HEALTH ANXIETY AND ASSOCIATED CONSTRUCTS IN CHILDREN AND ADOLESCENTS WITH CYSTIC FIBROSIS

Honours Thesis
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for the Degree of
Bachelor of Arts (Honours)
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Supervised by Dr. Kristi Wright
University of Regina

By
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Abstract

Health anxiety refers to the concern about one’s health, often based on the worry that harmful bodily sensations may be indicative of a serious illness. It was originally thought that health anxiety emerged in adulthood, however a burgeoning body literature suggests that the origin is likely much earlier (i.e., childhood). However, little research exists on the etiology or the experiences of health anxiety in specialized child medical populations (i.e., cystic fibrosis [CF]). CF is the most common inherited, life-limiting chronic disease amongst Caucasian individuals which causes multi-organ dysfunction and requires time-consuming therapies. Recent research has demonstrated that children and adults with CF are at an increased risk for psychopathology (i.e., depression and anxiety). The purpose of this study was to extend the current literature by examining the relationship between health anxiety and associated constructs (i.e., anxiety symptoms, intolerance of uncertainty, anxiety sensitivity) in children/adolescents with CF. Ten children/adolescents with CF, ages 8 to 21 years (mean age = 10.89, $SD = 4.61$) completed a battery of measures designed to assess child health anxiety and associated constructs. A significant, positive association ($r = .93$) was observed between child health anxiety (i.e., CIAS total scores) and the construct of anxiety sensitivity (i.e., CASI total scores). Results demonstrated a statistically significant difference between children/adolescents with CF and normative samples across an aspect of child health anxiety (i.e., CIAS treatment experiences subscale). This is the first study of its kind to examine child health anxiety and associated constructs within a CF population. The knowledge obtained from this study can facilitate an increase in our understanding of the psychological needs of children/adolescents with CF and may aid the development of innovative, tailored interventions aimed at improving overall mental health functioning and quality of life for this population.

Keywords: children, adolescents, health anxiety, cystic fibrosis, child psychopathology
Acknowledgements

There are a number of individuals who I wish to acknowledge for their involvement with this project. First and foremost, I would like to thank my supervisor, Dr. Kristi Wright for her decision to accept me as her honours student, her constant support and encouragement, her trust in my capabilities, and her guidance throughout this whole process. I am grateful to have had the opportunity to work on meaningful research and to complete my thesis under her supervision. Dr. Wright has allowed me to grow so much over the course of the past year and has truly instilled in me a passion for this field of research and the people within it.

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Health Anxiety and Associated Constructs in Children and Adolescents with Cystic Fibrosis

Health anxiety refers to an experience of fear that arises when an individual interprets changes in bodily sensations as being indicative of a serious disease or illness (Asmundson, Abramowitz, Richter, & Whedon, 2010; Sunderland, Newby, & Andrews, 2013). Health anxiety is a broad diagnostic construct that is best represented dimensionally, as people can experience various magnitudes of health anxiety, ranging from a complete lack of concern about one’s health to severe preoccupation with and fear of one’s bodily symptoms (Asmundson et al., 2010; Salkovskis & Warwick, 1986). Minor anxiety about health is common for most individuals and typically subsides as physical symptoms lesson or, if medical attention is sought out, upon reassurance from a medical professional (Asmundson et al., 2010; Wright & Asmundson, 2003). Mild expression of health anxiety can be adaptive as it motivates individuals to seek health care when it is warranted, while avoiding potentially detrimental behaviours (Taylor, 2004). It is only when the health anxiety becomes excessive, limiting ones social and occupational functioning, that it may meet diagnostic criteria for a psychological disorder, leading to maladaptive characteristics such as undue personal suffering, and inappropriate utilization of general and specialized health care services (Asumdson et al., 2010). Severe health anxiety, previously labeled hypochondriasis in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV-TR; American Psychiatric Association [APA], 2000), is incorporated under two separate diagnoses in the fifth edition (DSM-5; APA, 2013), somatic symptom disorder and illness anxiety disorder. Somatic symptom disorder is diagnosed when an individual has at least one significant somatic symptom (e.g., a localized pain) in combination with an excessive psychological reaction, whereas illness anxiety disorder is diagnosed when there is only a
preoccupation with having or acquiring an illness and no somatic symptoms (Axelsson, Andersson, Ljótsson, Finn, & Hedman, 2016). Regardless of severity, a variety of experiences may trigger an individual’s health anxiety, including common physical symptoms (e.g., a headache), a more threatening health experience, the death of a loved one, or exposure to health-related issues in the media (Delparte et al., 2015).

**Health Anxiety in Children and Adolescents**

Limited research exists on health anxiety in children and adolescents. While the prevalence rate is approximately 6% for severe health anxiety in the adult population (Bleichhardt & Hiller, 2007), past research suggested that the prevalence rate in children was unknown (Campo & Reich, 1999). This lapse in research is, in part, the result of health anxiety being thought of until recently as originating in adulthood (APA, 2000). However, a growing body of research has suggested that this is likely not true and that health anxiety may originate much earlier than adulthood (Delparte et al., 2015; Eminson, Benjamin, Shortall, & Woods, 1996; Thorgaard, Frostholm, & Rask, 2017; Rask, Elberling, Skovgaard, Thomsen, & Fink, 2012; Rask et al., 2015; Wright & Asmundson, 2003, 2005; Wright, Lebell, & Carleton, 2016; Wright, Reiser, & Delparte, 2015). For example, Rask’s et al. (2012) findings in a large population-based sample of children (n = 1323) found parent-reported health anxiety symptoms were present in 17.6% of children as young as five to seven years of age, and 2.4% were identified as having considerable health anxiety symptoms. Further, Rask et al. (2016) found health anxiety in adolescents was associated with increase healthcare expenditures, similar to that found in adult populations (Fink et al. 2010; Looper & Kirmayer 2001; Martin & Jacobi 2006; Sunderland et al. 2013). Overall, the findings from this research suggest that children and adolescents do indeed experience worries about their health and the health of significant others.
However, limited is known about health anxiety in specialized child medical populations.

**Health Anxiety in Specialized Medical Populations**

It has been recognized that a significant proportion of medically ill patients attending clinics (i.e., between 17.5 and 24.7%) have anxiety or worries about their health (Tyrer et al., 2011; Warwick & Salkovski, 1990). Individuals who experience at least one physical illness are 5 times more likely to meet health anxiety criteria compared to relatively healthy individuals (Sunderland et al., 2013). Literature examining health anxiety in adults across various specialized medical populations demonstrates significantly higher levels of health anxiety when diagnosed with a chronic physical illness (e.g., fibromyalgia, chronic pain, multiple sclerosis; Kehler & Hadjistavropoulos, 2009; Rode, Salkovskis, Dowd, & Hanna, 2006; Ucar et al., 2015).

For example, Jones et al. (2014) found that 23.5% of Canadian women diagnosed with breast cancer \( n = 137 \) presented with clinically significant health anxiety. Younger age acted as a significant predictor of health anxiety in this population, consistent with results found in nonmedical populations (Gerolimatos & Edelstein, 2012). Similar prevalence rates of health anxiety have been found in individuals with Type 1 and Type 2 diabetes, with 24.9% and 23.3% having elevated health anxiety (Claude, Hadjistavropoulos, & Friesen, 2014).

It is evident that adults with medical conditions tend to have heightened levels of health anxiety, with age as a potential contributing factor, but limited research exists for the examination of health anxiety among children and adolescents who have medical conditions. As a result, current knowledge on health anxiety in medical populations is taken largely from other closely related areas such as health anxiety within clinical medical populations or the associated construct of depression within medical populations. Results from meta-analytic and systematic reviews have demonstrated that children and young adults with chronic physical illnesses, as
well as their parent caregivers, are at an increased risk for developing depression and anxiety (Fauman et al., 2011; Pinquart & Shen, 2011). Specifically, Moussavi et al. (2007) demonstrated that comorbidity between chronic physical illness and depression is common (i.e. between 9 and 23 percent of physically ill-patients experience comorbidity), and that young adults with chronic diseases are significantly more likely to suffer from depression compared to nonmedical populations. Most recently, Villadesen et al. (2016) examined the presence of health anxiety in youth diagnosed with obsessive compulsive disorder. Results demonstrated that 30% of this clinical sample presented with high levels of health anxiety symptoms (Villadsen et al., 2016).

In terms of child medical populations, Rask et al. (2016) was able to examine the association between self-reported health anxiety and physical health conditions in children 11–12 years of age, in the context of a larger study. Rask and colleagues found no relationship between health anxiety and presence of chronic physical conditions. However, their overall sample was categorized as either having a chronic physical health condition or not, with the most common chronic physical condition being asthma (i.e. 12.9%). The latter study also did not recruit a priori or include children with chronic physical illness, beyond asthma. As such, these findings may not be generalizable to populations of children with chronic physical illnesses (such as cystic fibrosis [CF]) that may be associated with more significant functional impairment. The only study to-date to examine health anxiety in a chronic, child medical population was completed by Oliver and colleagues (2018). In contrast to findings of Rask et al. (2016), Oliver et al. (2018) reported significantly higher levels of health anxiety and associated constructs (i.e., AS, IU, and anxiety disorder symptoms) in children and adolescents with congenital heart defects than typically developing children and adolescents. These findings are consistent with the aforementioned research in adult populations with certain chronic medical conditions (Kehler &
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Hadjistavropoulos, 2009; Rode et al. 2006; Ucar et al., 2015). However, we do not know if the findings of Oliver et al. (2018) will extend to other physical health conditions (e.g., CF, diabetes, childhood arthritis). As such, it would be beneficial to explore childhood health anxiety in specialized medical populations in order to broaden our understanding of health anxiety as a whole.

Associated Constructs

**Intolerance of Uncertainty (IU).** Intolerance of uncertainty is the tendency to react negatively in situations that are unpredictable, and have negative beliefs about the potential consequences that may result from the uncertain (Carleton, Norton, & Asmundson, 2007; Wright et al. 2016). Research has indicated that IU is a trait-like characteristic that can predispose an individual to develop health anxiety symptoms (Deacon & Abramowitz, 2008; Gerolimatos & Edelstein, 2012). However, this finding is not consistent across the existing literature as other research has failed to find a statistical relationship between IU and health anxiety when controlling for other variables (e.g., neuroticism; Sexton, Norton, Walker, & Norton, 2003). More recently, Wright et al. (2016) examined IU and health anxiety within a population of youth ages 11 to 17 years old. The results demonstrated a relationship between IU and health anxiety, in addition to other related constructs of interest (i.e., anxiety sensitivity, anxiety disorder symptoms categories), further establishing the presence of health anxiety in children and adolescents.

**Anxiety Sensitivity (AS).** Anxiety sensitivity refers to the fear of anxiety-related symptoms (e.g., increase heart rate, sweating) that develop from the belief that physiological sensations with have harmful consequences (e.g., negative evaluation, death; Gerolimatos & Edelstein, 2012; Taylor et al. 2007). Taylor et al. (2007) suggest that AS is associated with
anxiety disorders as it is an anxiety antagonist, as anxious individuals can become alarmed by the arousal-related sensations, thereby intensifying their anxiety (Taylor et al., 2007). AS has been identified as a predictor variable for health anxiety in both nonclinical populations (Wheaton, Deacon, McGrath, Berman, & Abramowitz, 2012) and specific medical populations (Jones, Hadjistavropoulos, & Gullickson, 2014). This relationship between AS and health anxiety has also been demonstrated in children and adolescents (Delparte et al., 2015; Wright & Asmundson, 2003; Wright et al., 2016).

Depression. Childhood depression refers to some degree of functional impairment, present at home, school, or another social setting, that results from persistent low mood, lack of pleasure, tiredness, and a combination of other associated symptoms (Mills & Baker, 2016). Systematic reviews indicate increased prevalence rates and comorbidity of depression and anxiety in individuals with chronic medical illnesses (e.g., multiple sclerosis, Parkinson’s disease, diabetes; Boeschoten et al., 2017; Reijinders, Ehrt, Weber, Aarsland, & Leentjens, 2008; Grigsby, Anderson, Freedland, Clouse, & Lustman, 2002). However, limited research exists on the potential relationship between depression and health anxiety in particular, in both specialized medical and nonmedical populations. Wright and Asmundson (2003) demonstrated a significant positive association between health anxiety and depression in a community sample of school-aged children, thereby suggesting a relationship between depression and health anxiety in children and adolescents.

Cystic Fibrosis

CF is the most common fatal inherited disease among Caucasian populations, with estimates ranging from 70,000 to 100,000 patients worldwide (Cystic Fibrosis Worldwide [CFW], 2015; Sawicki et al., 2011). It is a multi-organ disease that affects the entire body,
causing progressive disability and early mortality, most commonly caused by lung disease (Faint, Staton, Stick, Foster, & Schultz, 2017). Clinical characteristics resemble that of other diseases such as pneumonia, bronchiectasis, failure to thrive, and celiac disease, with difficulty breathing and insufficient enzyme production being the most common symptoms. As a function of the complexity of the disease and multi-organ impact, treatment routines are expensive and time-consuming, often consisting of physiotherapy, inhaled therapies, and large amounts of oral medications (i.e., digestive enzymes, supplements, antibiotics; Faint et al., 2017). Medical advancements and the use of modern treatment strategies centered on increased daily functioning and perceptions of well-being has improved outcomes for people with CF (Sawicki et al. 2011). Life expectancy of those with the disease has been significantly extended with the majority of affected children surviving into adulthood (Dodge, Lewis, Stanton, & Wilsher, 2007). Individuals with CF in Canada are living to a median age of 50.9 years (Stephensen et al., 2017); nonetheless, CF continues to be more of the most difficult chronic health conditions to manage.

*Psychological Functioning in those with CF.* Research has demonstrated that individuals with CF have higher levels of psychological distress compared to community/normative data, consistent with research in other specialized medical populations (Havermans, Colpaert, & Dupont, 2008; Smith, Modi, Quittner, & Wood, 2010; Yohannes, Willgoss, Fatoye, Dip, & Webb, 2012). A large epidemiological study of nine countries (excluding Canada) further examined the increased risk for psychopathology (e.g. anxiety and depression) in individuals with CF (Quittner et al., 2014). Rates of anxiety and depression were measured in 6088 adolescents and adult patients age 12 years and older. Elevated symptoms of depression were found in 10% of adolescents with CF and 19% of adults with CF, and elevated symptoms of anxiety were found in 22% of adolescents with CF and 32 percent of adults with
CF. These elevations were 2 to 3 times higher than in community samples (Dierker et al., 2001; Eisenberg, Gollust, Golberstein, & Hefner, 2007; Martin, Rief, Klaiberg, & Braehler, 2006; Pignone et al., 2002). The latter is further concerning when one considers that psychological symptoms in individuals with CF have been associated with decreased lung function (Yohannes et al., 2012), lower body mass index (Snell, Fernandes, Bujoreanu, & Garcia, 2014), and worse health-related quality of life (Havermans et al., 2008).

While the aforementioned epidemiological study has contributed immensely to the understanding of the psychological functioning of individuals with CF, there are a number of limitations. It is unknown as to whether the findings capture or represent the psychological functioning of Canadian individuals with CF, as Canada was not one of the nine countries included in the research. The existing studies also have a limited focus on school-age patients with CF (i.e., 12 years and older) resulting in little knowledge on the psychological functioning of this age group. Furthermore, the research has narrowly focused on the examination of anxiety and depression without consideration of related psychological constructs (i.e., health anxiety, IU, and AS). As such it would be advantageous to design a study to extend our understanding of the psychological functioning of children and adolescents with CF by exploring the additional constructs of health anxiety, IU, and AS, while expanding the age range (i.e., 8-21).

**Purpose**

The overall objective of this study was to build upon the limited research examining health anxiety among a population of children and adolescents with chronic medical illness (i.e., cystic fibrosis). The research was exploratory in nature as no previous study has (a) examined psychological functioning in children with CF younger than 12 years, (b) included a sample of Canadian children and adolescents with CF, or (c) included the psychological constructs of
health anxiety, IU, and AS. The purposes were three-fold: (1) to examine the association between self-reported health anxiety and associated constructs (i.e., AS, state and trait anxiety, IU, and depression) in Canadian children and adolescents with CF (age 8 to 18 years); (2) to compare data from the current study to community/normative data across the constructs of health anxiety, AS, state and trait anxiety, IU, and depression; and (3) to explore potential demographic and medical variable predictors of child health anxiety.

**Hypotheses**

The hypotheses were three-fold:

1. It was hypothesized that significant, positive associations would exist between child health anxiety and the associated constructs of interest (i.e., AS, state and trait anxiety, IU, and depression).

2. It was hypothesized that children and adolescents with CF would have significantly higher scores on the measures of interest compared to existing community/normative data (Kovacks, 2010; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1973; Wright et al., 2016).

3. It was hypothesized that specific demographic (i.e., age, child gender, and child body mass index [BMI]) and medical (i.e., FEV₁ percent predicted scores [forced expiratory volume in 1 second], haemoptysis or pneumothorax in the last 6 months, receiving IV antibiotics, currently on psychiatric medication, and currently receiving psychotherapy) would be predictive of child health anxiety.

**Method**

**Participants**

Participants were 10 children and adolescents (mean age = 10.89 years; SD = 4.61; range
= 8-21 years) and 9 parents (mean age = 41.40 years; SD = 8.02; range = 37-49 years; see Table 1). Approximately 50% of child participants were female (mean age = 14.40, SD = 5.08). The majority of parent participants were female (88.9%, n = 8). Descriptive information regarding age was not obtained by one of the child and one of the parent participants. All participants self-reported as Caucasian (100%, n = 20). The majority of participants resided in the province of Ontario (60%, n = 6), two resided in Alberta (20%), and the remaining two resided in British Columbia or Saskatchewan (20%). In combination with a CF diagnoses, 20% (n = 2) of child and adolescent participants reported having haemoptysis or pneumothorax in the past 6 months and 10% (n = 1) were currently on intravenous antibiotics for no longer than a week. There were minimal mental health conditions reported by child and adolescent participants; one participant (10%, n = 1) self-reported as having two current mental health conditions (i.e., depression and anxiety). Four participants did not complete the entire battery of measures therefore the primary analyses were completed with 6 child participants.

**Measures**

**Childhood Illness Attitude Scales (CIAS; Wright & Asmundson, 2003; See Appendix B).** The CIAS is a 35-item self-report measure based on the Illness Attitude Scales (IAS; Kellner, 1987), and is designed for use with school-age children (8 to 15 years of age). The CIAS is intended to assess fears, beliefs, and attitudes that are associated with health anxiety and abnormal illness behaviour. Items are rated on a 3-point Likert scale (1 = none of the time; 2 = sometimes; 3 = a lot of the time), with items 29 through 31 assessing frequency of treatment experiences (1 = 0 times; 2 = 1-2 times; 3 = 3 or more times). Thirty-three of the 35 items are used in scoring with the exception of and items 28 and 32 which are open-ended questions providing supplementary information and not included in scoring. Total scores range from 29 to
Table 1. Descriptive Statistics for Demographic Information

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<td>%</td>
<td>n</td>
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<td>62.5</td>
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</table>

| FEV<sub>1</sub>, percent predicted<sup>b</sup> | 73.6          | 18.6         | 88.0  | 9.8          | 59.25   | 12.6         |
| BMI                                            | 17.3          | 2.0          | 16.3  | 1.5          | 19.2    | 1.3          |

<sup>a</sup>Data are missing from one participant for this variable.; <sup>b</sup>Data are missing from two participants for this variable. FEV<sub>1</sub> = Forced expiratory volume in 1 second.
87 with higher scores reflecting higher levels of health anxiety associated behaviours. The CIAS has demonstrated excellent internal consistency ($\alpha = .89$) and high test-retest reliability of .86 (Wright & Asmundson, 2003). In the current study, the CIAS total score demonstrated good internal consistency ($\alpha = .81$) and excellent and good internal consistency for the CIAS subscale scores help-seeking ($\alpha = .91$), symptom effects ($\alpha = .89$), and fears ($\alpha = .82$). However, the treatment experiences subscale was poor ($\alpha = .47$).

**Childhood Anxiety Sensitivity Index (CASI; Silverman, Fleisig, Rabian, & Peterson, 1991; See Appendix C).** The CASI is an 18-item self-report measure designed to measure fear of anxiety-related symptoms in school-aged children. Each item is rated on a 3-point Likert scale (1 = none; 2 = some; 3 = a lot) with total scores ranging from 18 to 54 and higher scores reflecting higher levels of anxiety sensitivity. Three factors are incorporated including of physical concerns (e.g., “It scares me when my heart beats fast”), social concerns (e.g., “Other kids can tell when I feel shaky”), and psychological concerns (e.g., “When I am afraid, I worry that I might be crazy”) Silverman et al. (1990) reported good internal consistency ($\alpha = 0.87$) and acceptable test-retest reliability ranging from .62 to .78 for nonclinical and clinical samples respectively. In the current study, the CASI total score demonstrated excellent internal consistency ($\alpha = .97$).

**State-Trait Anxiety Inventory-for Children (STAIC; Spielberger et al., 1973).** The STAIC is a 40-item self-report measure consisting of two separate 20-item subscales measuring two distinct anxiety concepts (i.e., state anxiety and trait anxiety), in elementary school children. The STAIC-State subscale measures anxiety experienced at a “particular moment in time”; that is, perceived feelings of apprehension and worry that vary in intensity and fluctuate over time. Each item is rated on a 3-point Likert scale, where half the terms indicate the presence of anxiety
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(e.g., very worried) and half indicate the absence of anxiety (e.g., not worried). The STAIC-Trait subscale indicates how children “generally feel”, measuring the overall tendency to experience anxiety states. The items are rated on a 3-point Likert scale reflecting frequency of occurring anxiety behaviour (1 = hardly ever; 2 = sometimes; 3 = often). Internal consistency for the STAIC subscales is reasonably good with alpha coefficients ranging from .82 to .87 for the state form and .78 and .81 for the trait form (Spielberger et al., 1973). In the current study, the state subscale demonstrated excellent internal consistency (α = .95) and the trait subscale demonstrated acceptable internal consistency (α = .75).

Intolerance of Uncertainty Scale-Revised (IUS-R; Walker, Birrell, Rogers, Leekam, Freestone, 2010; See Appendix D). IUS-R is a 12-item questionnaire adapted from the 12-item version of the Intolerance of Uncertainty Scale (IUS-12; Carleton, Norton, & Asmundson, 2007) that is assessing IU across the lifespan. Each item is rated on a 5-point scale ranging from 1 (not at all like me) to 5 (entirely like me). Total scores range from 12 to 60 with higher scores indicating higher levels of IU. The IUS-R is comprised of two distinct subscales: Prospective IU consisting of 7 items (e.g., “I can’t stand it when things happen suddenly”) and Inhibitory IU consisting of 5 items (e.g., “When I am not sure what to do I freeze”). Wright et al. (2016) reported good internal consistency for the total score (α = .87) and good to fair internal consistency for the Prospective IU and Inhibitory IU subscales (α = .81 and α = .79, respectively). In the current study, the IUS-R total score demonstrated acceptable internal inconsistency (α = .76).

Children’s Depression Index, second edition (CDI 2; Kovacks, 2010). The CDI 2 is a 28-item self-report measure that is a modified version of the Beck Depression Inventory (BDI: Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) designed to assess signs of depression in
children and adolescents 7 to 17 years of age. Each item assesses one symptom of childhood depression with item scores ranging from 1 (absence of symptom) to 3 (greatest severity of the symptom). The individual is asked to select the statement that best describes his or her feelings. The CDI and the CDI 2 have demonstrated good and excellent internal consistency with alpha coefficients ranging from .80 to .94 and .88 to .92, respectively (Kovacks, 2010; Saylor, Finch, Spirito, & Bennett, 1984). The current study was unable to determine internal consistency values for the CDI 2 as approximately half the items had variances of zero, indicating no presence of depressive symptoms.

**Procedure**

Research ethics approval was obtained from the University of Regina Research Ethics Board. Nurse coordinators from CF clinics and Cystic Fibrosis Canada Chapter Presidents were sent an introductory email and link to an anonymous, online-hosted survey (SurveyMonkey) and were asked to forward the email to potentially eligible participants. Inclusion criteria as directed by a larger on-going study required participants to have a confirmed diagnosis of CF and age within a specified range (8 to 21 years). The survey was hosted online by SurveyMonkey.com as the Child Health, Learning, and Development (CHLD) lab (the lab where the research is taking place) has ongoing research using this survey platform.

Consent was obtained from parents/legal guardians of the participants, and assent from the child/adolescent participants. All parent participants completed a personal demographics questionnaire form and a demographics form for their child or adolescent, which included questions regarding age, sex, ethnicity, location of residence, and medical history and diagnoses (see Appendix A). Child and adolescent participants completed a battery of measures assessing the aforementioned constructs (health anxiety, AS, state and trait anxiety, IU, depression). As
part of the larger study, the parents also completed a battery of measures assessing congruent psychological constructs of interest. All participants were entered into a draw for one of three $50 gift certificates to Best Buy as a token of appreciation of their participation.

**Results**

**Descriptive Statistics and Preliminary Analyses**

Descriptive statistics were computed for demographic information and for the study questionnaire subscales and total scores (see Tables 1-2). As indicated above, 10 children and adolescents aged 8 to 21 years (mean age = 10.89, SD = 4.61) completed the demographic questionnaire (5 females; mean age = 14.40, SD = 5.08 and 5 males; 10.00, SD = 2.83). An independent sample t-test was computed to examine potential gender difference across child participants with respect to age. No statistically significant age differences were observed across gender, $t(10) = 1.54$, $p = .17$. Bivariate correlations were computed between age and total scores on measures of health anxiety, AS, state and trait anxiety, IU, and depression to examine potential association between age and constructs of interest. No statistically significant associations were observed between age and constructs of interest.

Independent sample t-tests were computed to examine potential gender differences across total scores for child/adolescent measures of health anxiety, AS, state and trait anxiety, IU, and Results demonstrated statistically significant gender differences in the CIAS total score, $t(6) = 2.77$, $p < .05$, and the CIAS help-seeking subscale, $t(6) = 5.55$, $p < .005$. Further, statistically significant gender differences were observed for the IUS-R total score, $t(6) = 2.86$, $p < .05$. Results suggest that female participants have higher levels of health anxiety and intolerance of uncertainty compared to male participants. However, these findings may be overstated as a result of small sample numbers and not directly related to gender differences.
Table 2. Descriptive Statistics for Measures of Constructs of Interest

<table>
<thead>
<tr>
<th>Measures</th>
<th>Total</th>
<th>Females</th>
<th>Males</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIAS Total score</td>
<td>57.5(8.1)</td>
<td>66 (7.1)</td>
<td>53.3(4.6)</td>
<td>2.77</td>
<td>.050*</td>
</tr>
<tr>
<td>Fears</td>
<td>21.3(4.1)</td>
<td>23.5(3.5)</td>
<td>20.3(4.3)</td>
<td>.902</td>
<td>.418</td>
</tr>
<tr>
<td>Help-seeking</td>
<td>20.0(4.9)</td>
<td>26.0(0.1)</td>
<td>17.0(2.2)</td>
<td>5.55</td>
<td>.005**</td>
</tr>
<tr>
<td>Treatment experience</td>
<td>8.2(0.8)</td>
<td>8.5(0.7)</td>
<td>8.0(0.8)</td>
<td>.730</td>
<td>.506</td>
</tr>
<tr>
<td>Symptom effects</td>
<td>6.6(2.3)</td>
<td>6.0(2.8)</td>
<td>7.0(2.4)</td>
<td>.453</td>
<td>.674</td>
</tr>
<tr>
<td>CASI Total score</td>
<td>29.8(11.6)</td>
<td>39.5(14.8)</td>
<td>25.0(7.5)</td>
<td>1.69</td>
<td>.317</td>
</tr>
<tr>
<td>STAIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State subscale</td>
<td>32.7(5.1)</td>
<td>38.0(2.8)</td>
<td>30.0(3.6)</td>
<td>2.72</td>
<td>.053</td>
</tr>
<tr>
<td>Trait subscale</td>
<td>29.2(7.5)</td>
<td>27.0(8.5)</td>
<td>30.1(8.1)</td>
<td>.458</td>
<td>.671</td>
</tr>
<tr>
<td>IUS-R Total score</td>
<td>21.3(5.4)</td>
<td>27.0(1.4)</td>
<td>18.5(3.9)</td>
<td>2.86</td>
<td>.046*</td>
</tr>
<tr>
<td>CDI 2 Total score</td>
<td>7.8(1.8)</td>
<td>7.5(3.5)</td>
<td>8.0(1.2)</td>
<td>.284</td>
<td>.790</td>
</tr>
</tbody>
</table>

Note. Statistical analyses for children with CF (n = 6). CIAS = Childhood Illness Attitude Scales; CASI = Children’s Anxiety Sensitivity Index; STAIC = State-Trait Anxiety Inventory- for Children; IUS-R = Intolerance of Uncertainty Scale-Revised; CDI 2 = Children’s Depression Index, second edition. *p < .05. ** p < .01.
Association Between Child Health Anxiety and Associated Constructs

Anxiety Sensitivity. It was hypothesized that there would be a significant positive relationship between health anxiety and AS. Bivariate correlations were computed between the CIAS total and subscale scores, and measures of the associated constructs in order to examine this hypothesis (see Table 3). This hypothesis was supported. Specifically, a statistically significant association was found between the CIAS total scores and the CASI total score, \( r (4) = .93, p < .01 \).

State-Trait Anxiety. It was hypothesized that there would be a significant positive relationship between health anxiety and state and trait anxiety. However, no statistically significant associated were found between the CIAS total and subscale scores and the STAIC State and Trait total scores (see Table 3). This hypothesis was not supported.

Intolerance of Uncertainty. It was hypothesized that there would be a significant positive relationship between health anxiety and state and IU. A statistically significant relationship was found between the CIAS total score and the IUS-R total score, \( r (4) = .88, p < .05 \). Results also demonstrated a statistically significant association between the CIAS help-seeking subscale scores and the IUS-R total score, \( r (4) = .95, p < .01 \). This hypothesis was supported.

Depression Symptoms. It was hypothesized that there would be a significant positive relationship between health anxiety and depression symptoms. The results demonstrated no statistically significant association between the CIAS total and subscale scores and the CDI 2 total score. This hypothesis was not supported.
Table 3. Associations Between Measures of Child Health Anxiety and Constructs of Interest

<table>
<thead>
<tr>
<th>Measures</th>
<th>CIAS Total</th>
<th>CIAS FE</th>
<th>CIAS HS</th>
<th>CIAS TE</th>
<th>CIAS SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASI Total score</td>
<td>.93**</td>
<td>.69</td>
<td>.63</td>
<td>.76</td>
<td>.32</td>
</tr>
<tr>
<td>STAIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State subscale</td>
<td>.57</td>
<td>.05</td>
<td>.68</td>
<td>.54</td>
<td>.09</td>
</tr>
<tr>
<td>Trait subscale</td>
<td>-.08</td>
<td>-.01</td>
<td>-.14</td>
<td>.28</td>
<td>-.01</td>
</tr>
<tr>
<td>IUS-R Total score</td>
<td>.88*</td>
<td>.64</td>
<td>.95**</td>
<td>.48</td>
<td>-.41</td>
</tr>
<tr>
<td>CDI 2 Total score</td>
<td>.26</td>
<td>.52</td>
<td>-.05</td>
<td>.24</td>
<td>.12</td>
</tr>
</tbody>
</table>

Note. Higher scores indicate a more extreme response in the direction of the construct assessed. CIAS = Childhood Illness Attitude Scales; FE = Fear; HS = Help-Seeking; TE = Treatment Experience; SE = Symptom Effects; CASI = Children's Anxiety Sensitivity Index; STAIC = State-Trait Anxiety Inventory for Children; IUS-R = Intolerance of Uncertainty Scale-Revised; CDI 2 = Children’s Depression Index, second edition. *p < .05, **p < .01.
Health Anxiety and Associated Constructs in Normative Sample

It was hypothesized that children and adolescents with CF would have significantly higher scores on the measures of interest compared to existing community data and/or normative data, with similar aged children and adolescents (Kovacks, 2010; Spielberger et al., 1973; Wright et al., 2016). A series of independent sample t-tests were computed to assess potential differences across samples for constructs of health anxiety and associated constructs (see Table 4). The results identified one statistically significant difference between the current CF sample and community/normative sample, with children and adolescents with CF having statistically significantly higher levels of treatment experiences ($M=8.2, SD=0.8$), than typically developing children and adolescents ($M=5.7, SD=1.4$), $t(4) = 3.01, p < 0.03$. No other statistically significant results were found between the CF and community/normative samples. However, with the exception of IUS-R total score and STAI-trait subscale, the remaining total and subscale scores (where appropriate) were higher in the current CF sample (see Figure 1).

Predictors of Health Anxiety in Children and Adolescents with CF

Two multiple linear regressions were computed to examine potential demographic and medical variable predictors of childhood health anxiety. In the first regression child age, child gender, and child body mass index (BMI) were included as demographic predictors, and the dependent variable was the CIAS total score (child health anxiety). These predictors were chosen as they were used in an existing study (i.e., Quittner et al., 2014) where demographic and medical variable predictors anxiety and depression were explored in children and adolescents with CF. $R^2$ indicated that the amount of variance accounted in child health anxiety was 0.91 and the model was not statistically significant, $F (3, 2) = 6.36, p > .14$, $R^2 = .91$ (see Table 5 for regression coefficients).
### Table 4. Difference in Health Anxiety and Associated Constructs in CF and Community/Normative Samples

<table>
<thead>
<tr>
<th>Measures</th>
<th>CF Sample M (SD)</th>
<th>Community/Normative Samples M (SD)</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIAS Total score&lt;sup&gt;a&lt;/sup&gt;</td>
<td>57.5(8.1)</td>
<td>52.2(7.4)</td>
<td>.602</td>
<td>.573</td>
</tr>
<tr>
<td>Fears</td>
<td>21.3(4.1)</td>
<td>20.8(4.1)</td>
<td>.125</td>
<td>.905</td>
</tr>
<tr>
<td>Help-seeking</td>
<td>26.0 (0.1)</td>
<td>19.1(3.1)</td>
<td>.178</td>
<td>.866</td>
</tr>
<tr>
<td>Treatment experience</td>
<td>8.2(0.8)</td>
<td>5.7(1.4)</td>
<td>3.01</td>
<td>.030*</td>
</tr>
<tr>
<td>Symptom effects</td>
<td>6.7(2.3)</td>
<td>6.7(1.8)</td>
<td>.005</td>
<td>.996</td>
</tr>
<tr>
<td>CASI Total score&lt;sup&gt;a&lt;/sup&gt;</td>
<td>29.8(11.6)</td>
<td>28.9(5.4)</td>
<td>.071</td>
<td>.946</td>
</tr>
<tr>
<td>STAIC&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State subscale</td>
<td>32.7(5.1)</td>
<td>30.9(5.9)</td>
<td>.328</td>
<td>.756</td>
</tr>
<tr>
<td>Trait subscale</td>
<td>29.2(7.5)</td>
<td>37.4(6.5)</td>
<td>1.01</td>
<td>.360</td>
</tr>
<tr>
<td>IUS-R Total score&lt;sup&gt;a&lt;/sup&gt;</td>
<td>21.3(5.4)</td>
<td>27.2(8.6)</td>
<td>1.02</td>
<td>.355</td>
</tr>
<tr>
<td>CDI 2 Total score&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.8(1.8)</td>
<td>6.8(6.5)</td>
<td>.531</td>
<td>.618</td>
</tr>
</tbody>
</table>

<sup>Note.</sup> CIAS = Childhood Illness Attitude Scales; FE = Fear; HS = Help-Seeking; TE = Treatment Experience; SE = Symptom Effects; CASI = Childhood Anxiety Sensitivity Index; STAIC = State-Trait Anxiety Inventory- for Children; IUS-R = Intolerance of Uncertainty Scale-Revised; CDI 2 = Children’s Depression Index, second edition. *p < .05.
<sup>a</sup>Wright et al, 2016. <sup>b</sup>Spielberger et al., 1973. <sup>c</sup>Kovacks, 2010.
Figure 1. Difference in health anxiety and associated constructs in CF and community/normative samples
Table 5. *Regression Analysis for Demographic Predictor Variables for Child Health Anxiety*

<table>
<thead>
<tr>
<th>Variables</th>
<th>$B$</th>
<th>SE $B$</th>
<th>$\beta$</th>
<th>Zero-order Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Age</td>
<td>0.64</td>
<td>0.66</td>
<td>0.36</td>
<td>0.66</td>
</tr>
<tr>
<td>Child Gender</td>
<td>17.73</td>
<td>6.00</td>
<td>1.13</td>
<td>0.81</td>
</tr>
<tr>
<td>BMI</td>
<td>-3.29</td>
<td>1.45</td>
<td>-0.79</td>
<td>0.31</td>
</tr>
</tbody>
</table>

*Note. BMI = Body mass index. *$p < .05$. **$p < .01$. 
Table 6. *Regression Analysis for Medical Predictor Variables of Child Health Anxiety*

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>Zero-order Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV1 Percent Predicted</td>
<td>-0.23</td>
<td>0.17</td>
<td>-0.56</td>
<td>-.69</td>
</tr>
<tr>
<td>Haemoptysis or Pneumothorax in the last 6 months</td>
<td>1.84</td>
<td>6.42</td>
<td>0.12</td>
<td>.01</td>
</tr>
<tr>
<td>IV antibiotics&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Current Psychotherapy</td>
<td>-11.66</td>
<td>7.25</td>
<td>-0.59</td>
<td>-.82</td>
</tr>
<tr>
<td>Current Psychiatric Medication</td>
<td>-11.66</td>
<td>7.25</td>
<td>-0.59</td>
<td>-.82</td>
</tr>
</tbody>
</table>

*Note.* *a*No participants met criteria for this variable. FEV1 = Forced expiratory volume in 1 second. *p* < .05. **p** < .01.
To determine potential medical variable predictors for child health anxiety a second regression analysis was computed with the predictor variables of FEV₁ percent predicted scores (forced expiratory volume in 1 second), haemoptysis or pneumothorax in the last 6 months, receiving IV antibiotics, currently on psychiatric medication, and currently receiving psychotherapy. The dependent variable was the CIAS total scores as a measure of child health anxiety. These predictors were chosen as they were used in an existing study (i.e., Quittner et al., 2014) where demographic and medical variable predictors anxiety and depression were explored in children and adolescents with CF. $R^2$ indicated that the amount of variance accounted in child health anxiety was 0.86 and the model was not statistically significant, $F (3, 2) = 4.17, p > .20, R^2 = .86$ (see Table 6 for regression coefficients).

**Discussion**

Health anxiety refers to an experience of fear that arises when an individual interprets changes in bodily sensations as being indicative of a serious disease or illness (Asmundson et al., 2010; Sunderland et al., 2013). A burgeoning body of research has demonstrated that health anxiety exists during childhood, much earlier than was originally thought (Delparte et al., 2015; Eminson et al., 1996; Thorgaard et al., 2017; Rask et al., 2012; 2015; Wright & Asmundson, 2003, 2005; Wright et al., 2015; 2016). While our understanding of health anxiety in childhood is growing, there is very limited knowledge about health anxiety in specialized child and/or adolescent medical populations. Currently, only one study has examined health anxiety within a specific child and adolescent medical population (i.e., Oliver et al., 2018). Quittner et al. (2014) examined anxiety and depression among children and adolescents with CF and respective parents in nine countries (excluding Canada). Findings demonstrated that children and adolescents with CF had elevated symptoms of anxiety and depression compared to community
samples. While this epidemiological study has contributed significantly to the understanding of the psychological functioning of children and adolescents with CF, it is unknown as to whether the findings capture or represent the psychological functioning of Canadian children and adolescents with CF. The current study is the first study to examine health anxiety and associated constructs in a population of Canadian children and adolescents with CF. The overall objective of this study was to examine self-reported health anxiety and associated constructs (i.e., AS, state and trait anxiety, IU, and depression) in Canadian children and adolescents with CF, in order to examine the relationship between the constructs of interests and gain a better understanding of the psychological wellbeing of this specialized medical population. The purposes were threefold: (1) to examine the association between self-reported health anxiety and associated constructs (i.e., AS, state and trait anxiety, IU, and depression) in Canadian children and adolescents with CF (age 8 to 18 years); (2) to compare data from the current study to community/normative data across the constructs of health anxiety, AS, state and trait anxiety, IU, and depression; and (3) to explore potential demographic and medical variable predictors of child health anxiety. Each of the hypotheses and the associated findings will be discussed below in succession.

It was hypothesized that significant positive associations would exist between child health anxiety and the associated constructs of interest (i.e., AS, state and trait anxiety, IU, and depression). This hypothesis was partially supported. Specifically, a significant, positive association was found between child health anxiety (i.e., CIAS total score) and AS (i.e., CASI total score). These findings are consistent with previous research in a typically developing child and adolescent sample and adult samples (e.g., Delaparte et al., 2015; Jones et al., 2014; Wheaton et al., 2012; Wright et al., 2016). The current findings are also consistent with the existing study
examining health anxiety in a sample of children and adolescents with CHD (Oliver et al., 2018). These findings further validate a relationship between health anxiety and anxiety sensitivity in children in general. Research suggests that AS is a predictor of health anxiety (Wright & Asmundson, 2003). Further, it is suggested that AS is associated with anxiety disorders because it is an anxiety amplifier, such that those who become anxious can become alarmed by the arousal-related sensations which can intensify their anxiety (Taylor et al., 2007). These arousal-related sensations (e.g., increase heart rate, sweating) may be even more detrimental to children and adolescents with chronic medical conditions as they frequently experience similar symptoms as a result of their medical condition. Thus, they may be particularly sensitive and more reactive to arousal-related sensations compared to community samples.

A statistically significant positive association was also found between child health anxiety (i.e., CIAS total scores) and intolerance of uncertainty (i.e., IUS-R total score). The CIAS help-seeking subscale was also significantly associated with the IUS-R total score. These findings are consistent with existing child and adolescent typically developing (Wright et al., 2016) and chronic health condition samples (i.e., Oliver et al., 2018). IU may be heightened in children/adolescents with CF, and specialized medical populations in general, as their illness often has an uncertain implications for their health and future. For instance, younger children with CF have been found to be more anxious, which may be explained by their lack of knowledge about their disease and the uncertainty and complexity of its prognosis (Bregnballe, Thastum, & Schiotz, 2007). Those that are informed are often forced to accept the reality of their incurable condition and the relentless need to be compliant with prescribed medications and undergo physical therapy serve as constant reminders of their unknown life expectancy (Jamieson et al., 2014).
However, no association was observed between child health anxiety (i.e., CIAS total scores), state and trait anxiety, and depression symptoms (i.e., CDI 2). Interestingly, even though STAIC-state anxiety scores were not significantly associated with either the CIAS total or the subscale scores, the mean total was slightly higher, albeit not significantly, than normative samples (normative mean = 30.9, $SD = 5.9$; CF mean = 32.7, $SD = 5.1$). Furthermore, even though CDI 2 depression scores were not significantly associated with either the CIAS total scores or the subscale scores, the mean total score was higher, albeit not significantly, than community samples (normative mean = 6.8, $SD = 6.5$; CF mean = 7.8, $SD = 1.8$). Previous research has reported elevated levels of anxiety and depressive symptoms in children and adolescents with CF that are 2-3 times higher than community samples (Quittner et al., 2014). It is likely that our current findings are limited due to the small sample size, thus future research with a larger, more representative sample is required to better understand the associations between health anxiety and associated constructs within children and adolescents with CF.

It was also hypothesized that children and adolescents with CF would have significantly higher scores on the measures of interest compared to existing community/normative data (Kovacks, 2010; Spielberger et al., 1973; Wright et al., 2016). This hypothesis was partially supported. Specifically, the results demonstrated only one statistically significant difference between the current CF sample and community/normative sample, with children and adolescents with CF having statistically significantly higher levels of treatment experiences, than typically developing children and adolescents. This is not surprising as children and adolescents with CF see medical professionals regularly and often require an extensive treatment program (i.e., oral medication, physiotherapy, inhaled therapies, lung transplant). No other statistically significant results were found between the CF and community/normative samples. However, with the
exception of IUS-R total score and STAI-trait subscale, children and adolescents with CF had higher mean total and subscale (where appropriate) scores for the remaining measures than the community/normative samples. It is anticipated that subsequent research with an increased sample size will allow us to better understand the differential symptom presentation across typical-functioning and chronic health child populations.

The last hypothesis focused on the examination of potential demographic and medical variable predictors for health anxiety (as measured by CIAS total scores) in children and adolescents within CF. Specifically, it was hypothesized that that specific demographic (i.e., age, child gender, and child body mass index [BMI]) and medical (i.e., FEV$_1$ percent predicted scores [forced expiratory volume in 1 second], haemoptysis or pneumothorax in the last 6 months, receiving IV antibiotics, currently on psychiatric medication, and currently receiving psychotherapy) was predictive of child health anxiety. Analyses revealed no significant predictors (demographic or medical variables) for child health anxiety. These findings are inconsistent with past research that explored demographic and medical variable predictors of anxiety and depression, as opposed to health anxiety (Quittner et al., 2014). Quittner and colleagues’ (2014) findings identified being female, being recently on IV antibiotics, and receiving psychotherapy with levels of anxiety. With respect to depression, being female, having an episode of haemoptysis or pneumothorax in the last 6 months, currently taking psychiatric medication, and currently receiving psychotherapy were identified as significant predictors. It is possible that there is something inherently different about the population of children and adolescents with CF in Canada, which has obscured or altered the anxiety and depression risk variables commonly associated with adolescents with CF, or that our dependent variable (i.e., health anxiety) has a different relationship with such demographic and/or medical variables.
However, it is more likely the current findings are the consequence of a rather small sample size. Thus, a larger, more representative sample size is required to better understand this relationship.

**Limitations**

There are several limitations of the current study that require attention. First, this study is a part of a larger study that is examining both health anxiety and associated constructs in children and adolescents with CF in combination with their parent/caregiver. We anticipated having 50 participants complete the survey including the demographics questionnaires and battery of measures for parent and child. However, at the time of data analysis we only had 10 parents complete the demographics questionnaire and 6 children complete the battery of measures. It is possible that since both parents and children were required to fill out measures (i.e., 5 measures of health anxiety and associated constructs each) for approximately 2 hours total time, that the survey research was deemed too long or effortful for the perceived outcome expected by parents. Thus, the current findings may not generalize well due to the very small sample size and the analyses may be underpowered. Recruitment is ongoing, and we anticipate recruiting more participants in the future.

Second, this study was potentially limited as it relied solely on Internet-based technology, including email and an anonymous, online-hosted survey (SurveyMonkey) for researcher correspondence, recruitment, and data collection. This means of research, while efficient for the researchers, placed minimal accountability on the part of the participants, potentially leading to smaller sample size and poor completion rates. Going forward participant recruitment will be adapted to include additional advertising sources (i.e., paper advertisements posted in clinics) and recruitment methods (i.e., survey completion in person) to provide more opportunities to reach eligible participant, improve accountability and response rate, and increase awareness of
Third, the sole use of self-reports in order to measure health anxiety and the associated constructs of interest is an additional limitation to consider. During child data collection, parents were instructed to simply read out loud and provide explanation for measure items when required and to otherwise provide minimal assistance to children during self-reports. However, the child’s response potentially could have been influenced by the assistance provided by parents, as a researcher did not monitor survey completion. Specifically, a response bias due to parental presence (i.e., parent may have influenced their child’s response either advertently or inadvertently) may have occurred. It is also possible, due to the nature of self-reports, that the social desirability response bias influenced response, which is the tendency for participants to present a favorable image of themselves to conform to socially acceptable values rather than respond in a way that may elicit criticism or social disapproval (Van de Mortel, 2008). These biases suggest that children and adolescents may have reported fewer health anxiety symptoms as not to concern their parents or guardians. Future studies may endeavor to employ a combination of self-report measures and other means of measurement, such as behavioral or observation measures, in order to obtain a more complete picture of the psychological health within this population. In the context of the larger study, psychological measurement will involve both self-report measures and qualitative interviews to allow for a better understanding of the psychological needs of this population. However, future researchers may also seek to employ diagnostic interviews that utilize DSM-5 criteria, as this may strengthen the methodology of the study (Wright et al., 2015).

Fourth, another limitation is related to low internal consistency score in the CIAS treatment experiences subscale and the IUS-R inhibitory and prospective IU subscales (i.e., $\alpha =$
The strength of the alpha coefficients is affected by the length of scale (Streiner, 2003), and the lower CASI and IUS-R values may be attributed to having three to five items in each subscale. Poor internal consistency of these subscales may impact the strength of our findings. However, the internal consistency across the majority of total and subscale scores from the measures employed in the current study ranged from excellent to acceptable.

**Future Directions**

The current study was the first of its kind to explore health anxiety and associated constructs in a population of Canadian children and adolescents with CF. Improved understanding of health anxiety across childhood and adolescence is essential, as knowledge can facilitate early identification of clinically significant health anxiety and potentially prevent inappropriate and dangerous medical process and the unnecessary use of health care resources that can be associated with clinical levels of health anxiety. These findings may also speak to the psychological needs for children and adolescents with CF, a specific group who may be at a heighten risk for psychopathology. Specifically, further research findings will expand our understanding of the broader psychological functioning of Canadian children and adolescents with CF by having a more inclusive participant age range (i.e., 8-18) and including measurement of associated psychological constructs (i.e., IU, AS, anxiety, and depression). The knowledge gained from this research is critical to informing the development and execution of innovative, tailored interventions for children and adolescents with CF, with the overall objective of improving their mental health functioning and quality of life. Although our findings are only tentative, given the small sample size, the acquired findings expand our understanding of health...
anxiety and associated constructs within this specialized medical population. The current study can thus act as a vehicle for further research in the area.

The current study is cross-sectional in nature, limiting our ability to understand the developmental trajectory of health anxiety in children and adolescents with CF or the relationship between health anxiety, associated constructs, and related variables over time. Future research may seek to examine health anxiety in a sample of children and adolescents with CF longitudinally. This methodological approach may allow for a better overall understanding of health anxiety in this population, and potentially allow for the identification of demographic and medical variable predictors of child health anxiety. Such acquired knowledge may allow for the implementation or development of additional mental and physical support systems targeted toward this specialized child and adolescent medical population. For the most part mothers participated in the current study, resulting in possible bias in our findings. Research has found that fathers can play a major role in the development of anxiety disorders in typically developing children (Bogels & Phares, 2008; Last, Hersen, Kazdin, Orvashel, & Perrin, 1991). Future research should seek to collect data from both parents/caregivers in order to get a more complete understanding of the potential role of parental variables (i.e., age, gender, employment status, and physical and mental health conditions) in the development of health anxiety within this specialized medical population. The inclusion of data from both parents would further expand our knowledge of the role that parents may play in the presentation of child and adolescents health anxiety in general, and in specific chronic medical populations (i.e., CF).

An additional avenue of research may be to include typically functioning siblings of children and adolescents with CF. Research has demonstrated that CF within the family can significantly influence family functioning and negatively affect the psychologically well-being of
healthy siblings, with siblings of children with chronic illness or disability having 1.6 to 2.0 times the risk for developing psychological problems compared to siblings of healthy children (Harting et al., 2014). In particular, results from meta-analytic and systematic reviews have demonstrated that these children are vulnerable to experiencing aggression, depression, anxiety, guilt, and low self-esteem (Sharp & Rossiter, 2002; Vermaes, van Susante, & van Bakel, 2012; Williams, 1997). However, much of the research on the psychological functioning of siblings with chronic illness and disability are contradictory and lack a general consensus, and no study has explored the latter in Canadian siblings of children and adolescents with CF (Cuskelly & Gunn, 2006). Research into siblings of children and adolescents with chronic health conditions, such as CF, will highlight the importance of measuring and treating mental health issues in not only patients themselves, but families coping with serious, chronic illnesses as a whole.
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doi:10.1207/S15327752JPA8001_18


doi:10.1192/bjp.bp.111.103960


doi:10.1037/1040-3590.19.2.176


doi:10.1016/j.jpsychores.2017.03.298


Appendix A

Parent/Child Demographic Questionnaire:

**Parent**

1. What is your sex?
   ___ Male   ___ Female

2. How old are you?
   Age: ______

3. What is your ethnicity?
   ___ White/Caucasian   ___ Black/African   ___ Hispanic
   ___ Asian   ___ Aboriginal/First Nations   ___ Middle Eastern
   ___ Mixed Ethnicity   ___ Other (please specify)

4. What is your HIGHEST level of education?
   ___ Some elementary school   ___ Some University
   ___ Grade 8   ___ University Diploma
   ___ Grade 9   ___ University Degree
   ___ Grade 10   ___ Trade School
   ___ Grade 11   ___ M.A.
   ___ Grade 12   ___ Ph.D.

5. What is your current relationship status?
   ___ Single   ___ Divorced   ___ Common law/cohabiting
   ___ Married   ___ Separated   ___ Dating
   ___ Widowed   ___ Other (please specify)
6. What is your current employment status? (Select all those that currently apply)
   _____Employed-full time   _____Employed part-time
   _____Student             _____On disability   _____Other (please specify)

8. What is your current family size?
   _____
   number

9. What is your current household income?
   _____Less than 30,000   _____30,000-49,999   _____50,000-99,999
   _____100,000-499,000   _____greater than 500,000

9. Where do you live?
   _____urban setting       _____rural setting

10. Do you have an existing health condition?
    YES          NO

11. If YES, please list:

12. Do you have an existing mental health condition (e.g., attention deficit/hyperactivity disorder, depression, panic disorder, schizophrenia)?
    YES          NO

13. If YES, please list:

14. Are you receiving any intervention for an existing mental health condition?
    YES          NO

If YES, please check as appropriate
   _____psychiatric medication   _____psychotherapy   _____other
Child

1. What is your child’s sex?
   ____Male  ____Female

2. How old is your child?
   Age: _____

3. What is your child’s date of birth? (Month, Day, Year)
   Birthday:  ____  ____  ______
   MM  DD  YY

4. What is your child’s ethnicity?
   ____White/Caucasian  ____Black/African  ____Hispanic
   ____Asian  ____Aboriginal/First Nations  ____Middle Eastern
   ____Mixed Ethnicity  ____Other (please specify)

5. What grade is your child in?
   ____Grade 2  ____Grade 3  ____Grade 4  ____Grade 5  ____Grade 6
   ____Grade 7  ____Grade 8  ____Grade 9  ____Grade 10

Responses from the following two questions allow us to calculate your child’s body mass index (BMI)

6. What is your child’s height?
   ____feet  ____inches
   ____ Do not know

7. What is your child’s weight?
   ____lbs
   ____ Do not know
8. What is your child’s FEV₁ percent predicted (forced expiratory volume in 1s as a percentage of predicted)?

_____

____ Do not know

10. Has your child had haemoptysis or pneumothorax in last 6 months?

YES  NO

11. Is your child currently on intravenous antibiotics?

YES  NO

If YES, for how long

____ months  ____ weeks  ____ days

12. Is your child on the national waiting list for lung transplantation?

YES  NO

13. Does your child have an existing mental health condition (e.g., attention deficit/hyperactivity disorder, depression, panic disorder, schizophrenia)?

YES  NO

13. If YES, please list:

14. Is your child currently on psychiatric medication for a mental health condition?

YES  NO

If YES, please list mental health condition and associated prescribed medication

<table>
<thead>
<tr>
<th>Mental Health Condition</th>
<th>Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>________________________</td>
<td>________________________</td>
</tr>
<tr>
<td>________________________</td>
<td>________________________</td>
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<tr>
<td>________________________</td>
<td>________________________</td>
</tr>
</tbody>
</table>
15. Is your child currently receiving psychotherapy for a mental health condition?

YES       NO
**Appendix B**

**Childhood Illness Attitude Scales (CIAS)**

Directions: Below are a number of questions. Read each question carefully and put an X on the line in front of the words that best answers the question. There are no right or wrong answers. Remember, find the words that best answers the question.

<table>
<thead>
<tr>
<th>Question</th>
<th>None of the time</th>
<th>Sometimes</th>
<th>A lot of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you worry about your health?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. Are you worried that you might get really sick in the future?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Does the thought of being sick scare you?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4. If you have pain, do you worry that it may be caused by a bad sickness?</td>
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</tr>
<tr>
<td>5. If pain lasts for a week or more, do you tell your mom or dad?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. If pain lasts for a week or more, do you ask your mom or dad if you can go to the doctor?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. If pain lasts for a week or more, do you believe that you have a bad sickness?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Do you try not to have habits that may be bad for you, such as smoking, drinking, or drugs?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Do you try not to eat foods that may not be good for you (such as junk food)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Do you check your body to find out if there is something wrong?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Do you believe that you are really sick, but the doctors do not know why?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. When you feel sick, do you tell your mom or dad?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
13. When you feel sick, do you ask your mom or dad if you can go to the doctor?  
___ None of the time  ___ Sometimes  ___ A lot of the time

14. Do you ask your mom or dad for medicine?  
___ None of the time  ___ Sometimes  ___ A lot of the time

15. When your doctor tells you that you are not sick, do you not believe him/her?  
___ None of the time  ___ Sometimes  ___ A lot of the time

16. If a doctor tells you what he/she found, do you soon begin to believe that you might have another sickness?  
___ None of the time  ___ Sometimes  ___ A lot of the time

17. Are you afraid of news that reminds you of death?  
___ None of the time  ___ Sometimes  ___ A lot of the time

18. Does the thought of dying scare you?  
___ None of the time  ___ Sometimes  ___ A lot of the time

19. Are you afraid that you might die soon?  
___ None of the time  ___ Sometimes  ___ A lot of the time

20. Are you afraid that you might have cancer?  
___ None of the time  ___ Sometimes  ___ A lot of the time

21. Are you afraid that you have something wrong with your heart?  
___ None of the time  ___ Sometimes  ___ A lot of the time

22. Are you afraid that you have another bad sickness?  
___ None of the time  ___ Sometimes  ___ A lot of the time

Which sickness? ________________________________

23. When you read or hear about a sickness, do you think that you might have that sickness?  
___ None of the time  ___ Sometimes  ___ A lot of the time

24. When you have a strange feeling in your body, do you find it hard to think about something else?  
___ None of the time  ___ Sometimes  ___ A lot of the time

25. When you have a strange feeling in your body, do you worry  
___ None of the time  ___ Sometimes  ___ A lot of the time
about it?

| 26. When you have a strange feeling in your body, do you tell your mom or dad? | None of the time | Sometimes | A lot of the time |
| 27. When you have a strange feeling in your body, do you ask your mom or dad if you can go to the doctor? | None of the time | Sometimes | A lot of the time |
| 28. Has your doctor told you that you have a sickness? If yes, what sickness? | Yes | No |
| 29. How many times have you seen your doctor in the last year? | 0 times | 1-2 times | 3 or more times |
| 30. How many doctors have you seen in the past year? | 0 | 1-2 | 3 or more |
| 31. How often have you been treated (had to take medicine or had surgery) during the past year? | 0 times | 1-2 times | 3 or more times |
| 32. If you have had treatments in the last year, what were they? | |

The next three questions concern feelings in your body (for example, pain, aches, pressure in your body, breathing problems, being tired etc.)

| 33. Do strange feelings in your body stop you from going to school? | None of the time | Sometimes | A lot of the time |
| 34. Do strange feelings in your body stop you from enjoying yourself? | None of the time | Sometimes | A lot of the time |
| 35. Do strange feelings in your body stop you from keeping your mind on what you are doing? | None of the time | Sometimes | A lot of the time |
Appendix C

Children’s Anxiety Sensitivity Index (CASI)

**Directions:** A number of statements which boys and girls use to describe themselves are given below. Read each statement carefully and put an X on the line in front of the words that describe you. There are no right or wrong answers. Remember, find the words that best describe you.

1. I don’t want other people to know when I feel afraid.
   - None
   - Some
   - A lot

2. When I cannot keep my mind on my schoolwork I worry that I might be going crazy.
   - None
   - Some
   - A lot

3. It scares me when I feel “shaky”.
   - None
   - Some
   - A lot

4. It scares me when I feel like I am going to faint.
   - None
   - Some
   - A lot

5. It is important for me to stay in control of my feelings.
   - None
   - Some
   - A lot

6. It scares me when my heart beats fast.
   - None
   - Some
   - A lot

7. It embarrasses me when my stomach growls (makes noise).
   - None
   - Some
   - A lot

8. It scares me when I feel like I am going to throw up.
   - None
   - Some
   - A lot
9. When I notice that my heart is beating fast, I worry that there might be something wrong with me.
None
Some
A lot

10. It scares me when I have trouble getting my breath.
None
Some
A lot

11. When my stomach hurts, I worry that I might be really sick.
None
Some
A lot

12. It scares me when I can’t keep my mind on my schoolwork.
None
Some
A lot

13. Other kids can tell when I feel shaky.
None
Some
A lot

14. Unusual feelings in my body scare me.
None
Some
A lot

15. When I am afraid, I worry that I might be crazy.
None
Some
A lot

16. It scares me when I feel nervous.
None
Some
A lot

17. I don’t like to let my feelings show.
None
Some
A lot

18. Funny feelings in my body scare me.
None
Some
A lot
### Appendix D

**Intolerance of Uncertainty Scale-Revised**

Below are a series of statements. Please read each statement carefully and circle which box best describes you.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Not at all like me</th>
<th>A bit like me</th>
<th>Moderately like me</th>
<th>Very like me</th>
<th>Entirely like me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When things happen suddenly, I get very upset P</td>
<td></td>
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<tr>
<td>2</td>
<td>It bothers me when there are things I don’t know P</td>
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<tr>
<td>3</td>
<td>People should always think about what will happen next. This will stop bad things from happening P</td>
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<tr>
<td>4</td>
<td>Even if you plan things really well, one little thing can ruin it P</td>
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<tr>
<td>5</td>
<td>I always want to know what will happen to me in the future P</td>
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<tr>
<td>6</td>
<td>I can’t stand it when things happen suddenly P</td>
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<tr>
<td>7</td>
<td>I should always be prepared before things happen P</td>
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<tr>
<td>8</td>
<td>Feeling unsure stops me from doing most things I</td>
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<tr>
<td>9</td>
<td>When I’m not sure what to do I freeze I</td>
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</tr>
<tr>
<td>10</td>
<td>When I don’t know what will happen, I can’t do things very well I</td>
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<tr>
<td>11</td>
<td>The smallest concern can stop me from doing things I</td>
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</tr>
<tr>
<td>12</td>
<td>I must get away from all things I am unsure of I</td>
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<td></td>
</tr>
</tbody>
</table>
