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Mediating effect of perceived physical appearance in the association of disability and psychopathology in youth with chronic physical illness: a sex-stratified analysis

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Abstract

Objective: **This study examined the mediating effect of perceived physical appearance on the association between disability and psychopathology in youth with chronic physical illness, and whether effects differed by sex.**

Methods: **A cohort of 263 children and youth (2–16 years at enrollment) diagnosed with a chronic physical illness were recruited from a Canadian pediatric hospital. Data from 102 youth aged ≥ 10 years who were eligible to provide self-reports ($n = 50$ female; $n = 52$ male) were analyzed. Youth psychopathology (emotional, behavioral, and attentional symptoms) was measured using the Emotional Behavioural Scales-Brief Version, and disability was measured using the WHO Disability Assessment Schedule 2.0. Multiple-group path analysis was used to investigate the direct and indirect effects between youth disability and psychopathology, mediated by perceived physical appearance for male and female youth over a 24-month period.**

Results: **For both male and female youth, elevated disability was directly associated with lower perceptions of physical appearance ($\beta_{male} = -0.26$ [0.11], $\beta_{female} = -0.20$ [0.08]) and elevated symptoms of behavioral ($\beta_{male} = 0.35$ [0.10], $\beta_{female} = 0.29$ [0.09]) and attentional symptoms ($\beta_{male} = 0.31$ [0.10], $\beta_{female} = 0.24$ [0.09]). Perceived physical appearance mediated the relationship between disability and emotional symptoms for males ($\alpha\beta = 0.11$ [0.01–0.21]).**

Conclusions: **The level of disability is a key factor influencing the mental health of youth with chronic physical illness, and the mechanism by which its effects are exerted differs by sex. More comprehensive multiple-mediator models that consider potential bidirectional associations are warranted.**

Keywords adolescent, child, chronic disease, mental health, path analysis, self-concept

Chronic physical illnesses are common in childhood and adolescence, with epidemiological studies indicating that 30%–50% of children and youth are affected (Luther et al., 2026; Wisk & Sharma, 2025). Co-occurring psychopathology is frequent among youth with chronic physical illness—contemporary epidemiological samples suggest physical–mental multimorbidity prevalence ranging between 5% and 15% (Fearon et al., 2025a; Luther et al., 2026; Reaume et al., 2024), whereas in clinical samples, as many as 40% of youth with chronic physical illness have a co-occurring mental disorder (Ferro et al., 2025). Despite this burden, clinical, biological, and psychosocial mechanisms through which physical illness contributes to the onset and course of youth psychopathology remain understudied, limiting opportunities for prevention and early intervention to support the mental health of this vulnerable population.

Evidence suggests that risk for psychopathology is similar across different chronic physical illnesses in childhood and adolescence (Arrondo et al., 2022). Adopting a noncategorical approach—emphasizing the shared consequences of diverse conditions rather than diagnosis-specific features—offers a powerful framework for mechanistic studies in the context of pediatric chronic physical illness. Work by Stein and colleagues demonstrated that diagnostic labels explain little variance in child psychological, social, and educational outcomes relative to intrinsic consequences (e.g., limitations in activity and participation, need for services), establishing the rationale for noncategorical definitions, measurement, and approaches to research design (Stein & Jessop, 1982; Stein & Silver, 1999). Consistent with the WHO International Classification of Functioning, Disability and Health (ICF), this perspective operationalizes disability/functioning across domains

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(e.g., cognition, mobility, self-care, interpersonal relations), recognizes such person–environment interactions as central determinants of health, and supports assessments of disability or related constructs (e.g., functioning, impairment) as transdiagnostic indicators for causal inquiry (World Health Organization, 2002). Importantly, disability has been shown to be a strong predictor of psychopathology in pediatric populations, underscoring its value as a proximal exposure for mechanistic studies that move beyond diagnostic labels, particularly among youth with chronic physical illness (Ferro et al., 2025; Reaume et al., 2024).

Within this noncategorical framework, self-perceptions of physical appearance or body image are salient psychological constructs that are associated with internalizing and externalizing symptoms of psychopathology in childhood and adolescence. Meta-analytic evidence shows that youth with chronic physical illness report lower body image compared to healthy peers (Pinquart, 2013) and that such negative self-perceptions are associated with symptoms of psychopathology across the life course (Hards et al., 2023). Qualitative and quantitative studies also show that indicators of disability or illness severity among youth with chronic physical illness are inversely associated with self-perceptions, particularly body image and physical appearance, during adolescence (Gautam et al., 2024; Schruff et al., 2025). This is salient because during this developmental period, pubertal and social changes heighten self-perceptions of physical appearance—effects that may differ between sexes, particularly in how perceived physical appearance is associated with emotional and behavioral symptoms.

Indeed, the evidence base is mixed; some studies suggest stronger effects among females (Griffiths et al., 2016; Hao et al., 2023), others suggest stronger effects among males (Fismen et al., 2022), and still others suggest no moderating effects by sex (Griffiths et al., 2017; Thorup et al., 2024). Arguments have been made that similar processes underlie the mechanisms linking perceived physical appearance and psychopathology for both sexes (e.g., changes in physical activity levels, social media influences on body ideals) and that it is the timing of such processes alongside pubertal changes (earlier for females) that might drive sex differences (Holsen et al., 2001). Age-by-sex modification has been found with stronger effects among females in late childhood and stronger effects among males in adolescence (Paxton et al., 2006). Inconsistent sex differences related to the mental health of youth with chronic physical illness have also been reported in epidemiological and clinical samples (Ferro et al., 2025; Luther et al., 2026; Reaume et al., 2024). Thus, research that investigates the interrelationships among disability, perceived physical appearance, and psychopathology in youth with chronic physical illness should implement sex-based analyses to account for such differences.

Despite converging theory and evidence, very few studies have evaluated whether perceived physical appearance or body image mediates the association between disability (or related constructs) and psychopathology among youth with chronic physical illness. One study found that body image dissatisfaction mediated the association between weight status (a proxy for functioning) and health-related quality of life among youth 12–18 years old but did not mediate the association with psychopathology (Gouveia et al., 2014). Another study (not specific to youth) found that among individuals with serious burns, body image dissatisfaction mediated associations between burn severity and symptoms of post-traumatic stress disorder and depression (Huang & Su, 2021).

Given the paucity of research, knowledge gaps remain with implications for research and practice. First, studies examining the indirect effects of disability on psychopathology via perceived physical appearance have focused on single conditions (i.e., obesity, serious burns), which may limit their generalizability to the broader population of youth with chronic physical illness. Second, evidence of mediation in this population would refine causal models by identifying a potentially sex-specific psychosocial pathway from transdiagnostic indicators (i.e., disability) to symptoms of psychopathology during a developmental period in which self-perceptions regarding appearance gain prominence. If perceived physical appearance transmits risk in this vulnerable population of youth, embedding body image or self-concept interventions into pediatric health care could mitigate downstream psychopathology; current syntheses show emerging effectiveness of such interventions but highlight gaps for younger males and for youth with chronic physical illness (Brichacek et al., 2025; Guest et al., 2022). Third, given the high prevalence of chronic physical illness in children and youth, scaling school-based or digital programs and evaluating mental health outcomes could yield population-level benefits.

This study addresses a research priority in pediatric physical–mental multimorbidity (Jiang et al., 2025) by investigating the mediating effect of perceived physical appearance on the association between self-reported disability and psychopathology in youth with chronic physical illness and whether indirect effects differed between sexes. It was hypothesized that perceived physical appearance would mediate the association between disability and emotional, behavioral, and attentional symptoms of psychopathology and, given a sample that primarily comprised adolescence, that indirect effects would be larger for male compared to female youth.

Methods

Data source

This study utilized data from Multimorbidity in Children and Youth across the Life-course (MY LIFE), a longitudinal investigation of children and youth with a physical illness and their primary caregiving parent (Ferro et al., 2019), the details of which have been published but are described briefly herein. Children and youth and their parents were recruited from outpatient clinics within the divisions of endocrinology, gastroenterology, hematology/oncology, immunology, allergy and dermatology, neurology, respirology, and rheumatology at a pediatric hospital in Ontario, Canada. Eligibility criteria required that children and youth be aged 2–16 years at recruitment, have one physician-confirmed chronic physical illness, and have sufficient English proficiency to complete study measures. Chronic physical illnesses were those that were expected to persist for $\geq$ 12 months.

Recruitment and procedures

Research assistants were stationed in outpatient clinics and collaborated with clinical staff to identify potentially eligible families.

Clinic nurses introduced the study to families during appointments and referred interested families to the research assistant to learn more about the study and what participation would entail. The research assistant confirmed eligibility, explained the study, and obtained written permission for a follow-up contact with the study coordinator. Subsequently, the study coordinator arranged baseline assessments at the hospital or family home; in rare cases, materials were mailed to families. Data collection involved structured interviews with trained study personnel and self-report questionnaires administered via laptop (or paper for materials sent by mail). Parents provided proxy reports for all children and youth, and youth aged ≥ 10 years completed self-report measures.

Informed written consent was obtained from parents for themselves and all children and youth enrolled in MY LIFE. Youth 16 years of age also provided informed written consent. Informed written assent was obtained from children and youth 7–15 years of age. Parents consented on behalf of children 2–6 years of age. Ethical approval was granted by the Waterloo Human Research Ethics Board and the Hamilton Integrated Research Ethics Board. Approval for public availability of the data underlying this manuscript was not obtained to protect participant privacy. The data may be shared on reasonable request to the corresponding author. None of the previously published manuscripts using MY LIFE data have examined indirect effects of perceived physical appearance on the association between youth disability and psychopathology.

Measures

Disability (exposure)

The 12-item youth-reported version of the World Health Organization Disability Assessment Schedule (WHODAS) 2.0 was used to measure the level of youth disability at baseline (Üstün et al., 2010). The WHODAS 2.0 assesses functioning across the domains of cognition, mobility, self-care, getting along, life activities, and participation over the past 30-day period. Respondents rate items on a scale from 1 (*none*) to 5 (*extreme/cannot do*) and a total score is obtained by summing all items, whereby higher scores indicate more disability. The youth-reported WHODAS 2.0 generates valid and reliable scores in samples of youth with chronic physical illness (Ferro et al., 2023c; Tompke et al., 2020). The internal consistency of the WHODAS 2.0 in this sample was $\omega = 0.82$.

Physical appearance (mediator)

The physical appearance subscale of the Self-Perception Profile for Children (SPPC) was used to measure perceived physical appearance (Harter, 2012). Each of the six items in this subscale is scored on a four-point scale that describes traits or skills in both a negative and positive disposition. Youth choose which statement best describes them and then select whether the chosen statement was *really true for me* or *sort of true for me*. The mean of the six items constitutes perceived physical appearance such that higher scores reflect more positive perceptions. The SPPC has demonstrated strong psychometric properties across samples of youth (Harter, 2012). The internal consistency of the physical appearance subscale in this sample was $\omega = 0.90$.

Psychopathology (outcome)

The 25-item Emotional Behavioural Scales-Brief Version (EBS-B) is aligned with the Diagnostic and Statistical Manual of Mental Disorders and was used to measure youth psychopathology (Boyle et al., 2022). Developed from a subset of the 52 items from the EBS (Boyle et al., 2019), the EBS-B has a correlated three-factor structure representing problems in the domains of emotion, behavior, and attention, which have been validated in youth with chronic physical illness (Ferro et al., 2024a). Using a three-point response scale (0–2; *never or not true*, *sometimes or somewhat true*, and *often or very true*), youth reflect on symptoms over the past six months. Items are summed to form subscale scores, and higher scores indicate more severe psychopathology. The internal consistencies were $\omega = 0.90$, 0.82, and 0.83 for emotional, behavioral, and attentional subscales, respectively.

Parent psychological distress (covariate)

Parent mental health has been shown to be associated with youth self-concept and symptoms of psychopathology (Ferro & Boyle, 2015; Ferro et al., 2015); thus, it was included as a covariate in the analyses. Parent psychological distress was operationalized as a composite sum of the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977) and Generalized Anxiety Disorder Scale (GAD-7) (Spitzer et al., 2006), as scores on these scales were highly correlated ($r = 0.79$ on both occasions). This approach has been used previously as an indicator of overall parent psychological distress, which avoids problems of collinearity (Ferro et al., 2024b). Using a four-point response scale (0–3), the 20-item CES-D measures past-week symptoms of depressed affect, positive affect, somatic activity, and interpersonal relations. The seven-item GAD-7 measures the core symptoms of generalized anxiety over the past two weeks using a four-point response scale (0–3). Internal consistency of this composite measure was $\omega = 0.94$ in this sample.

Sociodemographics (covariates)

Parent-reported sociodemographic information including sex, age, country of birth, race, marital status, educational attainment, and annual household income were collected. Most participants were Canadian-born; thus, country of birth was dichotomized (i.e., immigrant or not). Marital status was coded as partnered (i.e., married or common-law) or not and education as postsecondary graduate (i.e., completed diploma or degree at college/university). Household income was dichotomized at $90,000, which reflected the median income of households with at least two residents.

Statistical analysis

Univariable statistics were computed to describe the study sample. Data for the variables of interest—youth disability, perceived physical appearance, and psychopathology—were measured at baseline, 12 months, and 24 months, respectively, to ensure temporality of associations. Baseline youth age, parent psychological distress, and household income, which in the context of a relatively small sample size, represent a minimum set of confounding factors (Ferro & Boyle, 2015; Ferro et al., 2023b; Luther et al., 2025; Yang et al., 2023) for the model. Pearson correlations among youth disability, perceived physical

appearance, and emotional, behavioral, and attentional psychopathology were estimated and stratified by sex. Independent *t*-tests (Levene's test confirmed homogeneity of variances) were conducted to examine sex differences in variables of interest. These descriptive analyses were computed using SPSS 30.

Multiple-group path analysis with maximum likelihood estimation was used to test direct and indirect effects between youth disability and psychopathological outcomes, mediated by perceived physical appearance for male and female youth. The model adjusted for youth age, household income, and parent psychological distress. Continuous variables were grand-mean centered to minimize multicollinearity in the model.

To investigate whether estimates of direct or indirect paths were different between male and female youth (i.e., moderation), a sequential model-building approach was applied (Kline, 2023). In the first step, an unconstrained model in which all paths were estimated freely for both groups (i.e., males and females) was specified. Model fit was deemed adequate if at least three fit indices met the following thresholds: χ^2 goodness-of-fit test $p > .05$, root mean square error of approximation (RMSEA) ≤ 0.06, comparative fit index (CFI) ≥ 0.950, and square root mean residual (SRMR) < 0.08 (Brown, 2015).

In the second step, a fully constrained model in which all paths were constrained to be equal between groups was estimated. The unconstrained and fully constrained models were compared, and changes in model fit indices were examined in relation to the following thresholds indicating a substantial worsening of fit: $\Delta\chi^2$ $p < .05$, ΔCFI ≤ -0.010, ΔRMSEA ≥ 0.015, and ΔSRMR ≥ 0.030 (Chen, 2007). Meeting at least three of these change thresholds indicated that the constraints reduced model fit (i.e., support for the unconstrained model) and the presence of moderation by sex.

In the third step, modification indices were reviewed to identify paths in the fully constrained model contributing to model misfit (i.e., paths moderated by youth sex). The constraints on these paths were released, and this partially constrained model was respecified and compared to the fully constrained model using the same change in fit thresholds. If the partially constrained model achieved a substantially better fit to the data, it was used to estimate direct and indirect paths. The indirect paths were tested using a bias-corrected bootstrap method (Tibbe & Montoya, 2022), which generated 2,000 bootstraps from which 95% confidence intervals were estimated. Standardized estimates from the path analysis were computed using Mplus 8.8.

Simulation studies were conducted to estimate the statistical power to detect significant indirect effects using path analysis (Thoemmes et al., 2010). Using a range of medium-sized effects for parameters in the model, statistical power was estimated to be $1 - \beta = .64–.78$.

Results

Sample characteristics

In total, $n = 294$ families consented to participate in MY LIFE and $n = 263$ (89.5%) were ultimately enrolled in the study. For these analyses, the sample was restricted to youth ≥ 10 years of age and provided self-reports ($n = 117$, 44.5%). Of these, $n = 15$ (12.8%) withdrew or were lost over the 24-month follow-up. Thus, the analytic sample included $n = 102$ youth ($n = 50$ [49.0%] female; $n = 52$ [51.0%] male). There was only one difference in sample characteristics between those included versus excluded in the analysis—parents of excluded youth were less likely to have postsecondary education compared to parents of included youth (40.0% vs. 75.5%, $p = .01$). Additional characteristics of the included and excluded samples are shown in Table 1. As shown in Table S1, only one difference was found between included males and females—a larger proportion of males had a hematological condition (26.9% vs. 4.0%, $p < .01$).

The mean age of youths included in the study was 13.3 (*SD* 2.1) years, 49.0% were female, and the mean duration of their chronic physical illness was 5.7 (*SD* 4.9) years. Parents had a mean age of 44.0 (*SD* 5.9) years, and 89.2% were female. Most parents identified as White (85.3%), and 18.6% were immigrants. The socioeconomic status of the families was relatively high; 87.3% of parents were partnered, 75.5% had completed postsecondary education, and 58.8% reported annual household incomes of $\geq$ $90,000 CAD.

Sex-based correlations and comparisons among exposure, mediator, and outcomes

Sex-specific correlations among key constructs are shown in Table S2. Correlations between youth disability and perceived physical appearance, as well as between perceived physical appearance and emotional symptoms, were significant for males but not females (−0.31 and −0.51, respectively; $p < .05$ for both). No other sex differences in correlations were found. Regardless of sex, small-to-medium correlations were found for disability and behavioral or attentional symptoms, emotional and behavioral or attentional symptoms, and behavioral and attentional symptoms. Mean scores for youth disability, perceived physical appearance, and psychopathology were not significantly different between sexes, with the exception that females reported more emotional symptoms at 24 months compared to males (4.7 vs. 2.4, $p < .01$; Table 2).

Path model testing

As shown in Table 3, the unconstrained path model demonstrated adequate model fit ($\chi^2[12] = 17.56$, $p = .130$; RMSEA = 0.095 [0.000–0.185]; CFI = 0.965; SRMR = 0.069). While changes in fit indices did not meet thresholds to indicate substantial worsening of model fit from the unconstrained to the fully constrained model ($\Delta\chi^2(7) = 12.43$, $p = .087$; ΔRMSEA = 0.011; ΔCFI = −0.033; ΔSRMR = 0.012), the latter did not demonstrate adequate fit to the data ($\chi^2[19] = 29.99$, $p = .052$; RMSEA = 0.106 [0.000–0.176]; CFI = 0.932; SRMR = 0.081). This suggested that at least a subset of estimates was not equal between groups—an indication of moderation by youth sex. In reviewing the modification indices of the fully constrained model, paths from perceived physical appearance to youth emotional and behavioral symptoms were found to be the major source of model misfit and the localized moderating effect of sex. The partially constrained model was then specified with the constraints on these two paths removed (all other paths remained equal for male and female youth). Fit for the partially constrained model was acceptable ($\chi^2[17] = 18.98$, $p = .329$; RMSEA = 0.0048 [0.000–0.140]; CFI = 0.988; SRMR = 0.069) and found to be substantially improved compared to

Table 1 Characteristics of the study sample at baseline.

Characteristic	Full sample ($N = 117$)	Analytic sample ($n = 102$)	Excluded sample ($n = 15$)	*p*
Youth				
Age (years)	13.4 (2.2)	13.3 (2.1)	13.9 (2.7)	.46
Female	57 (48.7)	50 (49.0)	7 (46.7)	.86
Born outside Canada	13 (11.1)	12 (11.8)	1 (6.7)	.56
Illness duration (years)	5.9 (4.9)	5.7 (4.9)	7.2 (5.0)	.27
Illness type				.46
Dermatological	6 (5.1)	5 (4.9)	1 (6.7)	> .99
Endocrine	20 (17.1)	15 (14.7)	5 (33.3)	.17
Gastroenterological	15 (12.8)	14 (13.7)	1 (6.7)	.79
Hematological	16 (13.7)	16 (15.7)	0 (0)	.19
Neurological	6 (5.1)	5 (4.9)	1 (6.7)	> .99
Respiratory	17 (14.5)	15 (14.7)	2 (13.3)	> .99
Rheumatological	37 (31.6)	32 (31.4)	5 (33.3)	> .99
Parent				
Age (years)	44.2 (5.9)	44.0 (5.9)	45.8 (6.0)	.28
Female	105 (89.7)	91 (89.2)	14 (93.3)	.62
Born outside Canada	21 (17.9)	19 (18.6)	2 (13.3)	.62
White	102 (87.2)	87 (85.3)	15 (100)	.11
Partnered	101 (86.3)	89 (87.3)	12 (80.0)	.45
Postsecondary graduate	83 (70.9)	77 (75.5)	6 (40.0)	.01
Household income ≥$90,000	66 (56.9)	60 (58.8)	6 (42.9)	.26
Psychological distress	14.5 (13.1)	13.7 (12.4)	20.5 (16.3)	.06

Note. Data are frequency (%) except for age, illness duration, and parent psychological distress, which are mean (*SD*). Comparisons between the analytic and excluded samples were made using χ^2 tests for categorical variables (Fisher's exact test was used for overall illness type and dermatological, neurological, respiratory, and rheumatological pairwise tests) and independent *t*-tests for continuous variables. Partnered parents are those who are married or in common-law relationships. Annual household income is reported in Canadian dollars.

Table 2 Comparisons of youth disability, perceived physical appearance, and psychopathology, by sex.

Measure	Males ($n = 52$)	Females ($n = 50$)	*t*	df	*p*
Disability	20.4 (7.4)	19.6 (6.7)	0.56	100	.58
Perceived physical appearance	3.0 (0.7)	2.9 (0.8)	0.50	100	.62
Baseline psychopathology					
Emotional	2.5 (2.7)	3.9 (3.3)	−2.20	99	.03
Behavioral	2.4 (2.5)	2.4 (2.3)	−0.06	99	.95
Attentional	4.5 (2.8)	4.0 (2.4)	0.91	99	.36
24-month psychopathology					
Emotional	2.4 (3.1)	4.7 (3.9)	−3.27	100	<.01
Behavioral	2.0 (2.3)	1.8 (2.4)	0.44	100	.66
Attentional	4.3 (2.9)	4.2 (3.5)	0.05	100	.96

Note. Disability was measured at baseline and perceived physical appearance at 12 months. Mean (*SD*) are reported. Levene's statistic indicated group variances were homogenous ($p > .05$ for all). One youth had missing EBS-B scores at baseline. *df* = degree of freedom.

the fully constrained model ($\Delta\chi^2(2) = 11.01$, $p = .004$; ΔRMSEA = −0.058; ΔCFI = 0.056; ΔSRMR = −0.012). Thus, the partially constrained model was used to model direct and indirect effects of disability on youth psychopathology.

Direct and indirect effects of youth disability on psychopathology

For males and females, youth disability at baseline was negatively associated with 12-month perceived physical appearance ($\beta_{male} = -0.26$ [0.11], $\beta_{female} = -0.20$ [0.08], $p < .05$ for both; Figure 1). Youth disability was positively associated with 24-month behavioral ($\beta_{male} = 0.35$ [0.10], $\beta_{female} = 0.29$ [0.09], $p < .05$ for both) and attentional symptoms ($\beta_{male} = 0.31$ [0.10], $\beta_{female} = 0.24$ [0.09], $p < .05$ for both); no association was found with emotional symptoms for either sex. Perceived physical appearance was negatively associated with emotional symptoms in males ($\beta = -0.41$ [0.11], $p < .05$) and negatively associated with behavioral symptoms in females ($\beta = -0.26$ [0.11], $p < .05$). Perceived physical appearance was not associated with attentional symptoms for either sex.

Table 4 shows the estimates of indirect effects by sex. Among males, disability was positively associated with emotional

Table 3 Indices of fit for the multiple-group path model.

Indices of model fit	Unconstrained model	Fully constrained model	Partially constrained model
AIC	1664.21	1662.64	1655.64
BIC	1638.60	1640.76	1632.69
χ^2 (df)	17.56 (12)	29.99 (19)	18.98 (17)
p	.130	.052	.329
RMSEA [90% CI]	0.095 [0.000–0.185]	0.106 [0.000–0.176]	0.048 [0.000–0.140]
CFI	0.965	0.932	0.988
SRMR	0.069	0.081	0.069

Note. Multiple-group path models adjusted for youth age, household income, and parent psychological distress. *AIC* = Akaike information criterion; *BIC* = Bayesian information criterion; *CFI* = comparative fit index; *CI* = confidence interval; *df* = degree of freedom; *RMSEA* = root mean square error of approximation; *SRMR* = square root mean residual.

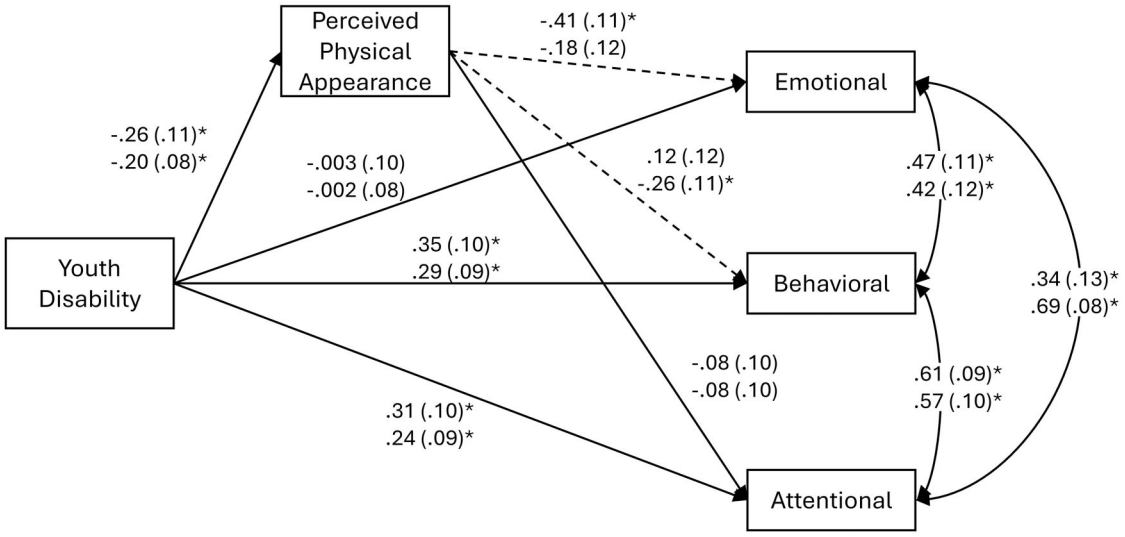


Figure 1 Multiple-group path model of the mediating effects of perceived physical appearance on the association between youth disability and psychopathology. *Note*. The multiple-group path model adjusted for youth age, household income, and parent psychological distress. All paths were constrained to be equal between sexes, except the dashed paths. Standardized path coefficients and correlations with their associated standard errors are reported for males (top) and females (bottom). *$p < .05$.

Table 4 Sex-stratified mediating effects of perceived physical appearance on the association between youth disability and psychopathology.

Sex	Outcome	$\alpha\beta$	Lower CI	Upper CI
Males	Emotional	0.11*	0.01	0.21
	Behavioral	−0.03	−0.10	0.03
	Attentional	0.02	−0.03	0.07
Females	Emotional	0.04	−0.02	0.09
	Behavioral	0.05	−0.01	0.11
	Attentional	0.02	−0.02	0.06

Note. The multiple-group path model adjusted for youth age, household income, and parent psychological distress. Standardized indirect path coefficients ($\alpha\beta$) are reported with 95% confidence intervals (CI) and were estimated using bootstrap replication ($n = 2{,}000$).
* $p < .05$.

symptoms, mediated by an increase in negative perceived physical appearance ($\alpha\beta = 0.11$ [0.01–0.21]). No other significant indirect effects were found.

Discussion

Summary of findings

Regardless of sex, elevated disability was directly associated with lower perceptions of physical appearance and elevated symptoms of behavioral and attentional symptoms of psychopathology among youth with chronic physical illness. Sex-specific differences were found such that perceived physical appearance was negatively associated with emotional symptoms for males and with behavioral symptoms for females. One indirect effect was found; perceived physical appearance mediated the association between disability and emotional symptoms for males, but not females. With this exception, hypotheses were not supported—perceived physical appearance was not a consistent mediator of the association between disability and psychopathology, and effect sizes were not larger for male versus female youth.

Discrepant findings between the current study and previous reports relate to the direct effect of disability and emotional symptoms. Recent evidence shows that disability (or related

constructs including functioning or impairment) is a robust predictor of anxiety or mood disorder in youth with or without chronic physical illness (Fearon et al., 2025b; Ferro et al., 2025; Reaume et al., 2024; Roemer et al., 2023). Discrepancies may be related to the methodological approach used in previous studies. In generating unbiased estimates of associations between disability and psychopathology, previous studies would have adjusted for potential confounding variables and avoided the inclusion of potential mediators, which would have attenuated or nullified the association between disability and psychopathology. Indeed, the current study showed that almost all the total effect of disability on emotional symptoms was a function of the indirect effect via perceived physical appearance, an effect that was statistically significant for males but not for females.

The direct effect of disability on behavioral and attentional symptoms is consistent with previous studies in youth with chronic physical illness (Ferro et al., 2025; Reaume et al., 2024). The reasons for an absence of a mediating effect of perceived physical appearance are multifaceted, and in the context of this study, speculative. Because associations between disability and behavioral or attentional symptoms are relatively large in magnitude, they may be robust against attenuation by mediation (Table S2). Likewise, it is possible that perceived physical appearance does not lie on the causal path and other processes, such as participation in social or physical activities with peers (Hwang et al., 2020; Shorey & Debby, 2020), likely exert mediating effects. It is also possible that the positive illusory bias might play a role in this finding—youth with elevated symptoms of behavioral or attentional psychopathology may disproportionately overestimate their perception of their physical appearance, which may mask its potential mediating effect (Volz-Sidiropoulou et al., 2016).

The mediating effect of perceived physical appearance is consistent with previous reports showing self-perceptions are antecedent to symptoms of anxiety and depression in the association between the presence of a chronic physical illness and psychopathology in childhood and adolescence (Cahill et al., 2021; Hards et al., 2023; Leon et al., 2024). Having a sample consisting only of youth with chronic physical illness, the current study builds on this knowledge to suggest that disability may be the mechanism linking chronic physical illness and self-perceptions, in this case, perceived physical appearance. A sample that consists of youth with and without chronic physical illness and tests a multiple-mediator model of psychopathology is warranted: physical illness → disability → self-perceptions → psychopathology. Bidirectional associations between self-perceptions and psychopathology have also been reported (Taherifard et al., 2025) and should be considered in these more complex models.

Perceived physical appearance as a mediator of the association between disability and emotional symptoms for males was likely due to the moderating effect of sex on the association between perceived physical appearance and emotional symptoms within the path model. The association between perceived physical appearance and emotional symptoms was stronger for males versus females. This finding is consistent with previous reports in samples of youth without chronic physical illness showing similar sex differences among youth in the association between perceived physical appearance or body dissatisfaction and feelings of loneliness, poorer health-related quality of life, and elevated psychological distress (Griffiths et al., 2016; Malinauskiene, 2023), though evidence is mixed (Griffiths et al., 2017; Thorup et al., 2024) and there is a dearth of evidence in samples of youth with chronic physical illness. In males with chronic physical illness, disability may be incongruent with sex/gender stereotypes of males/boys being strong and independent (Ellemers, 2018). Combined with evidence that compared to female youth, male youth are more likely to report barriers to seeking mental health services (Radez et al., 2021), these psychosocial processes may underline the indirect effect of disability and emotional symptoms via perceived physical appearance. Future investigation is needed to support or refute this hypothesis. In a related vein, this study could not examine the potential moderating effect of youth gender (sociocultural construct vs. sex, biological construct). Such research is relevant given that gender identity may better reflect the social experiences of youth (Allen et al., 2022), gender-diverse youth are more likely to report physical and mental health problems (Berkman et al., 2024; Fearon et al., 2025a; Page et al., 2026; Potter et al., 2021), and evidence suggests that effect sizes for mental health outcomes among youth are larger for comparisons across gender/sexual orientation versus comparisons between sexes (Page et al., 2026; Potter et al., 2021).

Implications

Health professionals should continue being leading advocates for promoting positive self-perceptions for youth with chronic physical illness (Ozbardakci & Lydecker, 2023) and implementing care plans to support the mental health of these youth that include interventions to improve or prevent declines in perceived physical appearance. Evidence from systematic reviews and meta-analysis suggests that interventions to promote positive body image demonstrate some effectiveness, particularly those that use psychoeducation, peer support, cognitive dissonance, or body image flexibility; however, evidence of effect among younger children, males, and youth with chronic physical illness is lacking (Brichacek et al., 2025; Guest et al., 2022). An updated systematic review suggests some evidence of psychosocial interventions that support self-esteem among youth with visible differences resulting from chronic conditions, injury, or treatment effects, though the generalizability of findings may be limited to this subgroup of youth with chronic physical illness (Waite et al., 2024). Given that perceived physical appearance is likely shaped by internal and external factors, opportunities to scale up interventions to more universal coverage (e.g., school-based targeting all children and youth) may hold promise in preventing negative self-perceptions and subsequently reducing the incidence of youth psychopathology (Granfield et al., 2025).

Limitations

Findings from the current study should be tempered in the context of some limitations. First, recruitment of participants occurred at a single pediatric hospital, which may not represent the larger population of youth with chronic physical illness including those who receive care from pediatricians or general practitioners in the community. Second, the sample size was small, and analyses were underpowered; thus, null findings may not indicate an absence of an indirect effect. Additional research

with larger and more diverse samples of youth is warranted to generate more definitive inferences. Related to the small sample size was the inability to test for youth age as a possible moderator in the context of sex differences on account of sparse data. Future research should investigate potential joint moderating effects of youth age and sex. Third, bias on account of shared-method variance from youth-reported data may overestimate measures of association; however, the use of parent reports for youth disability and psychopathology is hindered by relatively low informant agreement for these measures (Table S3) (Boyle et al., 2022; Ferro et al., 2023a). Fourth, no information about the mental health of youth prior to the diagnosis of their chronic physical illness was available in this study. It is unknown whether or how such information could influence the findings reported.

Conclusion

Among youth with chronic physical illness, disability was negatively associated with perceived physical appearance and had a direct association with behavioral and attentional symptoms of psychopathology. Sex differences were found such that the indirect effect of disability on emotional symptoms was mediated by perceived physical appearance for males but not for females. While interventions to support positive self-perceptions exist, the methodological quality of these studies is mixed, and evidence is lacking for male youth and youth with chronic physical illness. Mechanistic and intervention studies using a sex or gender lens to understand the interrelationships among disability, perceived physical appearance, and psychopathology with larger samples of youth with chronic physical illness would make valuable contributions to the research agenda.

Supplementary material

Supplementary material is available at *Journal of Pediatric Psychology* online.

Author contributions

Jenny K. Chen (Conceptualization [lead], Formal analysis [supporting], Writing—original draft [equal], Writing—review & editing [equal]), Christy K. Y. Chan (Conceptualization [supporting], Formal analysis [lead], Methodology [lead], Writing—original draft [equal], Writing—review & editing [supporting]), and Mark A. Ferro (Conceptualization [lead], Formal analysis [supporting], Funding acquisition [lead], Project administration [lead], Supervision [lead], Writing—original draft [lead], Writing—review & editing [lead])

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Conflicts of interest

We have no known conflicts of interest to disclose.

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