychosocial functioning [4]. People with ARFID may limit the variety and intake of food due to avoidance based on the sensory characteristics of the food or related to any adverse consequences of eating without the intention of losing weight and worrying about body image [3]. ARFID is commonly characterized by sensory sensitivity (e.g., texture, smell, and taste), fear of aversive consequences (e.g., choking, vomiting, and allergic reactions), or lack of interest in eating or food (i.e., low appetite) [5]. ARFID has a prevalence rate of 0.3–4.1% in adults [6]. The prevalence of ARFID is similar to that of other eating disorders, such as anorexia nervosa (0.5%), bulimia (3.3%) and being eating disorder (0.8%) [7]. Unlike other eating disorders, ARFID affects both men and women equally [8], but the findings of D'Adamo et al. [9] showed that ARFID was more common in younger, male, non-white, and lower-income people.

Although ARFID has been acknowledged as a unique clinical condition, not much is known about it overall [10]. Coglan et al. [11] proposed three categories of predisposing, precipitating, and perpetuating factors for this disorder. Dinkler et al. [12] emphasized the role of heredity as a predisposing factor. Cunliffe et al. [13] also suggested that parental factors should be considered when providing support. Accordingly, it seems that parenting factors and parent–adult–child relationships (PCAR) play a role in the onset [14] and persistence of eating problems. Kerzner et al. [15] believes that family therapy is effective in reducing ARFID symptoms, because the family meals of these children are accompanied by tension, and parents are hesitant between pushing the child and letting him/her go, because the child cannot eat the foods that other members are eating [16]. Brytek-Matera et al. [17] suggest that mothers' eating style and eating disorder symptoms are linked to ARFID symptoms in children. They found that mothers used food as reinforcement when raising children with ARFID symptoms, because food was not satisfactory for these children. Saravia et al. [18] also found that family meals for children with ARFID are boring and stressful and parents reinforced the children's behaviors. If parents exhibit dysfunctional attitudes, such as food avoidance or restrictive eating patterns, the child may adopt similar behaviors that can lead to ARFID. Furthermore, parents' beliefs and cognitions such as individual belief about health problems and preventive behavior may affect the eating habits of children with ARFID [19].

In addition, Waller [20] stated that EMS, which represent parental patterns, are associated with eating problems [21]. EMS refers to self-defeating emotional and cognitive patterns that begin early in life and repeat throughout life. The schema approach focuses on the EMS and coping strategies. Schemas develop in early life and stem from unmet emotional needs, such as love and care, safety, acceptance,

autonomy, and setting limits, in childhood and adolescence. According to Young's model, one of the modes of the schema is parent mode (representing messages internalized during childhood), and the perceived parenting style is one of the main aspects of the schema model. Thus, the way in which caregivers are cared for, protected, controlled, and punished during childhood affects the development of the schema [22]. Furthermore, people with eating disorders use these schemas as a compensatory or coping mechanism in eating behaviors [23]. Joshua et al. [24] also found a linear relationship between perceived parenting styles, schemas, and eating disorders.

Furthermore, Güler and Özgörüş [25] showed that there is a significant relationship among shame/defectiveness, emotional inhibition, failure, abandonment, dependence/incompetence, and vulnerability to harm or illness with eating attitude and failure/abandonment schema predict negative attitude to eating. In this regard, Pauwels and Dierckx [26] found that patients with ARFID scored higher in social undesirability, failure to achieve, subjugation, and unrelenting standards. The relationship between emotional deprivation schema and eating problems refers to the role of DER and eating problems [27]. Gratz and Roemer [28] proposed a comprehensive view of DER, encompassing modulation of emotional arousal, perception and acceptance of emotions, and the ability to act independently of an emotional state. DER involves difficulties in awareness, clarity, and acceptance, managing regulation strategies, goals, and impulses.

Children with ARFID symptoms are more likely to have emotional and behavioral problems, such as anxiety, withdrawal/depression, attention deficit, physical/social problems, and ASD/OCD characteristics [29]. A link between ARFID and emotional undereating has been reported [12, 30]. The cognitive–behavioral model of ARFID suggests that difficulty in coping with negative emotions, such as fear (e.g., of new foods or choking) and disgust (by the sensory characteristics of food), limits food volume and/or variety in people with ARFID. Fear of food being unpleasant or causing negative outcomes (such as gastrointestinal pain, vomiting, and choking) is one of the pathways through which emotion dysregulation can affect the variety and/or volume of food restriction among people with ARFID [30]. Inconsistent learned responses to emotional problems may partly explain ARFID, and it shares similarities with anxiety disorders [31]. Research suggests that eating for comfort and distraction can regulate emotions and alleviate unpleasant feelings. This tendency is linked to a preference for sweet and fatty foods. DER is associated with restrictive eating behaviors, and limited access to emotion regulation strategies is linked to dietary restriction [32, 33]. Given the influence of parental and emotional factors on both ARFID and its presentations, it is necessary to evaluate the influence of each predictor on ARFID symptoms. This increases our

understanding of the complexity of the predictive relationships between variables and their unique characteristics. In addition, this study aimed to explore the role of PACR, EMS, DER, and demographic characteristics in predicting ARFID symptoms.

Objectives

Heterogeneity in clinical samples of ARFID suggests a relationship between underlying mechanisms [10]. There are only a few studies on the etiology of ARFID symptoms, particularly on the correlation variables of emotion and parenting. Little research has been conducted on the association between EMS, PACR, DER, and eating disorders, specifically ARFID. This study aimed to explore the roles of MACR, EMS, and DER in ARFID symptoms. Further research is needed to understand the onset and continuity of ARFID. Therefore, the hypotheses of the present study are as follows:

1. The variables of PACR, EMS, DER, and demographic characteristics (gender and Field of study) can predict ARFID symptoms.
2. Variables of PACR, EMS, DER, and demographic characteristics (gender and Field of study) can predict sensory sensitivity.
3. The variables PACR, EMS, DER, and demographic characteristics (gender and Field of study) can predict lack of interest in food or eating.
4. The variables PACR, EMS, DER, and demographic characteristics (gender and Field of study) can predict the fear of aversive consequences.

Methods

Participants and procedures

In this descriptive-correlational study, 800 students (a nonclinical sample) from a university in the northwest of Iran (Urmia University) were selected by random cluster sampling, and 791 questionnaires were entered into the analysis and 9 (1.1%) of which were excluded from the analysis process due to incomplete answers (not responding to 5% of questions). In regression studies, a ratio of 10–15 participants for each variable is sufficient [34]. In this study, since there were 28 variables, 15 participants were used for each variable, with a total of at least 420 participants required. However, this study also included potential covariates in the model, so the aim was to double the minimum sample size required. As a result, the final sample size of 791 participants met the above recommendations. 74.8% of participants were female and 25.2% were male. The mean

age of the total sample was 21.3 (SD = 2.26), which was 21.4 (SD = 2.34) for females and 21.1 (SD = 1.97) for male participants. Regarding marital status, 8.8% were married, while the remaining were single. In terms of field of study, 61.3, 31.7, 4.2, and 2.8% studied humanities, science, art, and engineering, respectively. In addition, 70% of students lived with their parents and 30% lived in dormitories. In implementing the questionnaires, the participants' names and surnames were not requested to increase the validity and reliability of the data collection tool. They were told about the purpose of the study, and informed consent was obtained to complete the initial part of the questionnaire. The inclusion criteria for the present study were being a student at Urmia University, interested in participating in the study, and not receiving pharmacological and nutritional treatments for eating disorders. The exclusion criterion was incomplete questionnaire completion.

Measures

Nine-item avoidant/restrictive food intake disorder screen (NIAS)

This measure was designed by Zickgraf and Ellis [35] and consists of 9 questions and three subscales (sensory sensitivity or picky eating, lack of interest in eating or appetite, and fear of aversive consequences or fear). The questionnaire is scored based on a Likert scale (totally disagree = 0 to totally agree = 5). Cronbach's alpha was reported to be (0.90) for the entire scale, sensory sensitivity (0.87) (e.g., *I am a picky eater*), fear of aversive consequences (e.g., *I avoid or put off eating because I am afraid of GI discomfort, choking, or vomiting*) (0.93), and lack of interest in eating or food (e.g., *I am not very interested in eating; I seem to have a smaller appetite than other people*) (0.87). The cutoff points for this questionnaire is reported $10\geq$ for sensory sensitivity or picky eating, $9\leq$ for lack of interest in eating or appetite and $10\leq$ fear of aversive consequences or fear [36]. In this study, Cronbach's alpha was ensured for the entire scale (0.85), sensory sensitivity (0.87), fear of aversive consequences (0.80), and lack of interest in eating or food (0.78). In this study, 24% of the participants obtained a higher score for the cutoff point in the sensory sensitivity presentation, while 26.1 and 13% of the participants obtained a higher score than the cutoff point in the presentations lack of interest in eating or food and fear of aversive consequences, respectively.

Relationship between maternal and adult children

The Parent–Child Relationship Assessment Questionnaire (PCRS) was developed by Kerzner et al. [15] and consisted of 24 items used to measure the quality of PACR. The
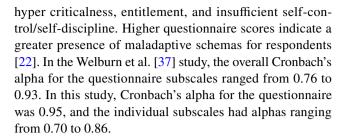
questionnaire scoring was based on a 7-point Likert spectrum. Items 9, 13, and 14 were scored inversely. Components of the questionnaire included positive affect (e.g., *spent with mother*), resentment/role confusion (e.g., *clarity of mother's role*), identification (e.g., *desire to be like mother*), and communication (e.g., *ease to talking about problem*). Cronbach's alpha for the whole questionnaire was (0.96), with positive affect (0.94), resentment/role confusion (0.61), identification (0.84), and communication (0.88) in 241 students. In this study, Cronbach's alpha was ensured for the entire scale (0.91), positive affect (0.93), resentment/role confusion (0.51), identification (0.67), and communication (0.89).

Difficulties in emotion regulation

The Difficulty in Emotion Regulation Scale (DERS) was developed by Gratz and Roemer [28] and has 36 items and six factors: nonacceptance of emotional responses (6 questions; e.g., *when I'm upset, I feel guilty for feeling that way*, with Cronbach's alpha 0.85), difficulties engaging in goal-directed (5 questions; e.g., *when I'm upset, I have difficulty concentrating*, with Cronbach's alpha 0.89), impulse control difficulties (6 items; e.g., *when I'm upset, I lose control over my behaviors*, with Cronbach's alpha 0.86), limited access to emotion regulation strategies (8 items; e.g., *when I'm upset, I believe that I'll end up feeling very depressed*, with Cronbach's alpha 0.80), lack of emotional awareness (6 items; e.g., *I am attentive to my feelings*, with Cronbach's alpha 0.88), and lack of emotional clarity (5 items; e.g., *I have no idea how I am feeling*, with Cronbach's alpha 0.80) and internal consistency of 0.93 for the whole scale. Scores range from 1 (almost never) to 5 (almost always). Questions 1, 2, 7, 8, 10, 17, 20, 22, 24, and 34 are scored inversely, and high scores indicate greater difficulty in emotion regulation, with scores ranging from 36 to 180 [28]. In this study, Cronbach's alpha for the entire questionnaire and subscales was 0.89, nonacceptance of emotional responses (0.81), difficulties engaging in goal-directed (0.72), impulse control difficulties (0.70), limited access to emotion regulation strategies (0.70), lack of emotional awareness 0.81, and lack of emotional clarity (0.67).

Early maladaptive schemas

The Young Schema Questionnaire-Short Form (YSQ-SF) is a 75-item questionnaire designed by Young in 1998 to assess 15 different schemas. Participants use a 6-point Likert scale to rate the items, with each scale consisting of five items. The 15 schemas include emotional deprivation, abandonment/instability, mistrust/abuse, social isolation, defectiveness/shame, failure, dependence/incompetence, vulnerability to harm or illness, enmeshment, subjugation, self-sacrifice, emotional inhibition, unrelenting standards/

hyper criticalness, entitlement, and insufficient self-control/self-discipline. Higher questionnaire scores indicate a greater presence of maladaptive schemas for respondents [22]. In the Welburn et al. [37] study, the overall Cronbach's alpha for the questionnaire subscales ranged from 0.76 to 0.93. In this study, Cronbach's alpha for the questionnaire was 0.95, and the individual subscales had alphas ranging from 0.70 to 0.86.

Data analysis

The statistical analysis was conducted using Jamovi, an R language-based software (version 2.3.28). The underlying assumptions of the regression analysis were examined to ensure the feasibility of testing the research hypotheses and all were met: the absence of autocorrelation in the data set was examined using the Durbin–Watson [38] (DW) test (DW statistic = 2., $p = 0.924$). The absence of multicollinearity was also examined. The variance inflation factor (VIF, ranging from 1.29 to 2.60) and its corresponding tolerance value (ranging from 0.36 to 0.66) were in the desired range, because the VIFs are less than 10 and the tolerance values are above 0.25 [39]. Cook's distance was used to ensure the absence of influential outliers. Given that the mean value (mean = 0.001, SD = 0.002) for this index was below 0.50, there was no evidence of influential outliers [40]. Normality was also tested using the skewness (ranging from −0.01 to 1.06) and kurtosis (ranging from −0.01 to 0.78) indices, and given that the values were not outside of the desired range of −3 to +3, the normal distribution of the data can be concluded [41]. In addition, a visual inspection of the residuals by Q–Q plot shows that the data are homoscedastic. Finally, the assumption of linearity (null residual) was tested by plotting the residuals to the fitted value, which was found to be satisfactory.

Results

Correlations of ARFID symptoms

Table 1 represents the variable of interest's dispersion indices and Pearson correlation matrix. As seen, MACR was negatively and significantly associated with ARFIDS symptoms r (799) = −0.09, and all maladaptive schemas r_s (799) = 0.08 to 0.30, and DER r (799) = 0.24 were positively and significantly associated with ARFIDS symptoms.

Hierarchical regression analysis

To examine the contribution of PACR, EMS, and DER, hierarchical regression analysis was performed. Table 2 presents the results for predicting ARFIDS symptoms scores from

Table 1 Mean, standard deviation, and Pearson correlation matrix ($N = 791$)

	x̄	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	21.23	8.96	–																	
2	125.67	25.86	–.092**	–																
3	89.71	20.13	.243**	–.277**	–															
4	12.46	6.04	.237**	–.381**	.404**	–														
5	13.51	5.96	.151**	–.118**	.389**	.371**	–													
6	13.93	5.77	.196**	–.273**	.386**	.489**	.429**	–												
7	13.31	5.93	.286**	–.258**	.434**	.492**	.373**	.629**	–											
8	10.56	5.65	.275**	–.238**	.492**	.470**	.405**	.459**	.634**	–										
9	10.37	5.11	.214**	–.281**	.432**	.402**	.403**	.409**	.491**	.585**	–									
10	10.34	5.26	.242**	–.179**	.420**	.320**	.399**	.375**	.473**	.582**	.657**	–								
11	10.91	5.67	.300**	–.198**	.409**	.314**	.365**	.486**	.509**	.581**	.548**	.602**	–							
12	11.20	5.18	.254**	–.104**	.383**	.288**	.414**	.454**	.415**	.451**	.492**	.595**	.587**	–						
13	10.84	5.40	.211**	–.210**	.440**	.370**	.436**	.413**	.489**	.588**	.567**	.669**	.608**	.630**	–					
14	15.65	5.19	.083*	–0.045	.092**	.242**	.293**	.244**	.229**	.140**	.172**	.160**	.216**	.261**	.347**	–				
15	13.73	5.88	.228**	–.237**	.420**	.387**	.313**	.446**	.532**	.434**	.418**	.323**	.388**	.327**	.393**	.289**	–			
16	17.32	5.96	.162**	–.096**	.131**	.194**	.206**	.314**	.311**	.117**	.149**	.076*	.168**	.196**	.138**	.417**	.402**	–		
17	16.28	5.79	.207**	–.229**	.220**	.219**	.256**	.358**	.336**	.178**	.206**	.158**	.241**	.275**	.210**	.351**	.403**	.570**	–	
18	14.32	5.27	.184**	–.217**	.375**	.326**	.327**	.352**	.359**	.303**	.378**	.332**	.321**	.377**	.415**	.376**	.452**	.406**	.538**	–

Note. Below and above the diagonal line represent the correlations across females and males, respectively; Maladaptive schemas: 1 = ARFID symptoms; 2 = maternal–adult–child relationship; 3 = difficult in emotion regulation; 4 = emotional deprivation; 5 = abandonment/deprivation; 6 = mistrust/abuse; 7 = social isolation; 8 = shame/defectiveness; 9 = failure; 10 = dependence/incompetence; 11 = vulnerability to harm or illness; 12 = enmeshment; 13 = subjugation; 14 = self-sacrifice; 15 = emotional inhibition; 16 = unrelenting standards/hyper criticalness; 17 = entitlement; 18 = insufficient self-control/self-discipline; two-tailed significance: *<0.05, **<0.01

Table 2 Hierarchical regression analysis of ARFID symptoms as a dependent variable ($N = 791$)

Predictor	β	Ll	Ul	T value	R	R^2	Adjusted R^2	ΔR^2
Step 1					**0.19**	**0.04**	**0.03**	–
Age	0.01	−0.07	0.07	0.03				
Gender (Female vs. male)	−0.17*	−0.33	−0.01	−2.11				
Field of study (humanities vs. science)	−0.37*	−0.52	−0.22	−4.81				
Marital status	−0.21	−0.46	0.04	−1.63				
Step 2					**0.23**	**0.05**	**0.04**	**0.01**
Age	0.01	−0.07	0.08	0.12				
Gender (Female vs. male)	−0.19*	−0.35	−0.03	−2.35				
Field of study (humanities vs. science)	−0.35*	−0.51	−0.20	−4.61				
Marital status	−0.23	−0.48	0.02	−1.79				
Positive affect	0.01	−0.19	0.20	0.06				
Resentment/role confusion	−0.08	−0.17	0.00	−1.95				
Identification	0.08	−0.02	0.18	1.56				
Communication	−0.10	−0.27	0.07	−1.12				
Step 3					**0.35**	**0.12**	**0.10**	**0.07**
Age	0.01	−0.06	0.08	0.25				
Gender (Female vs. male)	−0.17*	−0.32	−0.01	−2.07				
Field of study (humanities vs. science)	−0.33*	−0.48	−0.19	−4.49				
Marital status	−0.23	−0.48	0.01	−1.89				
Positive affect	−0.01	−0.19	0.18	−0.10				
Resentment/role confusion	−0.01	−0.09	0.08	−0.20				
Identification	0.07	−0.03	0.17	1.45				
Communication	−0.06	−0.23	0.11	−0.70				
Nonacceptance of emotional responses	0.03	−0.07	0.12	0.58				
Difficulty engaging in goal-directed behavior	−0.08	−0.17	0.02	−1.61				
Impulse control difficulties,	0.11*	0.01	0.20	2.23				
Lack of emotional awareness	−0.10*	−0.18	−0.02	−2.55				
Limited access to emotion regulation strategies	0.18*	0.07	0.29	3.24				
Lack of emotional clarity	0.08	−0.01	0.17	1.73				
Step 4					**0.45**	**0.20**	**0.17**	**0.07**
Age	0.02	−0.05	0.08	0.50				
Gender (Female vs. male)	−0.17*	−0.33	−0.02	−2.21				
Field of study (humanities vs. science)	−0.29*	−0.44	−0.15	−4.00				
Marital status	−0.18	−0.42	0.05	−1.51				
Positive affect	−0.07	−0.25	0.11	−0.74				
Resentment/role confusion	−0.02	−0.11	0.06	−0.53				
Identification	0.10*	0.00	0.20	2.03				
Communication	0.06	−0.11	0.22	0.68				
Nonacceptance of emotional responses	0.00	−0.09	0.10	0.07				
Difficulty engaging in goal-directed behavior	−0.06	−0.15	0.03	−1.23				
Impulse control difficulties	0.07	−0.02	0.17	1.54				
Lack of emotional awareness	−0.11*	−0.19	−0.02	−2.56				
Limited access to emotion regulation strategies	0.09	−0.02	0.20	1.64				
Lack of emotional clarity	0.03	−0.06	0.12	0.74				
Emotional deprivation	0.14*	0.05	0.22	3.11				
Abandonment/instability	−0.05	−0.13	0.03	−1.20				
Mistrust/Abuse	−0.09	−0.19	0.00	−1.91				
Social isolation	0.09	−0.01	0.19	1.73				
Shame/defectiveness	0.05	−0.06	0.15	0.90				
Failure	−0.05	−0.14	0.05	−0.96				

Table 2 (continued)

Predictor	β	Ll	Ul	T value	R	R^2	Adjusted R^2	ΔR^2
Dependence/incompetence	0.03	−0.07	0.14	0.59				
Vulnerability to harm or illness	0.17*	0.07	0.27	3.49				
Enmeshment	0.08	−0.01	0.17	1.67				
Subjugation	−0.06	−0.16	0.05	−1.03				
Self-sacrifice	−0.06	−0.14	0.02	−1.54				
Emotional inhibition	0.04	−0.05	0.13	0.88				
Unrelenting standards/hyper criticalness	0.04	−0.05	0.12	0.82				
Entitlement	0.11*	0.02	0.20	2.32				
Insufficient self-control/self-discipline	−0.03	−0.12	0.05	−0.76				

Note. Given the higher proportion of female participants (vs. male) and students in the humanities field (vs. science), they were considered as the reference groups. Other fields of study were not reported due to their insignificant statistical value. *< 0.05

age, gender, field of study, marital status [step 1], MACR [step 2], DER [step 3], and EMS [step 4].

The results indicated that in the first step, only gender and field of study significantly predicted ARFIDS symptoms, $F (6, 784) = 5.93$, $p < 0.01$, explaining a 3.9% of the ARFIDS variance, and model fit measures were $AIC = 5697$, $BIC = 5734$, and $RMSE = 8.78$. The addition of MACR (step 2) resulted in a significant regression equation, $F (10, 780) = 4.39$, $p < 0.001$, explaining an extra 1.3% of the variation in ARFIDS symptoms, which was significant ($\Delta F (4, 780) = 2.81$, $p = 0.02$); the model fit measures were $AIC = 5694$, $BIC = 5750$, and $RMSE = 8.71$, and the effect-size for the addition of step 2 was Cohen's $f^2 = 0.01$. Of MACR in step 2, only resentment/role confusion was marginally significant (T value $= 1.95$). The inclusion of DER (step 3) produced a significant equation, $F (16, 774) = 7.01$, $p < 0.001$, accounting for an additional 7.3% of the variation explained in ARFIDS scores, which was significant ($\Delta F (6, 774) = 10.82$, $p = 0.01$). The model fit measures were $AIC = 5642$, $BIC = 5726$, and $RMSE = 8.37$, and the effect-size for the addition of step 3 was Cohen's $f^2 = 0.06$. DER in step 3, impulse control difficulties, lack of emotional awareness, and limited access to emotion regulation strategies were significant (Table 3).

Finally, the addition of the EMS (step 4) resulted in a significant equation, $F (31, 759) = 6.21$, $p < 0.001$, accounting for an additional 7.6% of the variation in ARFIDS scores, which was also significant ($\Delta F (15, 759) = 4.85$, $p = 0.01$); the model fit measures were $AIC = 5599$, $BIC = 5754$, and $RMSE = 7.99$, and the effect-size for the addition of step 4 was Cohen's $f^2 = 0.09$. In step 4, emotional deprivation, vulnerability to harm or illness, and entitlement schemas were significant for the EMS. The final model (step 4) had superior fit metrics (lower AIC and RMSE and not for BIC) than earlier models (steps 1, 2, and 3) and predicted a 17% variance in ARFIDS scores. According to Cohen's f^2, the order of variables by their importance in predicting ARFIDS

symptoms in the final step was EMS (emotional deprivation, vulnerability to harm or illness, and entitlement), DER (lack of emotional awareness), demographics (gender and field of study), and MACR (identification).

Multiple regression analysis

We performed further analysis to explore the role of the variables studied in explaining the variance in different ARFIDS symptoms using multiple regression models across its three Dimensions: i.e., sensory sensitivity, lack of interest, and fear of aversive consequences. The first model for predicting sensory sensitivity was a significant $F (31, 759) = 4.26$, $p < 0.001$, which explained the significant variance in the score of sensory sensitivity ($R^2 = 14.8$, adjusted $R^2 = 11.3$). In predicting sensory sensitivity, the fields of study (negative coefficient for humanities and positive coefficient for science) and EMS (emotional deprivation, mistrust/abuse, social isolation, and vulnerability to harm or illness) were significant.

The second model for predicting lack of interest was also significant, $F (31, 759) = 5.22$, $p < 0.001$, which explained the significant variance in scores of lack of interest ($R^2 = 17.6$, adjusted $R^2 = 14.2$). In predicting lack of interest, gender, field of study (negative coefficient for humanities and positive coefficient for science), DER (difficulty engaging in goal-directed behavior and lack of emotional awareness), and EMS (emotional deprivation, social isolation, and entitlement) were significant.

Finally, the third model for predicting fear of aversive consequences was also significant, $F (31, 759) = 4.67$, $p < 0.001$, which explained the significant variance in the scores of fear of aversive consequences ($R^2 = 16$, adjusted $R^2 = 12.6$). In predicting fear of aversive consequences, the fields of study (negative coefficient for humanities and positive coefficient for science), MACR (identification), and EMS (shame/defectiveness, vulnerability to harm or illness, self-sacrifice,

Table 3 Multiple regression analysis on three dimensions of ARFID symptoms ($N=791$)

Predictors	Symptoms											
	Sensory sensitivity				Lack of interest				Fear of aversive consequences			
	β	LI	UI	T value	β	LI	UI	T value	β	LI	UI	T value
Age	−0.02	−0.09	0.05	−0.48	0.03	−0.04	0.10	0.83	0.03	−0.04	0.10	0.88
Gender (Female vs. male)	−0.11	−0.27	0.05	−1.38	−0.20*	−0.35	−0.04	−2.47	−0.11	−0.26	0.05	−1.34
Field of study (humanities vs. science)	−0.24*	−0.39	−0.09	−3.15	−0.23*	−0.38	−0.09	−3.13	−0.24*	−0.39	−0.09	−3.17
Marital status	−0.20	−0.45	0.04	−1.63	−0.18	−0.42	0.06	−1.48	−0.05	−0.29	0.20	−0.38
Positive affect	−0.03	−0.21	0.16	−0.26	−0.09	−0.27	0.10	−0.92	−0.05	−0.24	0.13	−0.57
Resentment/role confusion	0.02	−0.06	0.11	0.51	−0.05	−0.14	0.03	−1.17	−0.03	−0.12	0.06	−0.64
Identification	0.02	−0.09	0.12	0.32	0.10	0.00	0.20	1.93	0.14*	0.04	0.24	2.67
Communication	0.01	−0.16	0.18	0.07	0.05	−0.12	0.21	0.55	0.09	−0.08	0.26	1.03
Nonacceptance of emotional responses	−0.04	−0.13	0.06	−0.78	0.00	−0.09	0.09	0.01	0.05	−0.04	0.15	1.06
Difficulty engaging in goal-directed behavior	0.01	−0.08	0.11	0.22	−0.10*	−0.19	−0.01	−2.03	−0.05	−0.15	0.04	−1.12
Impulse control difficulties	0.07	−0.02	0.17	1.51	0.06	−0.03	0.16	1.32	0.04	−0.06	0.13	0.76
Lack of emotional awareness	−0.08	−0.16	0.01	−1.76	−0.12*	−0.20	−0.04	−2.81	−0.06	−0.14	0.02	−1.44
Limited access to emotion regulation strategies	0.05	−0.06	0.17	0.93	0.09	−0.02	0.21	1.62	0.08	−0.04	0.19	1.34
Lack of emotional clarity	−0.02	−0.11	0.08	−0.35	0.08	−0.01	0.17	1.69	0.02	−0.07	0.11	0.39
Emotional deprivation	0.16*	0.07	0.25	3.61	0.09*	0.00	0.18	2.05	0.07	−0.02	0.16	1.59
Abandonment/instability	−0.05	−0.13	0.03	−1.21	−0.08	−0.16	0.01	−1.83	0.01	−0.07	0.10	0.34
Mistrust/Abuse	−0.13*	−0.23	−0.03	−2.64	−0.05	−0.14	0.05	−0.99	−0.04	−0.14	0.06	−0.80
Social isolation	0.13*	0.02	0.24	2.42	0.14*	0.04	0.25	2.69	−0.07	−0.17	0.03	−1.31
Shame/defectiveness	−0.01	−0.12	0.10	−0.20	−0.02	−0.13	0.08	−0.39	0.16*	0.05	0.27	2.96
Failure	−0.04	−0.14	0.06	−0.87	−0.07	−0.17	0.03	−1.42	0.01	−0.09	0.10	0.11
Dependence/incompetence	0.02	−0.09	0.13	0.37	0.08	−0.02	0.19	1.52	−0.03	−0.14	0.07	−0.60
Vulnerability to harm or illness	0.14*	0.04	0.24	2.79	0.06	−0.03	0.16	1.27	0.22*	0.12	0.32	4.35
Enmeshment	0.09	−0.01	0.18	1.76	0.06	−0.03	0.16	1.26	0.04	−0.05	0.14	0.86
Subjugation	−0.08	−0.19	0.03	−1.48	−0.02	−0.12	0.09	−0.31	−0.03	−0.14	0.08	−0.61
Self-sacrifice	0.00	−0.08	0.08	−0.06	−0.06	−0.14	0.02	−1.48	−0.09*	−0.18	−0.01	−2.23
Emotional inhibition	0.02	−0.07	0.11	0.38	0.06	−0.03	0.14	1.24	0.02	−0.07	0.11	0.43
Unrelenting standards/hyper criticalness	0.03	−0.06	0.12	0.70	0.05	−0.04	0.14	1.13	0.00	−0.08	0.09	0.06
Entitlement	0.07	−0.03	0.16	1.43	0.10*	0.01	0.19	2.12	0.09*	0.00	0.18	1.97
Insufficient self-control/self-discipline	0.02	−0.07	0.11	0.37	−0.02	−0.10	0.07	−0.34	−0.09*	−0.18	−0.01	−1.97

Note. Given the higher proportion of female participants (vs. male) and students in the humanities field (vs. science), they were considered as the reference groups. Other fields of study were not reported due to their insignificant statistical value. *<0.05

entitlement, and insufficient self-control/self-discipline) were significant.

Discussion

ARFID is a relatively new diagnostic class, and the DSM-5 has called for further studies and evidence in its field. The present study investigated the roles of PACR, EMS, and DER in ARFID symptoms. The results showed that PACR had a significant negative relationship with ARFID symptoms, whereas EMS and DER had a significant positive relationship with ARFID symptoms. Hierarchical regression analysis revealed that gender and field of study with a 3.9%, MACR (only resentment/role confusion) with a 1.3%, DER (impulse control difficulties, lack of emotional awareness, and limited access) with a 7.3%, and EMS (emotional deprivation, vulnerability to harm or illness, and entitlement schemas) with a 7.6% predict ARFID symptoms. EMS and emotion regulation play a much more role in explaining the variance in ARFID symptoms, and PCAR play a smaller (but still significant) role in explaining the variance of ARFID symptoms. These results highlight the significance of emotional and parental (and EMS) factors in understanding and predicting ARFID symptoms.

Our findings align with Coglan and Otasowie [11], Mitchell et al. [42], Laporta-Herrero et al. [43] and Pelletier Brochu et al. [44], suggesting that eating disorders are strongly linked to the quality of the relationship between parents and progeny. Maternal depressive symptoms are linked to unresponsive and controlling feeding practices, correlate with ARFID [8]. The parental footprint in EMS can also influence perceptions of parental role and schema, such as impulsive deprivation and entitlement. According to Waller's model [20], schemas are representative of parental patterns, and people may choose disturbed eating behavior in response to these patterns and schemas, in other words, emotional deprivation, vulnerability to harm or illness, and entitlement schemas, which are the result of not meeting basic needs in childhood, may lead to ARFID. In line with emotion regulation and ARFID, children with ARFID symptoms often experience negative emotions or reduced eating in stressful situations [29]. Given that children with ARFID symptoms experience more emotional and behavioral problems, the relationship between eating behavior and emotional problems is also reaffirmed, i.e., ARFID is partly due to incompatible learned responses to emotional problems [45]. Stern et al. [30] asserted that these people may feel uncomfortable or embarrassed because of the type of relationship that they have with food.

Among the interesting findings of this study were the prominent role of gender (negative coefficient for females and positive coefficient for males) and field of study (negative coefficient for humanities and positive coefficient for science) in predicting ARFID symptoms. The findings of D'Adamo et al. [9] showed that ARFID was more common in males, but some studies have shown that the prevalence of ARFID is equal in both genders [8, 46]. Speculative at the moment, the role of gender might be explained by the fact that this study was conducted in non-clinical samples; thus, extensive studies are needed to interpret demographic variables. Furthermore, regarding the positive relationship between the science field of study and ARFID symptoms, Jamali et al. [47] revealed that the prevalence of eating disorders among university students, particularly in health science and engineering programs, is more**,** perhaps the inflexible environment of experimental sciences is correlated with strict and inflexible behavioral traits that can be observed in student's eating behaviors.

Predictors of sensory sensitivity

One of the presentations of ARFID is its sensory sensitivity. The field of study and EMS (emotional deprivation, mistrust/abuse, social isolation, and vulnerability to harm or illness) played a significant role in predicting sensory sensitivity and predicted 11.3% variance in sensory sensitivity. However, predictive variables had a lesser role in predicting sensory sensitivity. It seems that this presentation is mainly influenced by the heredity and sensory threshold of the taste buds [16]. Considering their biological abilities, such people become suspicious or disgusted by new foods.

Along with our findings, Finistrella et al. [48] found that cognitive schemas about new foods are linked to neophobic reactions, while Tuorila and Mustonen [49] suggested that a lack of interest in trying new foods leads to negative schemas. De Paoli et al. [50] linked insecure attachment and maladaptive schema, particularly emotional deprivation, to eating problems. Zhang et al. [51] suggested that social isolation schemas can lead to maladaptive eating behaviors. Speculative at the moment, people who have sensory sensitivities and avoid eating a variety of foods are likely to have a vulnerability to harm or illness schema that makes them sensitive to trying new foods. Of course, the role of the mistrust schema in trying new tastes and textures is also highlighted. Unoka et al. [52] stated that schemas play an important role in the development and maintenance of eating disorders.

Early stimuli contribute to the development of sensorineural pathways and shape sensory processing styles, thus affecting taste and texture responses. These experiences affect eating habits [53], improve food choices, and lead to lifelong eating habits. Taste sensitivity, particularly to bitterness, can affect food choices in children, with "supertasters" more likely to avoid certain foods. This heightened sensitivity may create challenges in PCR

regarding food, and PCR predicts EMS, ultimately influencing eating disorder symptoms [24].

Predictors of lack of interest in food or eating

In this study, we investigated the role of emotional and parental variables in predicting another presentation of ARFID (i.e., lack of interest in food or eating). Gender (negative coefficient for female and positive coefficient for male), field of study (negative coefficient for humanities and positive coefficient for science), DER (difficulty engaging in goal-directed behavior and lack of emotional awareness), and EMS (emotional deprivation, social isolation, and entitlement) were significant in predicting this variable with a variance of 14.2%.

According to the results of this study, more variables play a role in the presentation of lack of interest in food or eating, *and* it is likely that this variable is more affected by psychological factors. However, the interesting point is that despite the significant role of EMS, the PACR did not play a significant role in predicting the presentation.

Along with our findings, adolescents who experience restrictive parental feeding behaviors may not be aware of their feelings and may cope with unpleasant eating experiences [54]. Haynos and Wang [45] explained that hunger itself acts as an emotion regulation strategy that reduces inner experience and outward expression of emotions, leading individuals to rely on hunger as their only emotion regulation strategy over time due to its numbing effect [55]. People experiencing a lack of appetite may fear feeling bloated and nauseous after eating, leading to irregular eating habits and limited food intake. They may not anticipate enjoying meals and may skip them altogether. Stern et al. [30] stated that people with ARFID experience more difficulty engaging in goal-directed behavior when they experience negative emotions. The general difficulty in doing the behavior that meets the goals may be in the form of refusal/restriction of food, and people do not set a proper goal and are not interested in eating despite knowing that the food is good for them.

The findings support the EMS theory for eating disorders, linking EMS related to disconnection, rejection, impaired limits, and hypervigilance to disturbed eating behaviors like food addiction and overeating. The role of schema in eating behaviors may be due to unmet early needs, leading to emotional distress and a need for control [56]. Schemas such as emotional deprivation and social isolation may contribute to a lack of interest in eating, as individuals try to satisfy their basic needs while maintaining independence and non-dependence on others.

Predictors of fear of aversive consequences

In this study, the field of study (negative coefficient for humanities and positive coefficient for science), MACR (identification), and EMS (shame/defectiveness, vulnerability to harm or illness, self-sacrifice, entitlement, and insufficient self-control/self-discipline) variables had a significant role and predict 12.6% variance of fear of aversive consequences. Interestingly, DER had no significant role in this presentation, and this contradicts the current literature on the role of emotion regulation in fear of aversive consequences [29]. Emotion regulation is a complex construct that includes various strategies and abilities, such as emotional awareness, acceptance, and cognitive reappraisal. Research indicates that individuals with EDs may struggle with different aspects of emotion regulation, but this does not uniformly predict specific symptoms like fear of adverse consequences [57].

In line with our findings, Güler and Özgörüş [25] reported a significant relationship between EMS and a negative attitude toward eating. Gerges et al. [56] asserted that EMS, particularly those related to disconnection and rejection, impaired autonomy and performance, and other-directedness, have a direct impact on eating behaviors. A study by Viana et al. [58] categorized mothers into three styles: restrictive, emotional–external and neutral. Restrictive feeding practices, in which mothers limit food intake or pressure children to eat, are associated with negative outcomes, such as increased food avoidance behaviors in children. Conversely, emotional–external eaters may inadvertently encourage unhealthy eating patterns by responding to children's emotional cues with food. Mothers who express concern about their child's eating habits often engage in stressful behaviors that can intensify children's fears about eating. For example, one study found that a mother's concern for under-eating was linked to higher levels of stress during meals, which can lead to anxiety in children about food intake and fear of vomiting or discomfort after meals [59] and these behaviors are recorded in the child's mind and affect the person's eating behaviors in the following years of development and even during adolescence and adulthood.

Conclusion

The present study provides preliminary evidence that demographic characteristics, parental and emotional components may play a role in predicting ARFID symptoms, and these findings highlight the possibility that emotion regulation problems and parenting-related variables may be a mechanism for maintaining symptoms of ARFID. Future research, particularly in individuals with clinical ARFID symptoms, is needed to further elucidate the role of these variables in

ARFID, as well as cultural differences, longitudinal designs, or interventions targeting EMS, PCAR, and DER.

Strengths and limitations

The strengths of the present study are that a large sample was selected by cluster random sampling representing all university students. The study of the relationship between new variables and a new disorder introduced in the DSM-5 was another strong point. This study has some limitations. First, this study is a cross-sectional study, and longitudinal studies for causal inference are recommended. This study was cross-sectional; thus, it is not possible to determine whether people's problematic eating behaviors may be caused by parents' problematic eating patterns or whether long-term eating disorders in children may increase PACR. The groups of students assessed in this study may not represent the entire population, because ARFIDs can occur at any age. The findings of the present study are not generalizable to childhood or adolescence, as more children spend time with parents during childhood and adolescence, and parental influences on children's eating behaviors are greater. The present study was not conducted on individuals with a clinical diagnosis of ARFID. Therefore, future studies should explore the relationships of variables among different ages, individuals, and cultures and individuals with clinical diagnoses. This study focused mainly on the mother–child–adult relationship variable, and future studies should evaluate the role of father–child–adult relationships in ARFID symptoms. Considering the lack of predictability of the fear of aversive consequences based on DER, we suggest that more research be conducted in this field. Longitudinal studies on the role of EM, SDER, and PACR with ARFID are suggested.

Clinical implications

Professionals in intervention programs for ARFID should consider factors such as parental behavior and schemas such as emotional deprivation or distrust, as well as emotion regulation strategies. The role of demographic variables (including gender) should also be emphasized in the intervention protocols.

What is already known on this topic?

ARFID is a relatively new diagnostic classification, and the DSM-5 has called for further studies and evidence in this field. Scientific knowledge about this disorder is relatively new, and psychological predictors have received less attention. This study opens a new perspective on the disorder and examines the role of factors, such as PACR and EMS, in predicting this disorder. In previous studies, the three diagnostic presentations of ARFID, i.e., sensory sensitivity, lack of interest in food or eating, and fear of aversive consequences, were not considered. This study investigated the contribution of parenting, schema, and emotional variables in predicting these three presentations and demonstrated the different contributions of each of the variables in predicting ARFID symptoms and its presentations.

What does this study add to the literature?

This study characterizes the DER and EMS as significant in predicting lack of interest in food or eating, and EMS had a significant role in predicting sensory sensitivity. MACR and EMS had a significant role in predicting the fear of aversive consequences, and interestingly, DER had no significant role in the presentation. Among the interesting findings of this study were the prominent role of gender (negative coefficient for females and positive coefficient for males) and field of study (negative coefficient for humanities and positive coefficient for science) in predicting ARFID symptoms.

Declarations

Ethics approval All procedures used in studies involving human subjects follow the national research committee's ethical standards, the 1964 Declaration of Helsinki and its revisions, or *the American Psychiatric Association (2013).* The ethical principles of the process of implementation and selection of students were reviewed and approved by the members of the Department of Psychology at Urmia University during the meeting.

Informed consent All participants provided informed consent before initiating the study procedures.

Conflicts of interest The authors declare no competing interests.

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