

Self-concept in Adolescents with Physical-Mental Comorbidity

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Abstract

Objective: Little is known about self-concept in adolescents with physical-mental comorbidity. This study investigated whether physical-mental comorbidity was associated with self-concept in adolescents and examined if adolescent age or sex moderated the association between physical-mental comorbidity and self-concept.

Methods: Study data were obtained from the Multimorbidity in Youth across the Life-course (MY LIFE), an ongoing Canadian study of adolescents with chronic physical illness who were recruited from outpatient clinics at a pediatric hospital. A total of 116 adolescents aged ≥ 10 years provided self-reports on key measures.

Results: Adolescents with comorbidity ($n = 48$) had lower self-concept scores on the Self-Determination Questionnaire (SDQ; $d = 0.62$) and Self-Perception Profile for Children (SPPC; $d = 0.53$) vs. adolescents without comorbidity ($n = 68$). An age \times comorbidity status interaction was found and age-stratified models were computed to investigate this moderating effect of age. Amongst older adolescents, comorbidity was associated with lower SDQ ($B = -2.55$, $p < .001$), but this association was not found among younger adolescents ($B = -0.29$, $p = .680$). A similar effect was found for SPPC among older ($B = -0.48$, $p = .001$) and younger adolescents ($B = 0.03$, $p = .842$). Adolescent sex was not found to be a moderator.

Conclusions: Physical-mental comorbidity in adolescence was associated with lower self-concept and this association was moderated by age—differences between adolescents with vs. without comorbidity were greater for older adolescents and were clinically relevant. Opportunities to support positive self-perceptions for adolescents with comorbidity are warranted, especially when planning the transition from pediatric to adult health services.

Keywords

Child, chronic disease, disability, mental illness, physical illness, self-esteem

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Self-concept is an important psychological construct formed by interpersonal experiences and is largely shaped by the expectations and judgements of significant others (e.g., parents, siblings, peers).¹ It comprises perceived identity and self-evaluation of characteristics relative to others across the domains of physical appearance, social acceptance, behavior, athleticism, and academic capability.² Evidence suggests that self-perceptions are modifiable, leading to changes in self-concept during child and adolescent development.³ Because young children have

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difficulty thinking abstractly about themselves, they are often unable to form complex self-representations across the domains of self-concept. This results in extremely high levels of their perceived capabilities and elevated reports of self-concept.⁴ Declines in self-concept occur during early adolescence as a result of cognitive development leading to a better awareness of the self, pubertal changes, and increased social comparisons that reveal personal shortcomings occur during early adolescence, resulting in declines in self-concept.⁵ Late adolescence sees a rebound in ratings of self-concept as individuals develop a stronger sense of identity and more refined perceptions of their capabilities.⁶ Though the natural course of self-concept is comparable across socioeconomic status, ethnicity, and nationality,³ sex and health-related differences exist in the adolescent population (e.g., males report higher self-concept compared to females across developmental periods)³ and, individuals with chronic physical illnesses (e.g., asthma, diabetes, epilepsy) report lower self-concept (i.e., steeper declines in early adolescence and no rebound in late adolescence) compared to those without physical illness.^{6,7}

The negative association between physical illness and self-concept in adolescence is salient. First, the proportion of adolescents with physical illness represents a substantial portion of the population (>25%) with evidence suggesting that the prevalence is increasing,⁸ suggesting that a growing segment of the population is at risk for poor self-concept.⁹ Second, adolescence is a time of increased risk for mental illness and this risk is amplified among adolescents with physical illness,^{10,11} leading to physical-mental comorbidity. Evidence suggests that declines in self-concept precede compromises to mental health in adolescents with physical illness.^{12,13} Given the malleability of self-concept, preventing mental illness in adolescents with physical illness or improving mental health and functioning of adolescents with physical-mental comorbidity may improve their overall long-term health trajectories.

Despite the importance of addressing physical-mental comorbidity in youth populations, very little is known about the role of self-concept in this domain among children and adolescents. A recent review suggests that self-concept is compromised in adolescents with physical-mental comorbidity, though data were limited to studies of comorbid depression and had methodological limitations.¹⁴ An early study showed that chronic pain and its intensity among adolescents was associated with lower self-perception; whereas, chronic pain-depression comorbidity was negatively associated with identity formation in the context of social development.¹⁵ Another study found that self-esteem was a risk factor for disordered eating among adolescents with type I or II diabetes, supporting the notion that declines in self-concept may precede the onset of more serious mental illness.¹³ More recently, findings from a small

clinical sample of adolescents found that global self-worth was significantly lower among those with physical-mental comorbidity vs. those with physical illness only.¹⁶

While these initial studies investigating self-concept among adolescent with physical-mental comorbidity have laid important groundwork in the field, knowledge gaps remain. With few exceptions, most studies have focused on individual physical or mental illnesses, which limits the broad generalizability of findings across adolescent populations. Often measures of impaired functioning or disability have not been included in models to understand the self-concept of adolescents with physical-mental comorbidity. This is problematic given that disability is a robust predictor of mental and psychosocial health in adolescents with physical illness.¹⁷⁻¹⁹ Further, previous studies have included self-concept as a correlate of mental comorbidity in adolescents with physical illness, as opposed to conceptualizing self-concept as a potential modifiable, person-reported outcome. In a related vein, previous studies have not considered potential moderators that augment the association between physical-mental comorbidity and self-concept.

Informed by previous research, the current study investigated whether physical-mental comorbidity was associated with self-concept in adolescents and examined the potential moderating effects of adolescent age or sex on the association between physical-mental comorbidity and self-concept. We hypothesized that adolescents with physical-mental comorbidity would have lower self-concept compared to adolescents with physical illness only and that the moderating effects of age and sex would show larger magnitudes of association between physical-mental comorbidity and self-concept for older adolescents and for male adolescents.

Materials and methods

Sample and procedure

Baseline data from the ongoing Multimorbidity in Youth across the Life-course (MY LIFE), a prospective study of children and adolescents with diagnosed physical illnesses and their parents were used in the current study.^{20,21} Recruited from outpatient clinics at a pediatric hospital in Canada, participants are being followed over 48 months (assessments at recruitment, six, 12, 24, and 48 months). To be included in the study, children and adolescents must have been between the ages of 2 to 16 years during recruitment, had parents with (and for youth aged ≥ 10 years) sufficient command of the English language to complete study measures, and been diagnosed by a physician with a chronic physical illness. An illness was 'chronic' if it was expected to be present for ≥ 12 months and result in functional limitations, dependencies to compensate for such

limitations (e.g., medication, assistive devices), or need for additional health services.

Health professionals identified eligible participants using convenience sampling of all families attending the clinic, introduced the study, and invited them to speak with research staff about participating after their medical appointment. Research staff verified eligibility and obtained written permission from eligible families who wished to be contacted further about their participation. Research staff then contacted parents to schedule a time for data collection at the hospital or family home. In rare instances, study packages were mailed. Data were collected using structured interviews and self-reported questionnaires on laptops or paper for mail packages. Parent reports were collected for all children and adolescents, and adolescents aged 10 to 16 years provided self-reports. Informed consent and assent were obtained from participants. Ethical approval for this study was obtained from the Waterloo Human Research Ethics Board (#31010) and Hamilton Integrated Research Ethics Board (#2797). The data underlying this manuscript cannot be shared publicly for the privacy of individuals that participated in the study. The data may be shared on reasonable request to the corresponding author.

There were 508 eligible families, of which 294 consented to participate and 263 were enrolled in the MY LIFE study. A total of 117 adolescents were ≥ 10 years of age and age-eligible to provide self-reports on the structured interview and questionnaires. One adolescent did not complete the structured interview and was excluded from the current study. Thus, data from 116 adolescents were included in the analysis. Adolescents in the sample had a mean age of 13.4 (SD = 2.2) years and 60 (51.7%) were male. Most adolescents were White ($n = 100$, 86.2%) and 21 (18.1%) were children of an immigrant parent. Most adolescents had parents who were married/common-law ($n = 100$, 86.2%), had completed college/university ($n = 83$, 71.6%), and reported household incomes of \$90,000/year ($n = 65$, 56.5%). Additional sample characteristics are shown in Table 1.

Measures

Mental illness. Adolescent mental illness was measured using the parent-reported version of the Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID).²² The MINI-KID is a structured clinical interview that assesses psychopathology over the past six months and is aligned with the Diagnostic and Statistical Manual of Mental Disorders (5th edition). It has been shown to be valid and reliable in clinical and population-based samples of adolescents.²³⁻²⁶ Responses are binary (no/yes), and screening questions are used for each illness module on the MINI-KID. If the screening questions are not endorsed, the module is skipped. In the current study, the MINI-KID was administered by trained research staff and the most common mental illnesses affecting adolescents were

Table 1. Characteristics of the Study Sample.

Characteristic	Mean (SD)
Youth age, years	13.4 (2.2)
Disability, WHODAS 2.0	20.3 (7.3)
Frequency (%)	
Female youth	56 (48.3)
Physical illness	
Rheumatological	36 (31.0)
Endocrine	20 (17.2)
Respiratory	17 (14.6)
Hematological	16 (13.8)
Gastroenterological	15 (12.9)
Dermatological	6 (5.2)
Neurological	6 (5.2)
Mental illness	
Major depressive episode	13 (11.2)
Generalized anxiety disorder	9 (7.8)
Separation anxiety disorder	9 (7.8)
Social phobia	3 (2.6)
Specific phobia	9 (7.8)
Attention-deficit hyperactivity disorder	6 (5.2)
Oppositional defiant disorder	3 (2.6)
Conduct disorder	0 (0.0)
Immigrant parent	21 (18.1)
Parent race	
White	100 (86.2)
Arab	5 (4.3)
Asian	3 (2.6)
Black	3 (2.6)
Other	5 (4.3)
Parent marital status	
Married/common-law	100 (86.2)
Never married/single	5 (4.3)
Separated	5 (4.3)
Divorced	4 (3.4)
Widowed	2 (1.7)
Parent educational attainment	
Primary school	4 (3.4)
Secondary school	25 (21.6)
Technical training	4 (3.4)
College/university	68 (58.6)
Graduate/professional school	15 (12.9)
Annual household income, CAD	
\leq \$44,999	28 (24.3)
\$45,000 to \$89,999	26 (22.6)
\$90,000 to 134,999	16 (13.9)
\geq \$135,000	49 (42.6)

assessed—major depressive episode, generalized anxiety disorder, separation anxiety disorder, social and specific phobias, attention-deficit hyperactivity disorder, oppositional defiant disorder, and conduct disorder.²⁷ Because all adolescents in the sample were diagnosed with a physical

illness, those who screened positive for ≥ 1 mental illness were classified as having physical-mental comorbidity. This case ascertainment strategy resulted in 68 (58.6%) adolescents without comorbidity, 26 (22.4%) with one mental illness, and 22 (19.0%) with ≥ 2 mental illnesses.

Self-concept

Two measures of adolescent-reported self-concept were used in this study. Four items from the General Self-image subscale of the Self-Description Questionnaire (SDQ) were used to measure global self-concept.²⁸ The items included were: "In general, I like the way I am."; "Overall I have a lot to be proud of."; "A lot of things about me are good."; and, "When I do something, I do it well." and have been used in national and provincial studies conducted by Statistics Canada, including the National Longitudinal of Children and Youth²⁹ and the Ontario Child Health Study.³⁰ Responses on the items use a five-point scale (1 to 5) and indicate the degree to which respondents perceive each item as true or false. Scores on the SDQ range from 1 to 20, whereby higher scores indicate more positive self-concept. The general self-image subscale of SDQ has shown evidence of robust psychometric properties across adolescent populations, including those with chronic illness.^{6,7} In this sample of adolescents, internal consistency of the SDQ-General self-image was good ($\alpha = .83$).

The Self-Perception Profile for Children (SPPC) was used to measure self-concept across the domains of scholastic competence, social competence, athletic competence, physical appearance, behavioral conduct, and global self-worth.³¹ The SPPC contains 36 items (six items per domain), whereby each item contains a positive and negative description of a trait or skill. Respondents select which of the two statements best describe them and then choose whether the selected statement was "Really true for me" or "Sort of true for me." Each item is scored on a four-point scale (1 to 4). Subscale scores for the SPPC are the mean of the six items corresponding to that domain; higher scores indicate higher perceived competence in the respective domain of self-concept. The SPPC has demonstrated strong psychometric properties in various adolescent populations.^{16,31} In this sample of adolescents, internal consistency of the subscales of the SPPC were good ($\alpha = .82$ to $.89$). For both the SDQ and SPPC, higher scores indicated more positive self-concept.

Disability

Level of adolescent disability was measured using the 12-item self-administered World Health Organization Disability Assessment Schedule (WHODAS) 2.0.³² It assessed functioning across the domains of cognition, mobility, self-care, getting along, life activities, and

participation. Preceded by the statement, "In the past 30 days, how much difficulty did you have in...", respondents rate the items using a five-point scale from "None" to "Extreme/cannot do." The composite WHODAS 2.0 score was calculated as the sum of the items, with higher scores indicating more disability.³² The WHODAS 2.0 has been shown to be valid and reliable in populations of adolescents with or without chronic illness.³³⁻³⁸ In this sample of adolescents, internal consistency of the WHODAS 2.0 was good ($\alpha = .83$).

Sociodemographics

Parents reported on relevant sociodemographic factors including adolescent age and sex, parent race, country of birth, marital status, educational attainment, and annual household income.

Statistical analysis

Scores on the SDQ-General self-image and SPPC subscales were summarized for the full study sample (Table 2) and comparisons made across subgroups characterized by number of mental illnesses experienced by adolescents. Levene's test showed that the assumption of homogeneity of variances across subgroups was violated; Welch analysis of variance was subsequently used to compare self-concept across subgroups. Where an overall effect was found, Games-Howell post hoc contrasts were applied to identify pairwise differences. Regression models, adjusted for adolescent age and sex, level of disability, and household income, were computed to generate unbiased estimates of association between comorbidity and adolescent self-concept. Models did not adjust for parental psychopathology or family environment, because of previous evidence suggesting that these factors are potential mediators of the association between physical illness and self-concept.¹² Product-term interactions between comorbidity and adolescent age and sex were included in regression models to determine if the association between comorbidity and adolescent self-concept was moderated by these factors. In the presence of a statistically significant interaction, post hoc probing of the interaction was conducted to determine the nature of the moderating effect.³⁹ All hypothesis tests were two-sided with $\alpha = .05$. Data were analyzed using IBM SPSS Statistics 28.

Results

Association of physical-mental comorbidity and self-concept

Statistically significant differences in self-concept by number of mental illnesses were found for SDQ-General self-image ($F_{2,113} = 6.12$, $p = .003$) and SPPC-Global self-

Table 2. Self-Concept Across Number of Mental Illnesses.

Domain	Number of mental illnesses				η^2 (95%CI)	$F_{2,113}$ (p value)	Contrasts
	Full sample (n = 116)	0 (n = 68)	1 (n = 26)	≥ 2 (n = 22)			
SDQ-General self-image	12.9 (2.8)	13.6 (2.3)	11.5 (3.1)	12.4 (3.2)	.10 (.01, .20)	6.12 (.003)	0 > 1
SPPC-Global self-worth	3.2 (0.5)	3.4 (0.5)	3.0 (0.5)	3.2 (0.5)	.07 (.01, .17)	4.33 (.015)	0 > 1
SPPC-Scholastic competence	2.9 (0.8)	3.0 (0.8)	2.7 (0.6)	2.8 (0.7)	.02 (.00, .09)	1.37 (.258)	
SPPC-Social competence	3.0 (0.7)	3.1 (0.7)	2.8 (0.6)	2.9 (0.7)	.03 (.00, .11)	2.00 (.140)	
SPPC-Athletic competence	2.7 (0.7)	2.8 (0.7)	2.5 (0.8)	2.7 (0.9)	.03 (.00, .10)	1.57 (.213)	
SPPC-Physical appearance	2.9 (0.8)	3.0 (0.8)	2.6 (0.6)	3.0 (0.8)	.04 (.00, .11)	2.04 (.134)	
SPPC-Behavioral conduct	3.2 (0.6)	3.3 (0.7)	3.2 (0.5)	3.1 (0.6)	.03 (.00, .10)	1.55 (.216)	

Scores on measures of self-concept are reported as mean (standard deviation). Reported Games-Howell post hoc contrasts were statistically significant ($p < .05$).

worth ($F_{2,113} = 4.33$, $p = .015$), which corresponded to medium-sized effects of $\eta^2 = .10$ and $\eta^2 = .07$, respectively (Table 2). For both measures, pairwise differences were found between adolescents without comorbidity (i.e., physical illness only) and adolescents with one mental illness ($p < .05$ for both), such that those with one mental illness had lower reported self-concept. No statistically significant differences were found for any other self-concept measure. Because there were no statistically significant differences in adolescent self-concept between those with one or ≥ 2 mental illnesses and because these two subgroups were relatively small ($n = 26$ and $n = 22$, respectively), they were aggregated for subsequent analyses. As shown in Table 3, results remained unchanged; adolescents with comorbidity ($n = 48$) had statistically significant lower self-concept for SDQ-General self-image ($t_{114} = 3.28$, $p = .001$) and SPPC-Global self-worth ($t_{114} = 2.80$, $p = .006$) compared to adolescents without comorbidity ($n = 68$). These differences indicated medium-sized effects ($d = .62$ and $d = .53$, respectively).

Moderating effects of adolescent age and sex

Consistent with unadjusted results, adolescent comorbidity was associated with statistically significant lower self-concept, as measured by the SDQ-General self-image and SPPC-Global self-worth, in models adjusting for adolescent age and sex, level of disability, and household income (Table 4). For both self-concept measures, adolescent age moderated this association [SDQ-General self-image: $B = -0.52$ (0.24) and SPPC-Global self-worth: $B = -0.12$ (0.05), $p < .05$ for both].

In post hoc probing of the moderating effect of age, it was found that among older adolescents (operationalized as ≥ 1 SD above the mean sample age), comorbidity was associated with lower SDQ-General self-image [$B = -2.55$ (0.71), $p < .001$], but not among younger adolescents [≤ 1 SD below the mean; $B = -0.29$ (0.70), $p = .680$]. A

similar effect was found for SPPC-Global self-worth among older [$B = -0.48$ (0.14), $p = .001$] and younger adolescents [$B = 0.03$ (0.14), $p = .842$]. These moderating effects are illustrated in Figure 1. No statistically significant associations with comorbidity were found for the other measures of self-concept. Adolescent sex was not found to be a moderator.

Discussion

Summary of findings

In this sample of adolescents with chronic physical illness, those with co-occurring mental illness (i.e., comorbidity) reported lower self-concept compared to adolescents with a physical illness only. This association was moderated by age, such that differences between adolescents with vs. without comorbidity were greater for older adolescents.

Findings in the context of the literature and implications

Findings were consistent with previous studies examining self-concept in adolescents with physical-mental comorbidity.¹³⁻¹⁵ Compromises to adolescent self-concept were not directed within specific domains of self-perception, which supports the pervasive nature of comorbidity having a broader negative impact on self-concept (e.g., general self-image, global self-worth). Indeed, the effect size for the difference in the SDQ-General self-image between adolescents with vs. without comorbidity was similar to that reported previously of the comparison between adolescents with vs. without physical illness using the same measure.⁷ While evidence has shown that these generalized perceptions of the self are correlated with different domains of self-concept,^{16,31} no domain-specific differences were found, and no domain appears to be driving differences in overall self-concept between

Table 3. Self-Concept by Comorbidity Status.

Domain	Not multimorbid (n = 68)	Multimorbid (n = 48)	d (95% CI)	t ₁₁₄ (p value)
SDQ-General self-image	13.6 (2.3)	11.9 (3.1)	.62 (.24, .99)	3.28 (.001)
SPPC-Global self-worth	3.4 (0.5)	3.1 (0.5)	.53 (.15, .90)	2.80 (.006)
SPPC-Scholastic competence	3.0 (0.8)	2.8 (0.7)	.31 (-.06, .68)	1.65 (.102)
SPPC-Social competence	3.1 (0.7)	2.8 (0.6)	.37 (-.01, .74)	1.97 (.052)
SPPC-Athletic competence	2.8 (0.7)	2.6 (0.8)	.29 (-.09, .66)	1.52 (.131)
SPPC-Physical appearance	3.0 (0.8)	2.8 (0.7)	.27 (-.11, .64)	1.41 (.163)
SPPC-Behavioral conduct	3.3 (0.7)	3.1 (0.6)	.31 (-.06, .68)	1.66 (.100)

Scores on measures of self-concept are reported as mean (standard deviation). The multimorbid group includes adolescents with ≥ 1 mental illness.

adolescents with vs. without comorbidity. Instead, it can be speculated that minor differences within specific domains accumulate to larger differences in overall self-concept. This is noteworthy given previous reports suggesting individuals with mental illness often report deficits in academic, behavioral, and social outcomes during adolescence and into adulthood.^{16,40} Notwithstanding, findings from this study suggest that integrated physical and mental health services for adolescents with comorbidity should incorporate opportunities to improve or maintain self-concept broadly, whereas domain-specific targets should be considered on a case-by-case basis. Given evidence that overall and domain-specific self-concept are often strongly correlated, it is reasonable to anticipate that interventions aimed at overall self-concept will likely result in improvements across domains; this would require evaluation.

In this sample of adolescents, the phenomena of the *positive illusory bias* or *disability paradox* may also explain the lack of differences in domain-specific self-concept comparisons. The disability paradox posits that having a chronic illness—physical or mental—does not necessarily imply, despite the perception of others, that an individual views their life negatively.⁴¹ The positive illusory bias describes the discrepancy between self-reported perceptions of competence and actual competence, as reported by another informant or objective measure, with self-perceptions being higher than actual competence.⁴² Though much evidence supporting the positive illusory bias is rooted in studies of self-concept in children with attention-deficit hyperactivity disorder,⁴³ recent evidence suggests this bias may explain discrepancies in other psychosocial health outcomes, including health-related quality of life, in adolescents with physical illness, mental illness, or comorbidity.⁴⁴ Additional work is needed to quantify the magnitude of the positive illusory bias in the context of adolescent comorbidity with multiple informants and objective measures of domain-specific competence (e.g., report cards or standardized tests as indicators of scholastic competence). Understanding the extent to which the positive illusory bias is clinically relevant is essential to evaluating outcomes in this population of adolescents.

It is also possible that adolescents in this study, given their experience of living with a physical illness, adapted positively to the additional challenges of having comorbidity and thus did not report compromises in domain-specific self-concept. These adolescents may have already established supportive resources to maintain a relatively positive self-concept or have also acquired the cognitive flexibility needed to adapt to ever-new challenges. A similar finding was reported in a sample of adolescents with comorbidity who were currently receiving mental health services.⁴⁵ In that study, adolescents with comorbidity did not have poorer health-related quality of life compared to adolescents with mental illness only; in fact, adolescents with comorbidity reported better family functioning, which resulted in shorter lengths of stay in hospital. It is also noteworthy that adolescents in the current study were mostly White and typically had families of higher socioeconomic status, and thus may have access to supports that buffer the negative impact of physical illness on self-concept compared to adolescents from socioeconomic disadvantaged, racialized, or other marginalized populations.

Larger differences in self-concept among older adolescents are consistent with previous reports from longitudinal studies of self-concept and symptoms of depression in which trajectories for adolescents with vs. without physical illness diverge at approximately 14 years of age.^{6,11} For instance, Ferro & Boyle (2013b) reported that differences in self-concept between adolescents with vs. without physical illness increased from $d = 0.80$ at 10 years of age to $d = 1.27$ at 19 years of age. From a developmental perspective, adolescence is the period in which individuals begin to think more critically and abstractly about themselves, and experience stronger peer influences and comparisons. The development of self-concept during adolescence, which typically follows a declining trajectory,^{3, 5} may be more pronounced among older adolescents with comorbidity as they evaluate themselves in the context of their illnesses and in relation to their healthy peers.

The implications of larger differences among older adolescents bear clinical relevance. First, the difference in the

Table 4. Regression Models of Physical-Mental Comorbidity and Self-Concept.

Variable	SDQ General self-image		SPPC Global self-worth		SPPC Scholastic competence		SPPC Social competence		SPPC Athletic competence		SPPC Physical appearance		SPPC Behavioral conduct	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Multimorbid	-1.40 (0.50)	5.30 (3.21)	-0.22 (0.10)	1.35 (0.65)	-0.14 (0.14)	0.85 (0.92)	-0.24 (0.13)	0.83 (0.83)	-0.19 (0.14)	0.72 (0.88)	-0.23 (0.14)	1.05 (0.92)	-0.10 (0.11)	0.42 (0.73)
Age, years	-0.24 (0.11)	-0.04 (0.14)	-0.02 (0.02)	0.03 (0.03)	0.04 (0.03)	0.07 (0.04)	0.00 (0.03)	0.03 (0.04)	-0.03 (0.03)	-0.01 (0.04)	-0.10 (0.03)	-0.07 (0.04)	0.08 (0.03)	0.10 (0.03)
Female	-0.48 (0.48)	-0.69 (0.62)	-0.04 (0.10)	-0.05 (0.13)	-0.15 (0.14)	-0.27 (0.18)	-0.21 (0.12)	-0.23 (0.16)	-0.37 (0.13)	-0.27 (0.17)	-0.24 (0.14)	-0.24 (0.18)	0.31 (0.11)	0.25 (0.14)
Income	0.10 (0.06)	0.09 (0.06)	0.02 (0.01)	0.02 (0.01)	0.04 (0.07)	0.04 (0.07)	0.02 (0.02)	0.02 (0.02)	0.06 (0.02)	0.06 (0.02)	0.01 (0.02)	0.00 (0.02)	0.01 (0.01)	0.01 (0.02)
Disability	-0.08 (0.03)	-0.09 (0.04)	-0.02 (0.01)	-0.02 (0.01)	-0.02 (0.01)	-0.02 (0.01)	-0.10 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)	0.00 (0.01)	-0.00 (0.10)	-0.02 (0.01)	-0.02 (0.01)
CM × age		-0.52 (0.24)		-0.12 (0.05)		-0.08 (0.07)		-0.08 (0.06)		-0.06 (0.06)		-0.10 (0.07)		-0.04 (0.05)
CM × sex		0.65 (0.98)		-0.02 (0.20)		0.28 (0.28)		0.02 (0.25)		-0.27 (0.27)		-0.02 (0.28)		0.15 (0.22)

Data are reported as unstandardized regression coefficients, B (standard error). Results in bold are statistically significant ($p < .05$). CM, comorbidity.

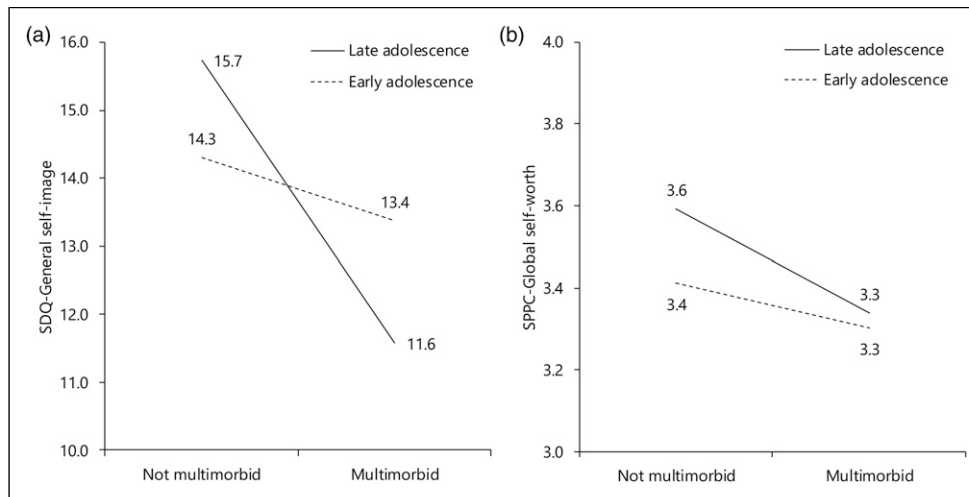


Figure 1. Moderating Effect of Adolescent Age on the Association Between Physical-Mental Comorbidity and Self-Concept. Panel A (left) shows the moderating effect of age on the SDQ-General self-image, and Panel B (right) on the SPPC-Global self-worth. For visual clarity, early and late adolescence was defined as below and above one standard deviation of the mean sample age, respectively.

SDQ-General self-image scale was substantially greater than typical metrics of minimal clinically important differences reported for psychosocial outcomes.⁴⁶ Thus, as a modifiable psychological construct that is antecedent to more serious psychopathology,^{12,47,48} low adolescent self-concept should be viewed as a mental health indicator for health professionals. Second, given the timing of these differences, transition planning from pediatric to adult health services should incorporate modules that aim to strengthen self-concept of adolescents with comorbidity. Transition planning, which often begins earlier in adolescence (e.g., 12-13 years) has been shown to be associated with better health outcomes for adolescents and families,⁴⁹ and if modules directed at self-concept are implemented upstream, disproportionate declines for adolescents with comorbidity may be mitigated. Indeed, self-concept modules within transition planning should be a core component of integrated health services.⁵⁰ In this context, interventions to support positive self-concept for adolescents with physical illness may serve to disrupt causal pathways leading to declines in mental health.

Study limitations

The relatively homogeneous sample of adolescents, recruited from a single pediatric hospital, may limit the generalizability of the findings. The cross-sectional data prevents inferences of causation and reverse causality is possible (i.e., lower self-concept may lead to the development of mental illness in adolescents). While the moderation analyses were adequately powered for the SDQ-General self-image ($1 - \beta = .97$) and SPPC-Global self-worth ($1 - \beta = .86$) models, those for the SPPC domains were underpowered ($1 - \beta = .30$ to $.53$).⁵¹

Relatedly, measurement error is always a concern when using self-reported assessments. Use of structural equation modelling, which accounts for this error, was not possible given the sample size requirements for estimating the > 80 parameters in such a model. The absence of a healthy control group (i.e., adolescents without physical or mental illness) or those with a mental illness only prevented the opportunity to examine self-concept across different morbidity groups. While, general population estimates of the SDQ and SPPC are available from the time these measures were developed, the use of normative data in comparisons of self-concept in children with chronic illness may result in biased estimates and is not recommended.⁹

Conclusions

We identified that physical-mental comorbidity in our sample was associated with lower self-concept and this association was moderated by age—differences between adolescents with vs. without comorbidity were greater for older adolescents and can be considered clinically relevant. Opportunities to assess self-concept and support positive self-perceptions for adolescents with comorbidity are warranted, especially when planning the transition from pediatric to adult health services.

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