

The indirect effect of perfectionism between anxiety, self-esteem, aesthetic pressure, and eating disorder risk in competitive figure skaters

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ABSTRACT

Background: Eating disorders are highly prevalent in aesthetic sports, where body weight and physical appearance are central to performance. In figure skating, aesthetic pressure from the competition uniform, along with psychological factors such as perfectionism, anxiety, and self-esteem, may increase the risk of eating disorder. This study examined the relationships between these variables and eating disorder risk among competitive figure skaters, and tested whether self-esteem, aesthetic pressure, and anxiety were indirectly associated with eating disorder risk through perfectionism. **Methods:** Forty-seven Spanish competitive figure skaters (83% female; $M = 16.8$ years) participated. The CHAD, MPS-F, STAI-R, EAR, and the Uniform Pressure subscale of the WPS-F were administered. Analyses included Spearman correlations, multiple linear regressions, and bootstrapped indirect-effect models. **Results:** The mean eating disorder risk score was close to the clinical cut-off. Significant positive correlations were found between eating disorder risk, perfectionism, anxiety, and uniform pressure, and a negative correlation with self-esteem. Regression analyses showed that uniform pressure and perfectionism were the strongest predictors of eating disorder risk. Self-esteem, aesthetic pressure and anxiety were indirectly associated to eating disorders risk through perfectionism. **Conclusions:** Competitive figure skaters exhibit an elevated risk of eating disorders associated with self-demand and aesthetic pressure. Perfectionism emerges as a key cognitive process associated with psychological and social factors, underscoring the potential value of preventive programs focused on managing self-demand and body image perception. However, given the cross-sectional and exploratory nature of the study and the relatively small sample size, these findings should be interpreted with caution.

1. Introduction

Eating disorders (EDs) are characterized by persistent disturbances in eating behavior, excessive weight control, and distorted body image perception (Márquez, 2008). In recent years, their incidence in the general population has increased significantly (Arija-Val et al., 2022). Individuals suffering from EDs can experience severe health consequences, including decreased bone mineral density, cardiovascular complications, and anxiety symptoms, among others (Márquez, 2008; Petisco-Rodríguez et al., 2020). When this general trend is combined with the demands of aesthetic sports—such as figure skating—where physical appearance is a key performance determinant, the risk of developing an ED increases considerably (Dwyer et al., 2012). Indeed,

previous studies have reported that up to 42% of athletes participating in aesthetic sports experience some form of disordered eating (Márquez, 2008).

Competitive athletes are immersed in a highly demanding culture that requires exceptional physical performance and strict weight control (Papathomas et al., 2018). Elite figure skaters, in particular, must maintain a balance between strength, flexibility, and low body weight, which may foster unhealthy eating behaviors aimed at meeting aesthetic and technical standards (Dwyer et al., 2012). Research indicates that athletes in judged sports, such as figure skating, exhibit greater concern with weight and share psychopathological features associated with EDs (Mancine et al., 2020; Zucker et al., 1999). Similarly, female athletes in aesthetic disciplines show higher levels of weight-related concern

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compared to those engaged in non-aesthetic sports or recreational exercise (Davison et al., 2002).

Eating disorders are widely conceptualized as multifactorial conditions, arising from the interplay of predisposing, precipitating, and maintaining influences within a biopsychosocial framework (Schmidt et al., 2025; Solmi et al., 2024). Predisposing influences may include individual vulnerabilities (e.g., perfectionistic self-evaluation and low self-esteem) and broader sociocultural ideals; precipitating influences may involve environmental and sport-specific stressors; and maintaining influences may include cognitive–emotional processes (e.g., anxiety, self-criticism, and rigid standards) that reinforce weight- and shape-control behaviors over time. In aesthetic sports such as figure skating, constant appearance evaluation and uniform-related body exposure may intensify these interacting influences, contributing to elevated risk for eating disorder.

Based on this perspective, the present study focused on several psychological variables identified as relevant to the development of EDs in adolescents and athletes—namely perfectionism, anxiety, and self-esteem—to explore their role within this specific population. Perfectionism has been identified as a psychological trait that increases vulnerability to EDs in adolescence (Pamies & Quiles, 2014). In sports contexts, it is associated with extremely high personal standards and compulsive behaviors, which heighten the risk of disordered eating (Márquez, 2008). However, the precise role of perfectionism in the development of EDs remains under debate. Some authors conceptualize perfectionism as a cognitive mechanism that may link other psychological or contextual factors to disordered eating behaviors (Bernabéu-Brotóns & Marchena-Giráldez, 2022), while others argue that perfectionism independently predicts ED risk and may be amplified by mediators such as body dissatisfaction (Prnjak et al., 2019).

Anxiety is another key feature in eating pathology (Solano & Cano, 2012) and represents one of the most frequent emotional responses among athletes, with a direct impact on performance (Giacobbi & Weinberg, 2000). Low self-esteem has also been consistently linked to body dissatisfaction and eating disorder risk (Fairburn et al., 2003). Individuals with EDs often present low self-esteem associated with unrealistic expectations and perceived underachievement (Sudi et al., 2004). Furthermore, self-esteem levels appear to differ between athletes in aesthetic versus non-aesthetic sports, with high self-esteem functioning as a protective factor against EDs (Petisco-Rodríguez et al., 2020).

Beyond psychological variables, sociocultural and aesthetic pressures specific to figure skating must also be considered. In competition, athletes are judged not only on technical performance but also on physical attractiveness (Teixidor-Battle et al., 2020). The design of competition uniforms often reflects sport-specific aesthetic ideals, where a revealing or visually striking outfit is perceived as enhancing performance (Greenleaf et al., 2009). However, in some cases, uniform selection emphasizes appearance or audience appeal, leading to objectification and influencing athletes' body perception (Cooper & Winter, 2017; Voelker et al., 2014). Díaz and Díaz (2012) suggested that tight-fitting uniforms and constant bodily exposure may increase anxiety relative to other sports, reinforcing body image concerns. Similarly, Berengüí et al. (2024) reported that body exposure, tight uniforms, and continuous aesthetic evaluation in sports such as gymnastics, dance, and figure skating substantially heighten vulnerability to body dissatisfaction and EDs. These findings underscore the need for continued examination of such risk factors within competitive figure skating.

Although increased drive for thinness and disordered eating symptoms have been identified in aesthetic sports, specific studies on risk factors in figure skating remain scarce (Monsma & Malina, 2004), and even fewer have examined how different explanatory variables interact. This limitation hinders the development of targeted prevention and intervention strategies (Bardone-Cone et al., 2007).

Given the growing popularity of this sport—as reflected by the steady expansion of member nations in the International Skating Union

(ISU Member Federation, 2025)—and the significant health risks associated with EDs, further research is needed to inform psychological interventions aimed at reducing the incidence of such disorders among figure skaters. Accordingly, this study had two main objectives: (1) to analyze the relationships between perfectionism, anxiety, self-esteem, and aesthetic pressure from the uniform and the risk of eating disorders in competitive figure skaters, and to determine which of these variables significantly explain eating disorder risk; and (2) to examine the indirect association of self-esteem, aesthetic pressure and anxiety to eating disorder risk through perfectionism.

The hypotheses were as follows:

1. Perfectionism, anxiety, and aesthetic pressure will show direct positive associations with eating disorder risk, whereas self-esteem will show an inverse relationship, all being significant predictors of eating disorder risk.
2. Self-esteem, aesthetic pressure and anxiety will have indirect association to eating disorder risk through perfectionism.

2. Methods

2.1. Participants

Table 1 presents the main characteristics of the study sample. The participants were 47 competitive ice figure skaters, including 8 men (17%) and 39 women (83%), aged between 13 and 24 years ($M = 16.8$, $SD = 2.52$). A non-probabilistic snowball sampling method was used. The mean age at which participants began figure skating was approximately 7 years ($SD = 2.8$). Most skaters competed at the international level, followed by national-level athletes, and one participant competed regionally. The most common disciplines were singles and synchronized figure skating, whereas pair skating was the least represented. On average, participants trained about 5 days per week, with the majority reporting between 9 and 11 h of weekly training.

2.2. Measures

2.2.1. Sociodemographic and sport-related questionnaire

An ad hoc questionnaire was used to collect sociodemographic data (age and sex) and sport-related variables, including skating category, discipline, number of training days, weekly training hours, and age at which participants began practicing the sport.

Table 1
Sociodemographic and sport-related characteristics of the sample.

Variable	Total (N = 47)	Range (if applicable)
Sex; n (%)		
Male	8 (17%)	
Female	39 (83%)	
Age at which skating began; M (SD)	7.09 (2.8)	[3–14]
Weekly training hours; n (%)		
6–8 h	9 (19.1%)	
9–11 h	16 (34%)	
12–14 h	13 (27.7%)	
15 or more hours	9 (19.1%)	
Training days per week; M (SD)	4.96 (1.10)	[2–6]
Skating discipline; n (%)		
Singles	22 (46.8%)	
Synchronized	21 (44.7%)	
Pairs	4 (8.5%)	
Competition level; n (%)		
Regional	1 (2.1%)	
National	14 (29.8%)	
International	32 (68.1%)	

Note. M = mean; SD = standard deviation.

2.2.2. Eating Habits Questionnaire for Athletes (CHAD; Díaz & Díaz, 2012)

This instrument assesses athletes' risk of developing eating disorders. It consists of 30 items grouped into four factors: (1) fear of gaining weight during rest periods; (2) psychological distress related to weight and body shape in response to others' comments or attitudes; (3) obsessive concern about food and weight in relation to teammates; and (4) body satisfaction and self-image. Responses are given on a 6-point Likert-type scale ranging from 1 (*completely disagree*) to 6 (*completely agree*). Total scores can range from 30 to 180, with higher scores indicating greater risk. The original validation reported excellent internal consistency ($\alpha = 0.93$). In the present study, total reliability was $\alpha = 0.98$, with values ranging from 0.93 to 0.96 across factors.

2.2.3. Multidimensional Perfectionism Scale – Frost (MPS-F; Frost et al., 1990; Spanish adaptation by Paredes et al., 2010)

This self-report instrument measures six dimensions of perfectionism: (1) personal standards—excessively high goals and their influence on self-evaluation; (2) concern over mistakes; (3) doubts about the quality of one's performance; (4) parental expectations; (5) parental criticism; and (6) organization and order. Only the total score was used in this study. In line with the exploratory aims of the study and to ensure model parsimony given the sample size, the total MPS-F score was used as a global indicator of perfectionistic tendencies rather than analyzing specific subdimensions. The scale includes 35 items rated on a 5-point Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The Spanish adaptation demonstrated good reliability ($\alpha = 0.87$), and reliability in the current sample was $\alpha = 0.94$.

2.2.4. State-Trait Anxiety Inventory (STAI; Spielberger et al., 1971; Spanish adaptation by Buela-Casal et al., 2011)

The STAI objectively assesses both state anxiety (SA) and trait anxiety (TA). Given the study's focus on a stable measure of anxiety, only the Trait Anxiety subscale was used. It comprises 20 statements rated on a 4-point Likert-type scale from 0 (*not at all*) to 3 (*very much*). The inventory shows excellent reliability ($\alpha = 0.93$), with $\alpha = 0.87$ obtained in the present study.

2.2.5. Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965; Spanish adaptation by Martín-Albo et al., 2007)

This instrument evaluates global self-esteem through 10 items rated on a 4-point Likert-type scale from 1 (*strongly disagree*) to 4 (*strongly agree*), yielding total scores between 10 and 40. Reliability reported in the Spanish validation was $\alpha = 0.88$, while in the present study it was $\alpha = 0.87$.

2.2.6. Weight Pressures in Sport – Female version (WPS-F; Reel et al., 2013; Spanish adaptation by Batlle et al., 2017)

The WPS-F measures weight-related pressures in sport settings. It includes 15 items rated on a 6-point Likert-type scale from 1 (*never*) to 6 (*always*) and contains two subscales: (1) sport and coach-related pressures (8 items) and (2) pressures from teammates and the competition uniform (7 items). In this study, we focused on the two WPS-F items that specifically assess perceived pressure related to the competition uniform. Although these items belong to the broader teammate/uniform pressure factor in the original instrument, they were analyzed separately to capture a conceptually specific form of aesthetic pressure particularly salient in figure skating. Scores on this uniform-related pressure index ranged from 2 to 12. The Spanish adaptation reported good internal consistency ($\alpha = 0.88$). Although the WPS-F was originally developed for female athletes, only two gender-neutral items from the uniform pressure subscale were used in the present study. These items refer to perceptions of pressure related to the competition uniform and do not contain gender-specific wording, allowing their use across all participants. Given the use of a two-item measure, reliability was assessed using the inter-item correlation ($r = 0.722$) and the Spearman–Brown

coefficient ($\rho = 0.839$), indicating good internal consistency for a brief measure used in exploratory research. In the context of a small and highly specific sample, this brief index was considered preferable to reduce measurement noise and participant burden while retaining the construct most relevant to the study aims.

2.3. Procedure

Data were collected through a Google Forms online questionnaire, which included two distinct informed consent formats: one for underage skaters, requiring authorization from their legal guardians, and another for adult participants. The survey link was distributed through several ice rinks across Spain where competitive figure skating is practiced, accompanied by detailed instructions on how to access and complete the form.

After providing informed consent, participants completed the questionnaire and responded to the battery of instruments designed to assess the selected variables. Confidentiality of the data was ensured, and participants were informed that their responses would remain anonymous and would be used solely for research purposes. No financial or material incentives were provided for participation. The study was exempt from Institutional Review Board review because all data were collected through fully anonymous questionnaires. No identifying or potentially identifying information was recorded, and participants completed the survey voluntarily.

2.4. Data analysis

First, descriptive statistics were computed for all study variables. Given that the normality assumption was not met, Spearman's rank-order correlations were used to examine associations among the variables of interest.

To identify the most relevant predictors of eating disorder risk among several correlated variables, we used forward stepwise multiple linear regression. This approach was chosen because the study was exploratory and aimed to reduce model complexity while avoiding multicollinearity. Variables entered the model if $p < 0.05$ and were removed if $p > 0.10$, following standard practice.

To address the first research objective and determine which variables best explained eating disorder risk and its related factors, a series of forward stepwise multiple linear regressions were conducted, including as predictors only those variables that showed significant correlations with eating disorder risk and its subscales.

To address the second objective, indirect-effect models were estimated using PROCESS (Hayes, 2018) Model 4 as a statistical test of an indirect-effect framework, rather than as evidence of temporal causality. Given the cross-sectional design, these analyses should be interpreted as consistent with hypothesized associations, not as proof of causal mechanisms. Analyses were performed with a 95% confidence level and 10,000 bootstrap samples. Independent variables were tested in separate indirect-effect models. All statistical analyses were carried out using IBM SPSS Statistics version 21 and the PROCESS macro version 3.5.3 (Hayes, 2022; <https://www.processmacro.org/index.html>).

3. Results

Table 2 presents the descriptive statistics of the scores obtained on the Eating Habits Questionnaire for Athletes (CHAD) and the other psychological measures. Regarding eating disorder symptomatology risk, the mean score was 90.8, which is close to the clinical cut-off of 100, indicating a potential risk for developing eating disorder symptoms. The mean perfectionism score was 101, classified as medium-to-high, falling within the range of 70 to 110. The mean anxiety score was 29, which reflects a level above the population average (range 26–32) and corresponds approximately to the 75th percentile for adolescent females, who comprised the majority of the sample. For self-

Table 2
Descriptive statistics for psychological variables and eating habits.

Psychological variables and eating habits	<i>M (SD)</i>	Observed range	Possible range
Eating disorder symptom risk	90.8 (46.5)	[31–164]	[30–180]
F1: Fear of gaining weight and exercise as a weight-control method	26.2 (13.6)	[8–48]	[8–48]
F2: Psychological distress related to weight and figure due to others' comments or attitudes	20.8 (11.6)	[7–40]	[7–41]
F3: Obsessive concern about food and weight in relation to teammates	31.2 (17.4)	[11–61]	[11–66]
F4: Cognitions related to body satisfaction and self-image	12.6 (6.8)	[4–24]	[4–24]
Perfectionism	101 (24.8)	[49–154]	[35–175]
Trait anxiety	29 (10.3)	[4–50]	[0–60]
Self-esteem	28.4 (6.5)	[11–40]	[10–40]
Uniform pressure	6.43 (2.7)	[2–10]	[2–12]

Note. *M* = mean; *SD* = standard deviation.

esteem, the mean score was 28.4, falling within the interval of 26 to 29, and therefore classified as average. Finally, the mean score for uniform-related aesthetic pressure was 6.43. Considering that the possible range is from 2 to 12, this represents a moderate level of perceived uniform pressure.

Table 3 presents the correlations between perfectionism, self-esteem, trait anxiety, and uniform pressure with the risk of eating disorders among competitive ice figure skaters. The results showed statistically significant and positive correlations between perfectionism, trait anxiety, and uniform pressure with eating disorder risk, as well as with all four CHAD factors. In contrast, self-esteem was significantly correlated with eating disorder risk and with all CHAD factors except Factor 1 (“Fear of gaining weight and exercise as a weight-control method”), but in the opposite direction, indicating that lower self-esteem was associated with higher levels of eating disorder risk.

Table 4 presents the summary of the predictive models for overall eating disorder risk and its specific factors, using the variables that showed statistically significant associations. No differences were found in the risk of eating disorders according to participants' gender ($z = -1.76$; $p = 0.07$), so it was not included in the regression analysis. Uniform pressure emerged as the strongest predictor of overall eating disorder risk, accounting for nearly 50% of its variance. A second significant model included perfectionism as an additional predictor,

Table 3
Spearman correlations between eating disorder risk and its factors, and perfectionism, self-esteem, trait anxiety, and uniform pressure.

	Perfectionism	Self-esteem	Trait anxiety	Uniform pressure
Eating disorder symptom risk	0.66**	−0.38*	0.47**	0.69**
F1: Fear of gaining weight and exercise as a weight-control method	0.63**	−0.27	0.40*	0.63**
F2: Psychological distress related to weight and figure due to others' comments or attitudes	0.56**	−0.37*	0.40*	0.70**
F3: Obsessive concern about food and weight in relation to teammates	0.64**	−0.38*	0.47**	0.64**
F4: Cognitions related to body satisfaction and self-image	0.60**	−0.48**	0.55**	0.65**

* $p < 0.05$.

** $p < 0.001$.

increasing the explained variance by 11% and reaching a total of 61% of the variance in overall eating disorder risk. Regarding specific CHAD factors, uniform pressure remained a significant predictor, explaining between 39% of the variance in Factor 1 (“Fear of gaining weight and exercise as a weight-control method”) and 50.1% in Factor 2 (“Psychological distress related to weight and body shape due to others' comments or attitudes”). Perfectionism also showed a significant but smaller predictive effect, contributing between 6% (Factor 2) and 12% (Factor 4: “Cognitions related to body satisfaction and self-image”) to the respective models.

Considering these variables, the models that included both uniform pressure and perfectionism as predictors were statistically significant and explained between 52.5% and 56.2% of the variance in the eating disorder risk factors. The variables self-esteem and trait anxiety were not significant predictors in any of the explanatory models. All models met the assumptions of non-collinearity (tolerance >0.10 and VIF <10) and independence of residuals (Durbin–Watson values between 1.5 and 2.5).

Fig. 1 shows the indirect association between self-esteem and eating disorder risk through perfectionism.

A significant negative association was observed between self-esteem and perfectionism (path *a*) and between self-esteem and eating disorder risk (path *c*), as well as a significant positive association between perfectionism and eating disorder risk (path *b*). However, the direct effect of self-esteem on eating disorder risk, when controlling for perfectionism (path *c'*), was not significant. Conversely, the indirect association of self-esteem on eating disorder risk through perfectionism (path *ab*) was significant and negative, indicating that perfectionism has indirect effect in the relationship between self-esteem and eating disorder risk.

Fig. 2 shows the indirect association of uniform pressure to eating disorder risk through perfectionism. Uniform pressure had a significant direct effect on perfectionism (path *a*), on eating disorder risk (path *c*), and also when perfectionism was controlled (path *c'*). Similarly, perfectionism showed a significant positive direct association on eating disorder risk (path *b*). The indirect association of uniform pressure on eating disorder risk through perfectionism (path *ab*) was also significant.

Fig. 3 shows the indirect association between trait anxiety and eating disorder risk through perfectionism. Trait anxiety had a significant direct association to perfectionism (path *a*) and to eating disorder risk (path *c*). However, its direct association to eating disorder risk became non-significant when perfectionism was controlled (path *c'*). Similarly, perfectionism showed a significant positive direct association to eating disorder risk (path *b*) and a significant indirect effect (path *ab*), confirming its indirect association between trait anxiety and eating disorder risk.

4. Discussion

Consistent with recent evidence emphasizing the heightened vulnerability of athletes participating in aesthetic sports (Mountjoy et al., 2023), the present study examined the relationship between eating disorder (ED) risk and psychological variables such as uniform pressure, anxiety, self-esteem, and perfectionism in competitive figure skaters. In addition, it explored the indirect role of perfectionism in the associations between self-esteem, uniform pressure, and anxiety with eating disorder risk.

Regarding eating disorder risk, the mean score obtained was close to the clinical cut-off point suggested by Díaz and Díaz (2012), who reported similar values in gymnastics—an aesthetic sport with comparable demands to figure skating. These findings highlight the relevance of this discipline in the field of psychological prevention and treatment, as it represents a population with high vulnerability to eating disorder risk and body image disturbances, requiring sport-specific strategies.

Beyond the global risk level, the analysis of the four CHAD factors provided a more nuanced understanding of the vulnerability profile observed in this sample. When scores are considered relative to their

Table 4
Predictive models for eating disorder risk and its factors.

Dependent variable	Model	Predictor variables	β	t	R^2	Adjusted R^2	ΔF
Eating disorder risk	1	Uniform pressure	0.713	6.82**	0.508	0.497	46.53
	2	Uniform pressure Perfectionism	0.514 0.403	4.87** 3.82**	0.631	0.614	14.65
F1: Fear of gaining weight and exercise as a weight-control method	1	Uniform pressure	0.641	5.60**	0.411	0.398	31.44
	2	Uniform pressure Perfectionism	0.437 0.414	3.71* 3.51*	0.541	0.520	12.37
F2: Psychological distress related to weight and body shape due to others' comments or attitudes	1	Uniform pressure	0.716	6.87**	0.512	0.501	47.22
	2	Uniform pressure Perfectionism	0.567 0.301	5.04** 2.68*	0.581	0.562	7.20
F3: Obsessive concern about food and weight in relation to teammates	1	Uniform pressure	0.661	5.91**	0.437	0.425	34.94
	2	Uniform pressure Perfectionism	0.460 0.408	4.00** 3.55*	0.563	0.545	12.62
F4: Cognitions related to body satisfaction and self-image	1	Uniform pressure	0.667	6.17**	0.459	0.447	38.17
	2	Uniform pressure Perfectionism	0.550 0.371	5.29** 3.56*	0.580	0.561	12.07

* $p < 0.05$.

** $p < 0.001$.

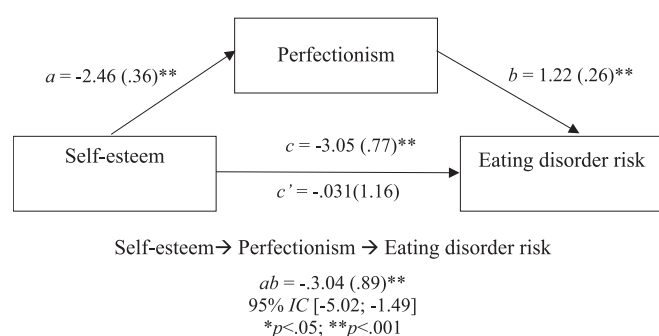


Fig. 1. Indirect association of self-esteem to eating disorder risk through perfectionism.

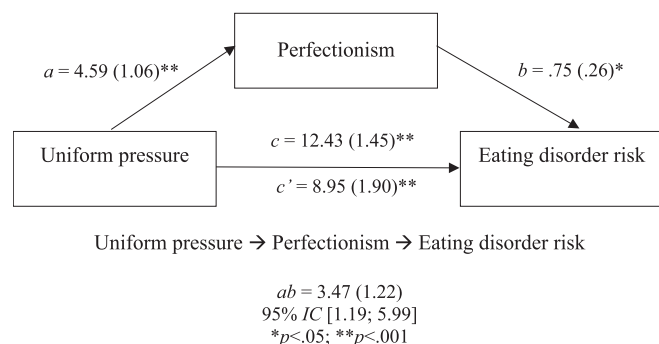


Fig. 2. Indirect association of uniform pressure to eating disorder risk through perfectionism.

possible ranges, skaters show moderate levels across all factors, with slightly higher values for fear of gaining weight and exercise as weight control (F1) and for cognitions related to body satisfaction and self-image (F4). This pattern suggests that risk is not concentrated in a single domain but rather distributed across behavioral, emotional, and cognitive dimensions of the instrument. In comparison with findings from Díaz and Díaz (2012) in gymnastics and De la Vega et al. (2015) in football, where F1 and F3 typically predominate, the profile of figure skaters appears less extreme but more homogeneous. This may reflect a broad internalization of aesthetic norms rather than a focal concern with eating behavior or social judgment. The relatively higher scores in F4, despite its smaller number of items, indicate that body image and physical self-evaluation constitute sensitive dimensions in this group. This aligns with Espinosa Carreño (2022), who found that aesthetic

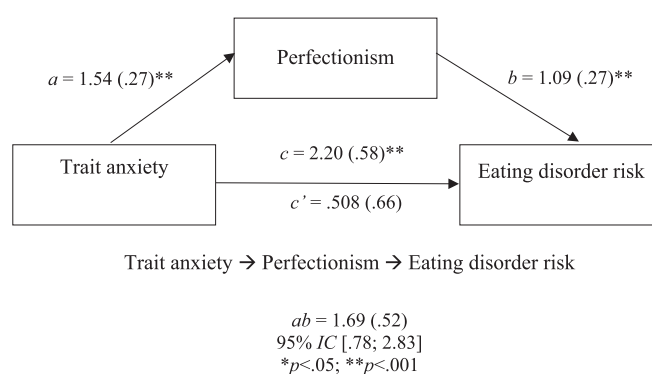


Fig. 3. Indirect association of trait anxiety to eating disorder risk through perfectionism.

athletes with higher body self-demand exhibited more stable perfectionism patterns and compensatory behaviors, even with limited external commentary. The moderate level of distress related to social feedback (F2) might reflect a perceived lower social exposure than in other aesthetic sports with stricter weight control, yet it remains influential given the evaluative component inherent to figure skating (Delgado, 2018). Overall, these findings reinforce the idea that perfectionism and body-related concern represent core, cross-cutting vulnerability factors associated with eating disorder risk in this athletic context.

With respect to the remaining variables, skaters showed medium-to-high levels of perfectionism, similar to those reported by Franco Paredes et al. (2011) in subclinical populations. Anxiety levels were somewhat elevated compared to normative data and consistent with those reported in adolescent gymnasts (Petisco-Rodríguez et al., 2020). In contrast, self-esteem and uniform pressure scores were moderate. While no previous studies have specifically quantified uniform pressure in aesthetic sports, aesthetic body ideals and pressure to maintain an attractive appearance have been consistently documented across various athletic settings (Berengüf et al., 2024; Mancine et al., 2020).

Beyond descriptive data, the correlational analyses confirmed the hypothesized linear relationships between all variables and eating disorder risk. However, only uniform pressure and perfectionism emerged as significant predictors of overall eating disorder risk and its dimensions, partially supporting the initial hypotheses. This pattern may be explained by the specific characteristics of figure skating, where aesthetic demands and body exposure are constant and visible reinforced by tight-fitting costumes, judges' evaluations, and audience attention. In this context, perceived uniform pressure and self-imposed

perfectionistic standards may represent proximal psychological factors associated with body-control behaviors (Márquez, 2008). Conversely, self-esteem and anxiety, as broader and less contextual constructs, may exert indirect effects on eating disorder risk through perfectionism, reducing their direct influence when perfectionism is considered.

This interpretation is supported by the results addressing the second study objective. The indirect effect analyses highlighted perfectionism as a central cognitive process associated with the relationships between emotional and social factors and eating disorder risk. Specifically, perfectionism had significant indirect effect in the relationship between self-esteem and eating disorder risk, and between uniform pressure and eating disorder risk. In both cases, self-critical tendencies and rigid self-demands appear to intensify the effects of low self-esteem and aesthetic pressure on body control behaviors, consistent with previous findings (Bardone-Cone et al., 2007; Flett & Hewitt, 2002; Sirois & Molnar, 2016). Similarly, St-Cyr et al. (2024) found that self-oriented and socially prescribed perfectionism were associated with disordered eating and lower well-being among athletes in aesthetic sports, with this relationship partially mediated by obsessive passion for the sport. This provides further insight into how perfectionistic striving was associated with psychological vulnerability in aesthetic athletes. In contrast, the indirect-effect model involving anxiety revealed a significant indirect association, suggesting that the influence of anxiety on eating disorder risk operates through perfectionism. This finding aligns with previous research linking anxiety to rigid perfectionism and fear of failure (Boone et al., 2010; Lloyd et al., 2015), reinforcing the notion that perfectionism may function as a cognitive process through which emotional vulnerability is associated with increased risk of eating disorder risk. The same role of perfectionism has also been observed in related domains—for example, between emotional eating and body mass index (Bernabéu-Brotóns & Marchena-Giráldez, 2022), between ED symptoms and quality of life (Rutter-Eley et al., 2020), and between perceived criticism and ED symptomatology (Sassaroli et al., 2011). Although mediation analyses suggested indirect associations consistent with our theoretical model, the cross-sectional design precludes causal inference. Alternative directions of association are plausible, and longitudinal research is needed to clarify temporal mechanisms. Together, these findings suggest the importance of incorporating strategies that address emotional regulation, anxiety management, and perfectionism flexibility into prevention and intervention programs in aesthetic sports (Flett & Hewitt, 2002; Gustafsson et al., 2017). These considerations are particularly relevant within the Spanish cultural context, where socio-cultural norms emphasizing thinness, appearance, and performance in aesthetic sports may influence athletes' experiences of appearance-related pressure and eating-related attitudes.

This study has several limitations. First, the relatively small sample size limits the stability and generalizability of the findings, particularly with regard to the observed indirect effects. Although the specificity of the population and the power analysis suggest adequate sensitivity for detecting moderate to large associations, the results should be interpreted as exploratory. Additionally, including a brief comment on statistical power (whether posthoc or theoretically grounded) helps clarify that the study was adequately powered to detect the observed effect sizes, particularly in the indirect-effect models, which typically require larger samples. As a sensitivity check, we considered how results might differ under a theory-driven hierarchical approach. In such a model, psychological variables (self-esteem, anxiety, perfectionism) would be entered first, followed by sociocultural factors (uniform pressure). Given the strong correlation between uniform pressure and eating disorder risk, this variable would likely remain the main predictor, while perfectionism would retain a secondary role. Thus, conclusions regarding the centrality of uniform pressure and perfectionism would remain unchanged, although explained variance might differ slightly.

Second, the gender imbalance must be acknowledged, particularly considering the higher prevalence of EDs among female athletes. Third, the cross-sectional design and exclusive focus on psychological variables

preclude causal inference and limit the understanding of temporal changes. Moreover, all data were collected through self-report questionnaires, which may be affected by response biases, especially on sensitive topics such as eating behavior and body image.

Despite these limitations, the study offers several strengths. It represents a novel contribution to Spanish research on competitive figure skaters—a small and understudied population—and provides insight into psychological factors associated with their health and performance. The combined analysis of perfectionism, anxiety, self-esteem, uniform pressure, and eating disorder risk offers a comprehensive view of the psychological factors associated with vulnerability in this sport. From an applied perspective, these findings carry important clinical implications for the prevention and early detection of eating disorder risk in aesthetic sports. Identifying psychological risk profiles can help coaches, psychologists, and nutritionists design targeted interventions that promote both psychological well-being and athletic performance. Thus, the present study not only contributes to the scientific literature but also provides practical value for enhancing the overall health and resilience of competitive figure skaters.

5. Conclusions

The findings of this study suggest that competitive figure skaters present an elevated risk of eating disorders, close to the clinical threshold, emphasizing the relevance of this aesthetic sport for prevention and early detection efforts. Perfectionism and uniform pressure emerged as significant predictors of eating disorder risk, whereas self-esteem and anxiety exerted indirect effects through perfectionism. These results indicate that self-demand and self-criticism may represent key psychological processes associated with body-control behaviors in this population.

These findings provide valuable evidence for the development of preventive interventions aimed at reducing aesthetic pressure and perfectionistic tendencies, while simultaneously promoting psychological well-being and athletic performance. Despite limitations related to sample size, gender distribution, and study design, this research offers important insights into the psychological factors that increase vulnerability to eating disorders among competitive figure skaters. Future studies should employ longitudinal designs to clarify causal mechanisms and inform evidence-based prevention programs tailored to the specific needs of athletes in aesthetic sports.

CRedit authorship contribution statement

Leiva Fernández Cordero: Writing – review & editing, Writing – original draft, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Carlos Marchena-Giráldez:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Alejandra Cruz Corbella:** Conceptualization. **Dra. Elena Ruiz-Sancho:** Writing – original draft, Validation, Supervision, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Author Statement

We, the undersigned authors, confirm that:

1. All authors have contributed significantly to the work, have read and approved the final version of the manuscript, and agree with its submission to *Eating Behaviors*.
2. There are no conflicts of interest to declare.
3. The corresponding author, Dr. Carlos Alberto Marchena-Giráldez, will act as the point of contact throughout the peer review and publication process.

Declaration of competing interest

The authors declare that they have no conflict of interest.

Data availability

Data will be made available on request.

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Further reading:

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