

# Annual Research Review: Health anxiety in children and adolescents—developmental aspects and cross-generational influences

Charlotte Ulrikka Rask,<sup>1,2</sup> Charlotte Steen Duholm,<sup>1,2</sup> Cecilie Müller Poulsen,<sup>3</sup>  
Martin Køster Rimvall,<sup>4,5</sup>  and Kristi D. Wright<sup>6</sup>

<sup>1</sup>Department of Child and Adolescent Psychiatry, Aarhus University Hospital Psychiatry, Aarhus, Denmark; <sup>2</sup>Department of Clinical Medicine, Aarhus University, Aarhus, Denmark; <sup>3</sup>Department of Medicine, Aalborg University Hospital, Thisted, Denmark; <sup>4</sup>Department of Child and Adolescent Psychiatry, Copenhagen University Hospital – Psychiatry Region Zealand, Roskilde, Denmark; <sup>5</sup>Child and Adolescent Mental Health Center, Copenhagen University Hospital – Mental Health Services CPH, Copenhagen, Denmark; <sup>6</sup>Department of Psychology, University of Regina, Regina, SK, Canada

Health anxiety involves excessive worries about one's health along with beliefs one has an illness or may contract a serious disease. Concerning evidence suggests that health anxiety is on the rise in society, possibly further fueled by the COVID-19 pandemic. Recent classification systems acknowledge that impairing health-related worries and beliefs can emerge in early childhood with significant levels of symptoms persisting throughout childhood, and possibly continuous with diagnostic considerations in adulthood. This narrative review summarizes recent research advances in health anxiety in children and adolescents, focusing on various developmental aspects of health anxiety and related concepts in youths. Findings suggest that health anxiety symptoms in young age groups are associated with impairment, distress, and increased healthcare use, as well as substantial comorbidity with mainly other emotional problems and disorders. Furthermore, longitudinal studies suggest that childhood health anxiety can persist across adolescence, perhaps with links to chronic courses in adulthood. The growing literature was further reviewed, thus extending our understanding of early risk factors, including the potential role of exposure to serious illness and transgenerational transmission of health anxiety. Learning more about developmental trajectories will be highly relevant to inform strategies for early detection and prevention. While modified cognitive behavioral therapies in adults are successful in treating health anxiety, specific interventions have not yet been tested in youths. Given substantial overlaps with other psychopathology, it could be important to develop and explore more transdiagnostic and scalable approaches that take advantage of common factors in psychotherapy, while also including a wider perspective on potential familiar maladaptive illness cognitions and behaviors. **Keywords:** Adolescent; child; health anxiety; hypochondriasis; illness anxiety; illness phobia; illness worries; review; transgenerational transmission.

## Introduction

The current review focuses on the growing evidence base regarding health anxiety in children and adolescents and developmental aspects of a growing societal problem. To appreciate the importance and scope of health anxiety in youths, an understanding of the seminal on adults is first warranted.

Health anxiety refers to excessive worries about one's present or future health and differs from developmentally normative or stress-induced transient health worries by being marked and persistent with impairment in daily functioning (Asmundson, Abramowitz, Richter, & Whedon, 2010). In adult literature, the distress is described not to be due to physical symptoms but related to anxious ruminations about their disease implications (Fink et al., 2004) and with the perception of normal bodily signals and symptoms as intense, disturbing, and noxious (Barsky, 1979). There is often a strong obsessional component with selective attention on

symptoms (hypervigilance), their cause, and how to alleviate them (Warwick & Salkovskis, 1990). These challenges are typically accompanied by excessive body-checking and medical reassurance, but in some cases also the opposite with avoidance of healthcare contacts and activities that may trigger symptoms or thoughts of illness (Tyrer, 2018). In several adult studies, health anxiety is shown to be an important mental disorder to recognize and treat in clinical practice due to its many negative effects on quality of life, social, and occupational functioning, healthcare resource utilization, as well as increased risk of somatic morbidity and mortality over time (Berge et al., 2016; Bleichhardt & Hiller, 2007; Kikkenborg Berg, Caspar Thygesen, Hastrup Svendsen, Vinggaard Christensen, & Zwisler, 2014; Tolmunen, Lehto, Julkunen, Hintikka, & Kauhanen, 2014; Van Beek et al., 2016).

## Diagnostic classification

Health anxiety is not included as a term in ICD or DSM, but in clinical practice it has been customary

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to assign severe health anxiety by the formal diagnosis of ‘hypochondrial disorder’ in ICD-10 (World Health Organization, 1993) or ‘hypochondriasis’ in the former DSM-IV (American Psychiatric Association, 2000). Hypochondriasis lies at the crossroads of three diagnostic categories, showing overlap with both somatoform disorders (now named somatic symptom and related disorders in DSM-5; American Psychiatric Association, 2013), anxiety disorders, and obsessive-compulsive-related disorders (OCD). In the DSM-5, the diagnosis of hypochondriasis has been replaced by two new diagnostic entities: somatic symptom disorder and illness anxiety disorder. Both diagnoses share high health anxiety as a common criterion, but additional somatic symptoms are only required for the former but not the latter (American Psychiatric Association, 2013). However, a subsequent empirical study did not support this splitting of health anxiety/hypochondriasis into two diagnoses (Bailer et al., 2016). The new ICD-11 classification (World Health Organization, 2019) emphasizes the stronger tie with ORCD by placing hypochondriasis in this category (Stein et al., 2016; see Table 1 for the main features of the different diagnoses).

Given the stigmatizing connotations suggesting that hypochondriasis is imaginary and that those inflicted only seek emotional comfort (Kellner & Schneider-Braus, 1988), health anxiety has been proposed as a more appropriate term and will therefore be used interchangeably with hypochondriasis throughout this paper.

### Can health anxiety have its onset in childhood?

Health-related worries are commonly reported by children and adolescents (Silverman, La Greca, & Wasserstein, 1995; Weems, Silverman, & La Greca, 2000) and in recent years there is growing evidence that health anxiety may have its onset in childhood. However, the conceptualization and status of health anxiety as an independent diagnostic entity in young people is still debated (American Psychiatric Association, 2013; World Health Organization, 1993). Research has suggested cross-generational impact with links between health anxiety in children and parents where pathways and mechanisms underlying these links may involve both genetic inheritance and behavioral systems (Taylor, Thordarson, Jang, & Asmundson, 2006; Thorgaard, Frostholm, & Rask, 2018). Also, the early preoccupation with physical symptoms and illness may be influenced by other systematic factors such as information about health threats from the media and authorities (Haig-Ferguson, Cooper, Cartwright, Loades, & Daniels, 2021). A further understanding of the developmental aspects of the psychopathology of health anxiety could therefore be of critical importance to inform early prevention and treatment.

## Aim of current review

This review aims to provide a concise summary of major avenues of current research in health anxiety in children and adolescents, including developmental aspects, associations with other types of psychopathology and the potential role of intergenerational transmission with a clinical notion of research on parents who display health anxiety toward their children. Also, the societal impact of health anxiety in young people, exemplified by research on cyberchondria and health anxiety in children and adolescents in the context of the COVID-19 pandemic will be presented. Finally, suggestions for potential preventive and treatment strategies as well as future directions for research in this area will be presented.

## Methods

### Literature search

A literature search was performed in Medline (PubMed), Embase (Elsevier), PsycInfo (ProQuest), and Cinahl (Ebsco) on September 16, 2022. We included all original papers (published in English between 1985 and the search date) that focus broadly on research on health anxiety in children and adolescents. A search strategy using full text and MeSH terms for PubMed was devised and adapted for the other databases. The terms used in PubMed were: “Hypochondriasis”[Mesh] OR Hypochondria\* OR “somatic symptom disorder” OR “illness anxiety disorder” OR “hypochondria\*” OR “illness phobi\*” OR “disease phobi\*” OR “health anxiety” OR “illness worr\*” AND “child” OR “children” OR pediatric\* OR pediatric\* OR adolescent\* OR schoolchild\* OR youth\* OR “Child”[Mesh] OR “Adolescent”[Mesh] OR “Pediatrics”[Mesh]. For the complete search strategy, see Appendix S1.

### Selection of references

Title and abstract of each retrieved reference were screened by two review team members independently (CSD and CMP) to identify relevant papers. These were included according to very wide criteria: (a) original data on children and/or adolescents; (b) investigation of health anxiety or related concepts/disorders such as hypochondriasis, illness phobia, disease phobia, illness anxiety disorder, or somatic symptom disorder, and (c) studies reported in English, Danish, Swedish, or Norwegian. Disagreements were solved by consensus, if necessary, by involving a third review author (CUR). More specifically, a total of 1835 possible papers of relevance were retrieved which after abstract screening gave 73 papers for full text screening and finally 22 papers included. A reference search of all included papers as well as relevant reviews retrieved by the database searches was examined to identify any further papers. Thus, additional 14 papers were identified.

The final 36 papers concerned three studies on diagnostics, five studies on assessment methods, 6 studies on epidemiology, 11 studies on co-occurring mental and physical symptoms, 6 studies on societal consequences and influences, 4 studies on intergenerational transmission, and 1 study on treatment. The complete flowchart for inclusion of original papers is shown in Appendix S2.

### Data analysis

As not enough studies with comparable designs were available to perform meta-analysis, data were systematically reviewed

**Table 1** Health anxiety (hypochondriasis) in ICD-10, DSM-5, and ICD-11

	ICD-10	DSM-5	ICD-11
Category	Somatoform disorders	Somatic symptom and related disorders	Obsessive-compulsive or related disorders
Name	Hypochondriacal disorder (F45.2)	Illness anxiety disorder (300.7)	Hypochondriasis (6B23)
Central features	(A) Persistent belief in the presence of at least one serious physical illness underlying the presenting symptom(s), even though repeated investigations and examinations have identified no adequate physical explanation or: Persistent preoccupation with a presumed deformity or disfigurement (B) Persistent refusal to accept the advice and reassurance of several different doctors that there is no physical illness or abnormality underlying the symptoms	(A) Preoccupation with having or acquiring a serious illness (B) Somatic symptoms are not present or, if present are only mild in intensity. If another medical condition is present or there is a high risk for developing a medical condition, the preoccupation is clearly excessive or disproportionate (C) High level of anxiety about health, and the individual is easily alarmed about personal health status (D) Excessive health-related behaviors or maladaptive avoidance (E) Symptom duration at least 6 months (F) Not better explained by another mental disorder	(A) Persistent preoccupation or fear about the possibility of having one or more serious, progressive, or life-threatening illnesses. (B) The preoccupation is accompanied by either: Repetitive and excessive health-related behaviors, such as repeatedly checking of the body for evidence of illness, spending inordinate amounts of time searching for information about the feared illness, repeatedly seeking reassurance (e.g., arranging multiple medical consultations); or Maladaptive avoidance behavior related to health (e.g., avoids medical appointments). (C) The symptoms result in significant distress or significant impairment in personal, family, social, educational, occupational, or other important areas of functioning. If functioning is maintained, it is only through significant additional effort Fair to good insight Poor to absent insight
Specifiers		Care-seeking type Care-avoidant type	With predominant pain Persistent (>6 months) Mild/moderate/severe

using a narrative approach (a table with an overview of the included studies is available in the Appendix S3). Furthermore, we supplemented with parallel literature on anxiety disorders and general worry in children and adolescents as well as original papers on health anxiety from the adult literature when relevant for the individual sections due to scarcity of specific research in health anxiety in children and adolescents, for example, in the sections on intergenerational transmission, societal impact and treatment.

## Results

### Developmental aspects

*Childhood worry in general.* Studies on developmental patterns of childhood worry indicate that worrisome thoughts become increasingly prominent in children after the age of 7 as their ability to reason about future possibilities to consider multiple-threatening outcomes and to elaborate potential negative consequences dramatically increases (Vasey & Daleiden, 1994). Generally, the prevalence and types of worries increases with child age with females tending to report higher levels of worry compared to males across the age range (Chorpita, Tracey, Brown, Collica, & Barlow, 1997; Silverman et al., 1995). The worries can become excessive, uncontrollable, and associated with distress fulfilling the criteria for a genuine anxiety disorder (e.g., generalized anxiety disorder (GAD) or separation anxiety disorder) in approximately 6.5% of children worldwide (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015). The content of worries is wide ranging (Muris, Merckelbach, Gadet, & Moulart, 2000; Vasey & Daleiden, 1994; Weems et al., 2000) and typically pertain to school and disasters, but health, fear of dying, and harm to one self or others are also common themes in both nonclinical and clinical samples of children (Muris et al., 2000; Muris, Meesters, Merckelbach, Sermon, & Zwakhalen, 1998; Silverman et al., 1995). However, especially younger children may not to the same degree as adults be capable of articulating the content of their fears, or the focus of their apprehension, making it difficult to assess the difference between symptoms of health anxiety and other types of worries (Muris, Merckelbach, Meesters, & van den Brand, 2002; Vasey, Crnic, & Carter, 1994). Furthermore, in most studies health-related worries have been investigated as part of childhood GAD rather than as a distinct health anxiety disorder (Kertz & Woodruff-Borden, 2011; Songco, Hudson, & Fox, 2020; Weems et al., 2000). Still, some child studies suggest that health-related concerns and behaviors can in their own right be associated with significant distress and impairment (Eminson, Benjamin, Shortall, Woods, & Faragher, 1996; Rask et al., 2016; Wright & Asmundson, 2003; see also the later section on epidemiology). This is corroborated by a recent population-based study showing that among adolescents with high self-report of

health anxiety (10.4%), almost half (4.6%) only reported this type of anxiety symptoms whereas the remaining 5.8% also reported high scores of other types of anxiety symptoms (Duholm et al., 2023a). Furthermore, the study established through latent profile analysis that health anxiety could co-occur with different types and combinations of anxiety phenomena (GAD, separation anxiety, social phobia, obsessive-compulsive disorder (OCD), fear of physical injury, agoraphobia). Overall, these results indicate that health anxiety in this age group should not only be seen as a phenomenon co-occurring with GAD but also other anxiety disorders as well as be recognized as a separate construct.

*Diagnostic considerations.* In the ICD and DSM classification systems health anxiety categorized as hypochondriasis (or the newer corresponding diagnoses) is described with onset primarily in adulthood and to be rare in childhood and adolescence (American Psychiatric Association, 2000; Schulte & Petermann, 2011a, 2011b; World Health Organization, 1993, 2019). Correspondingly, children and adolescents have been reported to rarely meet these diagnostic criteria (Bisht, Sankhyan, Kaushal, Sharma, & Grover, 2008; Essau, Conradt, & Petermann, 1999; Lieb, Pfister, Mastaler, & Wittchen, 2000). Still, a medical record review on 126 adult patients diagnosed with severe health anxiety, found that 32% (95% CI: 24–41) of participants reported onset of excessive illness worries before age 18, and among these a mean age at symptom onset of 11.6 years (SD 4.0, range: 5–17; Nyengaard, Frostholm, & Rask, 2023). These results corroborate other retrospective studies on adults suffering from hypochondriasis with self-reports of health anxiety precursors early in life (Fink et al., 2004; Noyes et al., 2002). A likely explanation behind the low prevalence of hypochondriasis in younger populations is therefore that the diagnostic criteria do not reflect the developmental aspects of health-related worries in young age groups rather than the disorder being uncommon in children and adolescents as such (Fritz, Fritsch, & Hagino, 1997). Furthermore, maladaptive health-related behaviors will typically involve reassurance seeking from caregivers, rather than from healthcare professionals (Wright & Asmundson, 2003). The key clinical features with excessive health concerns, and preoccupation with symptoms and illness in childhood and adolescence, might also be difficult to isolate from the beliefs and psychosocial functioning of the parents, especially in very young children (Muris et al., 2002; Vasey et al., 1994). Indeed, it has been shown that children whose parents suffer from somatoform disorders make more use of healthcare services (Levy et al., 2004) and that the mother's previous healthcare use is a stronger predictor of the child's healthcare use than the child's concurrent somatic complaints (Janicke, Finney, & Riley, 2001). Also, children with



unspecific recurrent abdominal pain are likely to represent serious outcomes to health scenarios while their mothers also display higher levels of health anxiety and rate their children as having more physical symptoms and anxiety as compared to children without abdominal pain (Ramchandani, Murray, Romano, Vlachos, & Stein, 2011). Hence, parents' perceptions of their child's symptoms, and willingness to tolerate these symptoms, are likely to predict the child's actual healthcare attendance. Medical reassurance in children will therefore be contingent upon caregivers, and not necessarily representative of the child's own concerns. Recent research on these transgenerational aspects of health anxiety will be further discussed in a later section.

### Assessment methods

Currently, only few measures to assess health anxiety and related concepts in young persons exist (see Table 2).

**Child measures.** In 2003, the *Childhood Illness Attitude Scales*, the first specific measure to assess health anxiety in school-aged children (8–14 years) was developed (Wright & Asmundson, 2003). This measure is a modified version of the *Illness Attitude Scales*, which is an often-used measure of health anxiety in adults (Sirri, Grandi, & Fava, 2008). The adaptations included modification to age-appropriate language, a simplified rating scale, and seven additional items to evaluate child help-seeking behavior from parents regarding medical attention or treatment. The *Childhood Illness Attitude Scales* demonstrated good preliminary psychometric properties (Wright & Asmundson, 2003), which were examined further in additional studies (Delparte et al., 2015; Rask et al., 2016; Thorisdottir et al., 2017; Wright & Asmundson, 2005). Subsequent research on the factor structure on a large sample showed that a revised 3-factor structure with 21 items (fears = 11 items, help-seeking = 6 items, and symptom effects = 4 items) displayed a better fit compared to the original four-factor model (Delparte et al., 2015; Thorisdottir et al., 2017). This version was also found appropriate to use across sexes (Thorisdottir et al., 2017).

**Adolescent measures.** The *Short Health Anxiety Inventory* and the *Whiteley-6-R* (Carstensen et al., 2020) can also be valid options for assessment in older adolescents. The *Short Health Anxiety Inventory* is designed to assess fear of illness and negative consequences from illness (Salkovskis, Rimes, Warwick, & Clark, 2002). A meta-analysis of the psychometric properties concluded that the instrument can reliably assess health anxiety across adult samples (Alberts, Hadjistavropoulos, Jones, & Sharpe, 2013) and the Spanish version has been validated in adolescents (Morales, Espada, Carballo, Piqueras, & Orgilés, 2015). Adolescent females showed higher levels of fear of disease and health anxiety, but no age-related differences were found. The other measure, *Whiteley-6-R*, focuses on the cognitive construct of health anxiety, that is, excessive illness worry with a new item on obsessive illness rumination included. This measure has recently been validated in both adults and adolescents (Carstensen et al., 2020; Duholm et al., 2023b).

**Assessment of related concepts.** Two newly developed measures have been designed to assess health anxiety-related concepts of potential relevance for intergenerational transmission (see later section on this subject). The *Health Anxiety by Proxy scale* is a de novo developed measure to assess parents' self-reported worries about their child's health (Ingeman et al., 2021). It covers thoughts, feelings, and behaviors that are characteristic of health anxiety by proxy and with an additional impact section. Good face and content validity has been established and further validation supports its psychometric properties with excellent internal and test-retest reliability, convergent validity with the construct of parental catastrophizing and good discriminative validity with higher scores observed in parents diagnosed with health anxiety compared to parents with diagnoses of functional somatic syndromes and healthy parents, respectively (Ingeman et al., 2022). Finally, the *Fetal Health Anxiety Inventory*, based on the *Short Health Anxiety Inventory*, specifically assesses the anxiety an expectant mother may experience regarding her developing fetus (Reiser & Wright, 2019).

**Table 2** Measures for assessment

Child	Measure	Age group	No. of items
Health anxiety	Short Health Anxiety Inventory (SHAI) (Salkovskis et al., 2002)	Adolescents	18
	The Whiteley-6-Revised (Whiteley-6-R) (Carstensen et al., 2020)	Adolescents	6
	Childhood Illness Attitude Scales-Revised (Thorisdottir et al., 2017)	Children and adolescents	21
<b>Parent</b>	<b>Measure</b>		<b>No. of items</b>
Health anxiety by proxy	Health Anxiety by Proxy scale (HAPYS) (Ingeman et al., 2021)		26 + 6 impact items
Fetal health anxiety	Fetal Health Anxiety Inventory (FHAI) (Reiser & Wright, 2019)		14

## Epidemiology

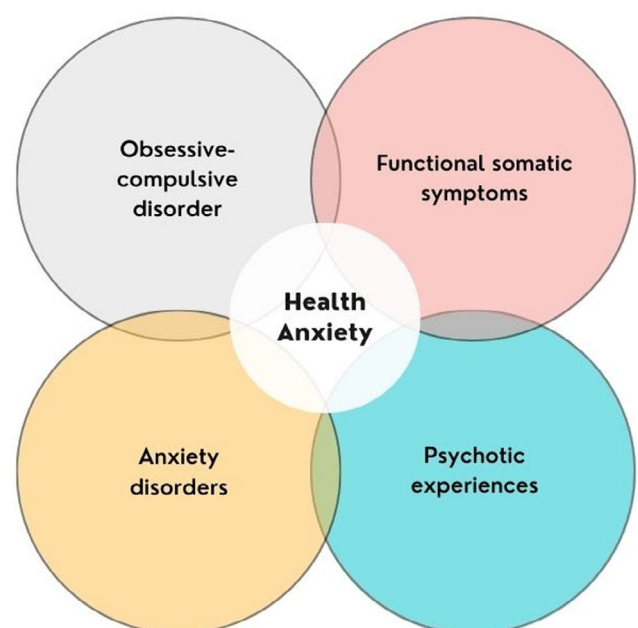
Burgeoning research using mainly self-report measures suggests that illness worries are very commonly experienced by children and adolescents (Delparte et al., 2015; Eminson et al., 1996; Köteles, Freyler, Kökönyei, & Bárdos, 2015; Marshall, Jones, Ramchandani, Stein, & Bass, 2007; Rask et al., 2016; Rask, Elberling, Skovgaard, Thomsen, & Fink, 2012; Sirri, Ricci Garotti, Grandi, & Tosani, 2015; Wright & Asmundson, 2003, 2005; Wright, Reiser, & Delparte, 2017). In a sample of adolescents, health anxiety symptoms were reported by 15.7% of the participants (Sirri et al., 2015). Similar results were found in a study on the population-based Copenhagen Child Cohort CCC2000 where 17.6% of 5–7-year-old children according to parental reports displayed health anxiety symptoms and 2.4% were determined to have considerable health anxiety symptoms (Rask et al., 2012). Within the same cohort, 1,278 youths were later followed during childhood and adolescence and assessed for health anxiety, chronic somatic illnesses (e.g., epilepsy, diabetes), emotional disorders (e.g., depression, anxiety) and functional somatic symptoms at age 11 (Rask et al., 2016), and health anxiety again at age 16 (Rimvall et al., 2021). The results showed that girls and children with a chronic somatic illness at age 11 were at the highest risk of health anxiety at age 16, after accounting for all other age-11 measures, while persistence of high health anxiety levels from childhood into adolescence was quite rare (1.3%; Rimvall et al., 2021).

Whereas most research on health anxiety in adults report no age or sex differences (Barsky, Wyshak, Klerman, & Latham, 1990; Martin & Jacobi, 2006; Weck, Richtberg, & Neng, 2014) findings on children and adolescents suggest females reporting more health anxiety symptoms compared with males both in preadolescence (Rask et al., 2016) and adolescence (Bahrami & Yousefi, 2011; Eminson et al., 1996; Morales et al., 2015; Sirri et al., 2015; Wright, Lebell, & Carleton, 2016). The study on adolescents by Eminson and colleagues also reported increasing illness worries with increasing age, and that the gap in health anxiety reporting between females and males became more prominent with age (Eminson et al., 1996) which corroborates findings on age and sex differences in childhood worry in general (Kertz & Woodruff-Borden, 2011). However, other studies report no significant age-related differences (Freyler, Kohegyi, Köteles, Kökönyei, & Bárdos, 2013; Morales et al., 2015; Sirri et al., 2015) whereas a recent study (Duholm et al., 2023b) established that in a group of adolescents only reporting health anxiety symptoms without other anxiety symptoms, 84.7% were females. These mixed findings call for further research to establish if there are indeed age- and sex-related differences for health anxiety presentation early in life.

## Comorbidities and co-occurring mental and physical symptoms

Research in adults exhibits comorbidity between health anxiety and other disorders, especially with anxiety disorders, depression, and obsessive-compulsive disorder (Abramowitz, Olatunji, & Deacon, 2007; Barsky, 1992; Deacon & Abramowitz, 2008; Greeven, Van Balkom, Van Rood, Van Oppen, & Spinhoven, 2006; Hedman et al., 2017; van den Heuvel, Veale, & Stein, 2014; Lee, Lam, Kwok, & Leung, 2014; Noyes, 1999; Olatunji, Deacon, & Abramowitz, 2009; Scarella, Laferton, Ahern, Fallon, & Barsky, 2016; Sunderland, Newby, & Andrews, 2013; Weck, Bleichhardt, Witthöft, & Hiller, 2011). In children and adolescents, cross-sectional studies have also demonstrated that health anxiety co-occurs with other psychopathology such as various types of anxiety symptoms (Williams & Hollis, 1999), functional somatic symptoms and OCD as well as psychotic experiences and behavioral disturbances (Duholm, Højgaard, Skarphedinsson, Thomsen, & Rask, 2021; Köteles et al., 2015; Rask et al., 2012, 2016; Rimvall et al., 2019; Selles et al., 2021; Villadsen et al., 2017; Wright et al., 2016; Wu et al., 2017; See Figure 1).

*Health anxiety and other anxiety disorders.* The CCC2000 study on 5–7-year-old children found that considerable health anxiety symptoms were significantly associated with other types of internalizing problems (Rask et al., 2012) and in a later study on 11–12-year-olds to both other types of anxiety (i.e., separation anxiety, social phobia, specific phobia, GAD, and panic anxiety/agoraphobia) and depressive disorders, PTSD and OCD (Rask et al., 2016). These



**Figure 1** Venn diagram indicating overlaps between health anxiety and other psychopathological domains

findings support that persistent worry is a core feature of several emotional disorders in children (Rabner, Mian, Langer, Comer, & Pincus, 2017; Weems et al., 2000), especially GAD (World Health Organization, 2019). Health anxiety and GAD may share similar negative cognitive biases and deficits in executive control related to worry (Kertz & Woodruff-Borden, 2011; Songco et al., 2020). In adults co-occurring health anxiety and GAD may also signify greater illness severity (Lee et al., 2014). Likewise in adolescents, reporting both health anxiety and other anxiety symptoms has been demonstrated to be associated with more depressive symptoms, physical symptoms and lower health-related quality of life compared with reporting only health anxiety or only other anxiety symptoms, respectively (Duholm et al., 2023b).

Health anxiety symptoms has further been found correlated with quite specific types of anxiety phenomena like phobia of vomiting (Wu et al., 2017) and food neophobia (Selles et al., 2021) in youth. Also, an association between health anxiety and anxiety sensitivity has been demonstrated by recent studies (Reiser, Oliver, Power, & Wright, 2020; Wright et al., 2016) in line with the strong connection between worry, intolerance of uncertainty and anxiety disorders in general in children and adolescents (Osmanağaoğlu, Creswell, & Dodd, 2018). In sum, the possible distinct characteristics as well as similarities between primary health anxiety and other types of anxiety disorders, including GAD, are yet to be explored in more detail in younger age groups.

*Health anxiety and obsessive-compulsive disorder.* Recent studies show that health anxiety is commonly reported in children and adolescents diagnosed with OCD (Duholm et al., 2021; Villadsen et al., 2017). Villadsen et al. (2017) found that 30% of a pediatric OCD sample presented with high health anxiety symptoms and that the majority (67%) of these children and adolescents were categorized with moderate to severe OCD, indicating that the presence of concurrent health anxiety was associated with greater OCD impairment. Furthermore, children with both OCD and health anxiety symptoms presented with significantly more comorbid anxiety disorders and anxiety symptoms in both studies (Duholm et al., 2021; Villadsen et al., 2017). Overall, these associations may therefore to some degree be explained by the previously mentioned substantial phenomenological overlap between health anxiety and OCD with significant cognitive and behavioral similarities involving intrusive, distressing thoughts, and related repetitive behaviors (Barsky, 1992; Deacon & Abramowitz, 2008; Starcevic, 2014).

*Health anxiety and functional somatic symptoms.* Although the presence of somatic symptoms is not a diagnostic requirement for the diagnosis of hypochondriasis, somatic symptom burden and

health anxiety often cluster in adult patients where high levels of both have been shown to be associated with greater psychological distress, functional impairment, and healthcare utilization in population-based studies (Creed & Barsky, 2004; Lee, Creed, Ma, & Leung, 2015). Similar findings have been reported in children and adolescents. Both in preadolescence and adolescence, health anxiety has been found to be positively associated with higher levels of self-reported unspecific somatic complaints, that is, functional somatic symptoms (Köteles et al., 2015; Rask et al., 2016). In a clinical study on children with chronic fatigue syndrome, also designated as a functional somatic syndrome (Henningsen, Zipfel, & Herzog, 2007), these young patients displayed significantly higher health anxiety compared to children diagnosed with juvenile idiopathic arthritis or emotional disorders (i.e., anxiety and depression; Garralda & Rangel, 2004).

*Health anxiety and psychosis vulnerability.* Health anxiety has alongside more abnormal bodily sensations historically been acknowledged as commonly occurring in early stages of psychotic disorders as part of anomalous self-experiences (Simon, Borgwardt, Lang, & Roth, 2014). Overlaps exist between suggested cognitive models underlying psychosis (Nelson, Whitford, Lavoie, & Sass, 2014) and health anxiety (Norris & Marcus, 2014), and diagnostic overlaps have been hypothesized along an “anxiety-hypochondriasis-psychosis” spectrum in which adolescents might be particularly vulnerable due to the pubertal-related bodily changes (Simon et al., 2014). A specific association between health anxiety and psychotic experiences, independent of general psychopathology and functional somatic symptoms, has been found in one of the studies on the aforementioned CCC2000 cohort in both pre- and midadolescence (Rimvall et al., 2019, 2023). Preadolescents with psychotic experiences reported high scores on illness-related fears and daily impact of symptoms, yet they did not report increased help-seeking behavior, suggesting that this subgroup might quietly suffer from health anxiety (Rimvall et al., 2019).

Much less researched is the co-occurrence with externalizing problems, but increased levels of self-reported health concerns and illness worries in combination with somatic complaints have been reported in a case control study comparing incarcerated adolescent females with antisocial and aggressive behavior to a population-based sample (Williams & Hollis, 1999).

*Health anxiety and concurrent medical disease.* The presence of a medical disease can be a trigger of health anxiety, balancing between a normal response to managing a disease that is potentially life-threatening on one hand, and misinterpretation of symptoms, impairing worry, and excessive reassurance-seeking on the other hand. A recent



systematic review on health anxiety in chronic disease has established that health anxiety is consistently present across chronic diseases in adults, affecting more than 20% of patients with various chronic conditions (Lebel et al., 2020). There are only few specific studies on this subject in young populations (Goodwin, Lewinsohn, & Seeley, 2004; Murphy et al., 2001; Oliver et al., 2020; Rask et al., 2016). Results from the CCC2000 study showed that chronic somatic illness at age 11 predicted high health anxiety levels at age 16 whereas functional somatic symptoms and emotional mental disorders did not (Rimvall et al., 2021). Also, a recent study on young patients with congenital heart disease found they reported significantly higher levels of health anxiety compared to healthy children and adolescents (Oliver et al., 2020). In adolescents with HIV, health anxiety has also been found related to health risk behaviors (i.e., recent sexual activity; Murphy et al., 2001). Still, more research is needed to understand if young people with early exposure to serious illness may be at particular risk of health anxiety and therefore require additional and appropriate intervention.

### *Societal consequences and influences*

*Societal costs.* In addition to the associations between health anxiety and other types of psychopathology, and the individual personal suffering that health anxiety may entail by itself, the associated societal costs in young people are tangible. Findings from the CCC2000 study indicated that health anxiety in preadolescents was associated with increased healthcare costs due to increased visits to general practitioners and other medical doctors in private practice covered by the tax-funded healthcare system (Rask et al., 2016). The findings were similar 5 years later at age 16–17 years in the same cohort, particularly when health anxiety symptoms persisted (Rimvall et al., 2021). Similar reports from other cultural settings and countries without universal healthcare systems are lacking. Nonetheless, evidence from adults report similar findings of increased healthcare costs (Bobevski, Clarke, & Meadows, 2016; Fink, Ørnboel, & Christensen, 2010), and given that courses of health anxiety throughout adult life are often chronic (olde Hartman et al., 2009), these findings ultimately suggest continuous costliness of health anxiety throughout the life span.

Other factors than healthcare costs, such as reduced educational attainment and (parental) sick leave might further contribute to the societal burden of health anxiety in young people. However, whereas adult data suggests that health anxiety is strongly associated with days out of role (Bobevski et al., 2016; Sunderland et al., 2013), this has yet to be studied further in youths, though self-reported response patterns to the *Childhood Illness Attitude Scales* suggest that school absenteeism is prevalent (Rask et al., 2016; Wright & Asmundson, 2003).

*Cyberchondria.* Evidence has emerged with regard to excessive, repeated and obsessional browsing of the internet for health information, often minted “cyberchondria” (Muse, McManus, Leung, Meghreblian, & Williams, 2012). Cyberchondria, along with a general notion of increased focus on health-related topics in the media and in society, has been suggested as a possible reason for the observed increase in health anxiety in the general population as such over the past few decades (Tyrer, Cooper, Tyrer, Wang, & Bassett, 2019; Tyrer, Eilenberg, Fink, Hedman, & Tyrer, 2016). Seeking health-related information might briefly alleviate health anxiety, yet in the long term such behavior might be seen as a maintaining behavior and an aggravating factor in health anxiety. As cyberchondria has recently been recognized as an increasing problem, the need for developing prevention and management programs for the condition has been addressed (Starcevic, 2023).

While cyberchondria has been sparsely investigated in child and adolescent samples, young people are likely to be particularly susceptible to cyberchondria, given the massive role that the internet plays in many young people’s lives (Alpaslan, 2016). Accordingly, recent findings based on a large sample of Chinese adolescents aged 12–20 years found health anxiety and cyberchondria to be tightly linked (Liu, Yang, Cheng, & Miao, 2022). However, a recent meta-analysis of university student samples indicates that the trend of increasing health anxiety started even before the inception of the Internet, speaking against cyberchondria as the only or main reason behind insidious health anxiety in society (Kosic, Lindholm, Järvholm, Hedman-Lagerlöf, & Axelsson, 2020).

*The potential impact of COVID-19.* The still ongoing COVID-19 pandemic might be another important triggering as well as perpetuating factor of health anxiety on a societal level. Possible mechanisms might involve excessive media coverage of health issues through mechanisms common to those of cyberchondria, clinically significant health anxiety emerging from a general tendency in society of well-founded fears of COVID-19 infection (Haig-Ferguson et al., 2021), and worsening of health anxiety in the context of an apparent decline in mental health and increase in psychopathology in general (Cortese, Sabe, & Solmi, 2022). Few studies have, however, examined the possible impact of the COVID-19 pandemic on health anxiety in young people specifically. While not assessing health anxiety directly, a Swedish study showed that the majority of children and adolescent at all ages reported worry related to COVID-19 illness, as well as possible derivative effects on the future regarding both themselves, their close ones, and the broader society (Sarkadi, Sahlin Torp, Pérez-Aronsson, & Warner, 2021).



According to an Australian report on adolescents, health anxiety (along with other psychopathology and mental health indicators) was high during the COVID-19 pandemic when compared with normative data (Li et al., 2022). In a Korean study examining health insurance data on all Korean children and adolescents, most mental disorders, including hypochondriasis, were more often diagnosed in youths during the first year after the COVID-19 outbreak compared to the year before (Kim et al., 2022). Conversely, a study from Denmark on children in middle childhood found low levels of health anxiety in the midst of the COVID-19 pandemic; furthermore, those who did exhibit substantial health anxiety were likely to also have high anxiety levels prior to the pandemic (Hulgaard et al., 2022). However, while the findings from the current “natural experiment” introduced by the pandemic do not uniformly indicate a substantial increase in health anxiety on a societal level, substantial health threats such as COVID-19 might indeed influence maladaptive health anxiety behaviors in vulnerable individuals (Tyrer, 2020). This calls for sober communication by health authorities to the public (Asmundson & Taylor, 2020), in order to adequately balance health anxiety symptoms, as naturally occurring worries about COVID-19 might indeed be protective of physical health consequences (Funkehouer, Klemballa, & Shankman, 2022).

### *Intergenerational transmission*

*Cross-generational influences on childhood anxiety disorders in general.* In recent years, researchers have begun to explore the role parents play in the etiology of childhood health anxiety, in particular the intergenerational transmission of health anxiety. Given the established and mentioned links between health anxiety and anxiety across pediatric (Rask et al., 2016; Wright et al., 2016; Wright & Asmundson, 2003) and adult populations (Deacon & Abramowitz, 2008; Olatunji et al., 2009) it would be remiss to not briefly review the parental mechanisms implicated in the etiology of childhood anxiety disorders as such.

Anxiety disorders run in families as demonstrated in a recent meta-analytic study which established that children of anxious parents are twice as likely to have anxiety than children of nonanxious parents (Lawrence, Murayama, & Creswell, 2019). There are three suggested main pathways for intergenerational transmission, namely (i) genetic inheritance, (ii) fetal programming through maternal experiences during pregnancy, and (iii) socialization of emotion and stress-response through parent-child interactions. Regarding the first pathway, Kendler, Abrahamsson, Ohlsson, Sundquist, and Sundquist (2022) explored in a recent study the role genes play in the intergenerational transmission of anxiety using an extended adoption design comprised of 2 million

Swedish families (Kendler et al., 2022). Results demonstrated that both genes and rearing environment play a role in the intergenerational transmission of anxiety. With regard to the second pathway, studies have reported that the prenatal environment can already exert an effect with associations between pregnant mothers' distress or anxiety and signs of anxious temperament or high reactivity in infants (Lebowitz, Leckman, Silverman, & Feldman, 2016). Potential biological mechanisms for this early transmission are proposed to involve the embryo being exposed to high maternal steroid hormones and restricted uterine blood flow leading to neuropsychological abnormalities, including impact on the child's developing limbic system (Rifkin-Graboi et al., 2015), with later hypersensitivity to stressful stimuli and increased anxiety-like behaviors. Finally, regarding the last pathway, these anxious behaviors can subsequently evolve in the child after birth based on both instrumental (i.e., anxious thoughts and behaviors emerge through patterns of reinforcement (e.g., by parents)) and vicarious learning (i.e., children observe anxious behavior and then emulate those behaviors themselves; Askew & Field, 2008; Fisak & Grills-Taquechel, 2007) as well as anxious parenting approach, for example, maintaining negative expectations, displaying greater intrusiveness, overprotection, and anxiety (Creswell, Apetroaia, Murray, & Cooper, 2013; Creswell, Murray, Cooper, Hadwin, & Field, 2011; Jones, Hall, & Kiel, 2021). These effects might be bidirectional, whereby the anxious child influences parental behaviors, for example, parents display higher levels of overprotection or rejection, and lower levels of emotional warmth (Hale, Klimstra, Branje, Wijsbroek, & Meeus, 2013; Kagan, Frank, & Kendall, 2017; Knappe et al., 2009; Murray, Creswell, & Cooper, 2009; Pinquart, 2017).

*Parental factors and intergenerational transmission of health anxiety.* The literature exploring intergenerational transmission of health anxiety has followed a similar trajectory. In a study exploring the genetic and environmental origins of health anxiety, including 88 monozygotic and 65 dizygotic twin pairs, Taylor and colleagues demonstrated that for the two most heritable dimensions (fears and interference) genetic factors accounted for 34–37% of variance whereas for the two other dimensions (treatment-seeking and disease conviction) these factors accounted for only 10–13% of variance, suggesting that health anxiety is by large a learned phenomenon (Taylor et al., 2006). Most critical to the discussion of the specific transmission of health anxiety is therefore the exploration of the studies that have a focus on childhood learning of illness-related perceptions and behaviors.

As outlined in the systematic review by Thorgaard et al. (2018), nine papers explored aspects of childhood learning. Variable methodology was employed in these papers, including having

participants complete one or a few retrospective items assessing social learning (Alex Mabe, Hobson, Ralph Jones, & Jarvis, 1988; Barsky, Wool, Barnett, & Cleary, 1994; Fernández, Fernández, & Amigo, 2005; Noyes et al., 2002; Salmon & Calderbank, 1996), completing a questionnaire designed to obtain information on vicarious and instrumental childhood learning (Watt & Stewart, 2000), and exploration of the possible transmission of health anxiety and illness beliefs from parent to child by examining child and parent responses to questionnaires measuring these constructs (Köteles et al., 2015; Marshall et al., 2007; Wright et al., 2017). Results from the six papers exploring childhood learning in particular were mixed, with no association established in four of six papers. In turn, less than robust methodology was employed with reliance on retrospective reports and measures with limited known psychometrics.

The remaining three papers sought to specifically examine the potential of intergenerational transmission of health anxiety (Köteles et al., 2015; Marshall et al., 2007; Wright et al., 2017). Marshall et al. (2007) examined self-reported health anxiety and illness beliefs in 8- to 16-year-old children of parents diagnosed with a somatoform disorder ( $n = 18$ ) and parents diagnosed with an organic physical disease ( $n = 15$ ). Results demonstrated that children of parents with a somatoform disorder had significantly higher bodily preoccupation and disease phobia subscale scores. Furthermore, parents with somatoform disorders had significantly higher subscale scores regarding bodily preoccupation, hypochondriacal beliefs, treatment experience, and effect of treatment supporting the notion that child health anxiety and illness beliefs may result from exposure via parents. Köteles et al. (2015) explored self-reported health anxiety in 186 students aged 14–19 years and their parents. Findings suggested that, after controlling for sociodemographic variables and somatic symptoms, youth and parent health anxiety symptoms were significantly associated. Parent and youth scores for somatosensory amplification were also significantly associated. In a similar study, Wright et al. (2017) explored self-reported health anxiety in 77 children, aged 8–15 years, and one of their parents or guardians. Results demonstrated parental health anxiety and depressive symptoms collectively predicted child health anxiety.

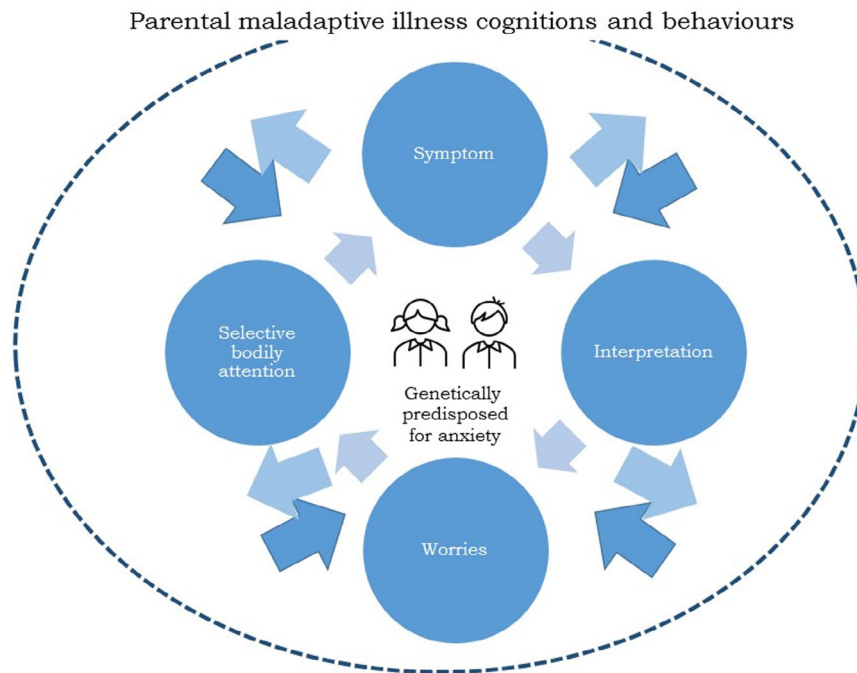
Applying a family case–control design, Thorgaard et al. investigated in a subsequent study the health anxiety and related concepts in 8- to 17-year-old children who had been exposed to different maternal health status: 50 case children of mothers with severe health anxiety, 49 control children of mothers with rheumatoid arthritis, and 51 control children of healthy mothers. Case children reported significantly higher level of health anxiety symptoms than children of mothers with rheumatoid arthritis but not compared to children of healthy mothers. There was

no significant difference between the children's self-reports in the three groups with regard to anxiety symptoms in general, physical complaints, or quality of life. In contrast, mothers with health anxiety reported their children as having more emotional and physical symptoms than mothers in one or both control groups (Thorgaard et al., 2017). Though these latter findings suggest that maternal healthy anxiety may only weakly affect children's own report of health anxiety, the overall picture lends support to an association between health anxiety and illness beliefs in children and their parents.

In sum, the current research could suggest that the specific pathways by which risk for health anxiety is transmitted across generations as in other anxiety disorders is likely to involve both genetics and socialization processes where children at high genetic risk for anxiety coupled with exposure to family influences with social learning of maladaptive illness behavior, and transmission of high parental health anxieties may specifically engage in excessive reassurance seeking around their health which can then again be accommodated by the close environment, thus exacerbating this behavior. Figure 2 shows the vicious circle of health anxiety introduced by Warwick and Salkovskis (1990) with the extension of the potential bidirectional impact of a rearing environment dominated by parental maladaptive illness perceptions and behaviors in a child predisposed for anxiety (see Figure 2).

*New concepts of potential relevance for transmission of health anxiety in families.* There are two additional avenues of exploration that provide further insight into this potential intergenerational transmission of health anxiety. These focus on the concepts of fetal health anxiety and health anxiety by proxy, respectively. As noted earlier in the measurement section, fetal health anxiety refers to anxiety an expectant mother may experience regarding her developing fetus (Reiser & Wright, 2019), whereas health anxiety by proxy refers to parental persistent concerns about the health of one's child, which drives engagement in maladaptive parental behaviors such as disproportionate attention directed to observable or suspected symptoms in the child and misinterpretation of child-reported symptoms as indicative of a physical illness (Ingeman et al., 2021, 2022; Thorgaard et al., 2017).

*Fetal health anxiety.* In a study on women in mid-pregnancy whose ultrasound indicated elevated risk of severe fetal abnormality, which was later ruled out, it was demonstrated that these women also showed more signs of anxiety, had lower maternal sensitivity and more intrusive behavior during interactions with their newborn infants compared to pregnant women with normal ultrasounds, potentially increasing the risk for childhood anxiety as well (Viaux-Savelon et al., 2012). In a subsequent study, Reiser and



**Figure 2** Potential bidirectional impact of social learning on the vicious circle of health anxiety (Warwick & Salkovskis, 1990)

Wright (2019) demonstrated in 100 pregnant women significant associations between fetal health anxiety (as measured by the *Fetal Health Anxiety Inventory*) and maternal health anxiety, generalized anxiety, and the related constructs of anxiety sensitivity and intolerance of uncertainty. Whereas this study established an association between maternal and fetal health anxiety, what remained to be explored was whether fetal health anxiety might be associated with continuous parental concerns about the child's health postpartum (i.e., health anxiety by proxy). One small study explored the association between fetal health anxiety, maternal health anxiety, and associated constructs in 63 women in their third trimester of pregnancy and then the subsequent association with health anxiety by proxy (as measured by a parent version of the Illness Worry subscale; Garralda & Rangel, 2001; Wright, Tamaian, Power, Reiser, & Klest, 2023). Consistent with the previous findings, significant associations were observed between fetal health anxiety and maternal health anxiety, and generalized anxiety in the third trimester. With respect to postpartum, significant associations were observed between fetal health anxiety in the third trimester and maternal health anxiety, health anxiety by proxy, and generalized anxiety at 3 months postpartum. However, maternal health anxiety was the only variable that accounted for significant variance in health anxiety by proxy at 3 months postpartum. The latter finding suggests that while anxiety about one's fetus is associated with health anxiety by proxy postpartum, maternal health anxiety during pregnancy may be a more significant contributor to the presence of health anxiety by proxy postpartum.

*Health anxiety by proxy.* Inherent to the concept of health anxiety by proxy is parental engagement in specific maladaptive illness-related cognitions and behaviors that may be observed and experienced by the child as a function of their worries about their child's health (Ingeman et al., 2021, 2022; Thorgaard, Frostholm, Walker, Jensen, et al., 2017). As in the small study by Wright et al. (2023), Thorgaard et al. (2017) employed the parent version of the Illness Worry subscale in their examination of health anxiety by proxy in the previously mentioned case-control study on mothers with severe health anxiety and two control groups (i.e., mothers with rheumatoid arthritis and healthy mothers). The results demonstrated that mothers with severe health anxiety reported significantly more health anxiety by proxy compared to both control groups. While this assessment facilitated the preliminary examination of health anxiety by proxy in terms of the parent worries, it did not provide a complete assessment of the behaviors a parent may engage in toward their child. As such, additional measures were employed to assess for parental response to the child's symptoms, frequency of medical consultations for the child, and parent satisfaction with medical evaluation of the child. Results demonstrated that the mothers in the severe health anxiety group generally reported more protective parenting, higher frequency of medical consultations for their child, and were less satisfied with medical care than control groups. The recent creation of the *Health Anxiety by Proxy scale* (see Table 2) allows for a more integrated assessment of the role parents play and can contribute to a more complete understanding of the intergenerational transmission pathway of health anxiety.



### Prevention and treatment

There are currently no specific treatment programs developed for health anxiety in young people. In adults, cognitive behavioral therapy (CBT) is so far the most studied type of psychological treatment with moderate to large effect sizes (Cooper, Gregory, Walker, Lambe, & Salkovskis, 2017; Fineberg et al., 2022). The existing programs follow the general principles of CBT for other anxiety disorders, but adapted to specifically target health anxiety, that is, focusing on modifying maladaptive illness-related cognitions and behaviors. Exposure is key in treatment, involving testing and “facing fears” in typical health anxiety-provoking situations according to a gradually increasing hierarchy. Incipient evidence is available for the effect of the so-called third waves therapies like mindfulness-based therapy and acceptance and commitment therapy (ACT; Hoffmann, Rask, Hedman-Lagerlöf, Jensen, & Frostholm, 2021; McManus, Surawy, Muse, Vazquez-Montes, & Williams, 2012). Mindfulness exercises are suggested to function as a direct exposure to anxiety-provoking bodily sensations, and concurrent training of a more nonjudgmental and accepting stance toward these bodily sensations may alleviate the symptom experience (Frostholm & Rask, 2019).

*Child studies on treatment.* In children and adolescents, the use of CBT for health anxiety has only been reported in a single case study (Roberts-Collins, 2016), and treatment studies applying third wave therapies are not available. However, Duholm et al. found that the presence of health anxiety in young people diagnosed with OCD did not act as an effect modifier of CBT aimed at OCD. In fact, encouragingly, health anxiety symptoms were also reduced by the treatment (Duholm et al., 2021). This could indicate that management of health anxiety in young people is tractable by well-established common CBT approaches for anxiety and related disorders in youths which in general show moderate response rates (Ale, McCarthy, Rothschild, & Whiteside, 2015; Crowe & McKay, 2017; James, Reardon, Soler, James, & Creswell, 2020). Here, developmental aspects should be taken into account. Thus, it is generally assumed that CBT can be applied only when the child has reached a certain level of cognitive development, including the ability to understand that a thought or belief can cause a person to behave and feel in a certain way, though positive effects of CBT have been reported in preschool children (Hirshfeld-Becker et al., 2010).

*Parental involvement in treatment.* Another important developmental aspect is parental involvement which appears particularly important in young children. Indeed, the treatment of anxiety disorders in young children can be effective by applying CBT principles through working directly with parents

alone (Cartwright-Hatton et al., 2011), although there are inconsistent findings in relation to whether child–parent delivery format is superior to parent-only or not (Monga, Rosenbloom, Tanha, Owens, & Young, 2015; Waters, Ford, Wharton, & Cobham, 2009). In older children and adolescents, direct parental involvement and intervention seem to be of less benefit compared to individual or group-based treatment for anxiety in general (Barrett, Dadds, & Rapee, 1996; Creswell & Cartwright-Hatton, 2007). However, the presented potential transgenerational effects of parental maladaptive illness-related cognitions and behaviors on the development of health anxiety in youths fuel the idea of including parents actively in the treatment of health anxiety across the age span of children and adolescents.

More preventive strategies relate to high-risk families where either one or both parents are diagnosed with an anxiety disorder. A promising study reduced the 1-year incidence of anxiety disorders among the offspring, using a family-based intervention with a brief psychosocial prevention program (Ginsburg, Drake, Tein, Teetsel, & Riddle, 2015). Very recently, an ACT-based internet-based program, PROXY, based on an existing treatment program iACT (Hoffmann et al., 2021; Hoffmann, Rask, Hedman-Lagerlöf, Ljótsson, & Frostholm, 2018), has been developed to specifically target parents with health anxiety by proxy. The results from a first efficacy testing employing a single case experimental design are now pending (Ingeman et al., 2023).

*Medication.* With regard to drug treatment directed at pediatric anxiety, five selective serotonin reuptake inhibitors (SSRIs) trials, and three selective serotonin-norepinephrine reuptake inhibitors (SSNRIs) trials have suggested meta-analytic superiority to placebo with a moderate effect size and a nonsignificant risk of suicidality (Strawn, Welge, Wehry, Keeshin, & Rynn, 2015). However, there are no specific trials for health anxiety in young people.

## Discussion

### Future directions for research

Disentangling the complex causal pathways for the development of health anxiety calls for a better understanding of the relevant cross-generational influences. To this date, data appear to suggest that personal health anxiety may be the precursor to fetal health anxiety, and these related constructs may lead to subsequent health anxiety by proxy toward a child. What remains to be seen is whether the proposed trajectory via these family processes with long-term exposure to high parental health anxiety (which could further include frequent medical examinations imposed on the child), also results in health anxiety experienced by the child itself. As such, a methodologically sound, longitudinal examination including

extant information across generations might be an important next step in this avenue of research.

Other contributing mechanisms such as heritability have yet to be further explored. Adoption and twin studies would allow us to better understand the complexity of the relationship between learning experiences and heritability as it applies specifically to the intergenerational transmission of health anxiety. Research could also benefit from larger case-control studies exploring potential genetic variants involved in health anxiety as well as the specific transmission of health anxiety by comparison of children of parents with severe health anxiety to both children of healthy parents and other relevant control groups such as children of parents with other anxiety disorders.

Also, research could move beyond correlational studies to embrace the methods of experimental psychology, manipulating potential key variables such as affect/stress, expectancies, and attention related to the development of anxious information processing biases specifically related to health issues in children with fearful temperament who are prone to selectively attend to threat cues (Aktar, 2022). Furthermore, the potential role of the exposure to severe illness-related events and the timing of this exposure, both in self and significant others needs to be further elucidated in prospective longitudinal studies (Mertz, Carstensen, Frostholt, Ørnboel, & Rask, 2023). Such data could help us understand how illness- and injury-related events potentially in combination with interpersonal learning experiences involving illness may represent the specific social developmental factors that make children with a general vulnerability to anxiety begin a trajectory toward health anxiety.

Importantly, increasing levels of psychological distress and anxiety have been observed in young populations in recent years. A specific focus for future research on health anxiety would therefore be to explore whether increased risk of health worries in youth might arise from this trend, which might be the case given the simultaneous rise in the tendency to advise people to monitor their own health status.

## Conclusive remarks

Research from the past two decades has established that children and adolescents do report health anxiety symptoms associated with both impairment, distress and increased healthcare use, and that childhood health anxiety can persist into preadolescence and adolescence. This emphasizes the importance of understanding early risk factors for the developmental trajectory of health anxiety over time to inform strategies for early detection and prevention.

The presented findings on considerable co-occurring psychopathology within numerous domains call for a dimensional approach to characterize whether and/or when health anxiety should be conceptualized and treated as a distinct disorder. Although health anxiety symptoms in young people may be eminently treatable by specifically adapted CBT as proven in adults, the overlap with other psychopathology could make the argument for additional testing of more unified, transdiagnostic interventions. Such an approach might also be more feasible to implement outside specialized, high-resource healthcare settings.

Particularly children and adolescents exposed to parental health anxiety and health anxiety by proxy may benefit from the development of evidence-based treatment programs with a specific focus on the involvement and integration of parents and family systems. Considering the risk of chronicity and devastating consequences of health anxiety later in life, the potential of effective early intervention would be substantial both on an individual and societal level.

## Correspondence

Charlotte Ulrikka Rask, Department of Child and Adolescent Psychiatry, Aarhus University Hospital Psychiatry, Palle Juul Jensens Boulevard 175, entrance K, 8200 Aarhus N, Denmark; Email: [charrask@rm.dk](mailto:charrask@rm.dk)

### Key points

- Children and adolescents report health anxiety symptoms associated with both impairment, distress, and increased healthcare use and with potential long-term continuity.
- Research suggests cross-generational impact with links between health anxiety in children and parents where underlying pathways may involve both genes and environment.
- Considerable co-occurring psychopathology call for a dimensional approach to characterize whether health anxiety should be conceptualized and treated as a distinct disorder already at young age.
- Health anxiety symptoms in youth may be treatable by specifically adapted cognitive behavioral therapy but the overlap with other psychopathology calls for also testing more unified, transdiagnostic interventions.
- Youths exposed to parental health anxiety and health anxiety by proxy may especially require interventions involving parents and family systems.

## Data availability statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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