PARENT-PROXY IMPACT-III: DEVELOPMENT AND VALIDATION OF AN IBD-SPECIFIC HEALTH-RELATED QUALITY OF LIFE MEASURE

by

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(Under the Direction of Ronald Blount, Ph.D.)

ABSTRACT

Objective: The current study aimed to create and validate a parent-proxy version of the IMPACT-III, an IBD-specific measure of health-related quality of life (HRQOL). Validity and reliability analyses were conducted. *Method:* Youth (N=36) diagnosed with inflammatory bowel disease (IBD) reported on their HRQOL and pain interference, parents reported on their children's HRQOL and psychosocial functioning, and physicians completed a measure of disease activity. *Results:* The parent IMPACT-III was strongly, positively associated with the PedsQL. Higher parent IMPACT-III scores were associated with less pain interference, but were not associated with disease activity. It was not more strongly related to disease activity than anxiety/depression. Internal consistency, parent-child agreement, and item-level analyses revealed strong reliability. *Conclusions*: The parent IMPACT-III showed strong criterion validity, adequate construct validity, and strong reliability. It may be used with, or as a possible alternative to, the child IMPACT-III to provide valuable information regarding HRQOL in youth with IBD.

INDEX WORDS: Pediatric, inflammatory bowel disease, health-related quality of life, parents

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CHAPTER 1

PARENT-PROXY IMPACT-III: DEVELOPMENT AND VALIDATION OF AN IBD-SPECIFIC HEALTH-RELATED QUALITY OF LIFE MEASURE

Inflammatory bowel diseases (IBD) are a group of gastrointestinal diseases that include Crohn's disease (CD), ulcerative colitis (UC), and indeterminate colitis (IC). It is estimated that 0.2-8.5 per 100,000 children are diagnosed with CD and 0.5-4.3 per 100,000 children with UC (Mamula, Markowitz, & Baldassano, 2003), whereas few estimates exist for IC in pediatric populations. Many individuals with IBD are plagued with uncomfortable and painful inflammation of the gastrointestinal tract, which can cause abdominal pain, fever, fatigue, diarrhea, hematochezia, weight loss, and growth delays in youth (Diefenbach & Breuer, 2006; Mackner, Sisson, & Crandall, 2004). This inflammation is often episodic in nature, in that patients undergo periods of active disease and remission. Most researchers postulate that IBD develops due to the interaction of environmental, genetic, and immune factors, although the exact etiology remains unclear (Diefenbach & Breuer, 2006).

Pediatric IBD is one of the most disruptive childhood physical health conditions and can be considered a chronic stressor and burden on normal development. An estimated 20-30% of individuals with IBD have an onset of symptoms before the age of 18, with research indicating that symptoms of both CD and UC are more severe and invasive when the age of onset is younger (Malaty, Fan, Opekun, Thibodeaux, & Ferry, 2010; Sawczenko et al., 2001; Van Limbergen et al., 2008). Youth with IBD report feeling a sense of vulnerability, a diminished sense of control over their lives and future, and perceive themselves as "different" from others

their age (Nicholas et al., 2007). In addition to these negative self-evaluations, pediatric patients with IBD generally experience lower quality of life compared to their healthy peers (Greenley et al., 2010).

Health-Related Quality of Life

Health-related quality of life (HRQOL) has been widely examined in the pediatric IBD literature and refers to how a child's illness affects their functioning across multiple domains, including social, emotional, and physical functioning (De Civita et al., 2005). HRQOL is a distinct construct from health status, as it provides a more comprehensive portrayal of a patient's health and functioning. HRQOL goes beyond an examination of medical factors and describes health status from the patients' perspectives (Borgaonkar & Irvine, 2000) and can provide valuable information when considering mechanisms to improve clinical care and management (Varni, Seid, & Kurtin, 2001).

A recent meta-analytic review of psychosocial adjustment in youth with IBD found that compared to parents of healthy youth, parents of children with IBD reported their child had lower HRQOL (Greenley et al., 2010). Specifically, studies have found that children with IBD have lower physical and psychological health than their healthy peers, but higher overall HRQOL compared to a sample of other chronically ill pediatric populations (Cunningham, Drotar, Kunz, Hommel, & Greenley, 2010; Palermo, McGowan, & Arendt, 2007). Both child and parent reports indicate that adolescents with IBD are at an elevated risk for emotional problems, which are associated with lower HRQOL (Cunningham et al., 2007; Engelmann et al., 2015). However, certain mechanisms can serve as protective factors for youth with IBD. A positive attitude and support from family members and friends can lead to positive coping strategies and better quality of life (Nicholas et al., 2007). Having positive expectations about the

disease has also been associated with better HRQOL in about half of the core QOL domains (Van der Zaag-Loonen, Grootenhuis, Last, & Derkx, 2004).

HRQOL is a growing area of research among youth with IBD. The IMPACT-III, one of the most widely used measures of IBD-specific HRQOL, was developed using patient interviews and patient responses to a questionnaire (Otley et al., 2002). Many researchers and clinicians choose to utilize the IMPACT-III due to its excellent reliability (Cronbach's $\alpha = 0.90$), as well as a relatively low grade reading level of 4.5 (Otley et al., 2002). Originally created by Otley and colleagues, the IMPACT-III was developed as a child-report measure in order to examine the child's perception of their own HRQOL. Since its inception, the IMPACT-III has been validated for use in the United States as well as in an international sample (Abdovic et al., 2013; Otley et al., 2002). Good internal reliability, discriminant reliability, as well as concurrent validity when compared to the Pediatric Quality of Life Inventory 4.0, was also shown in a study of Croatian children with IBD (Abdovic et al., 2013). Despite the IMPACT-III's reliability and validity, no parent-proxy version of the IMPACT-III has been validated.

Demographic Variables and Health-Related Quality of Life

In order to identify potentially vulnerable groups of pediatric patients diagnosed with IBD, previous literature has examined demographic variables that may be associated with HRQOL. In regards to age, older children and adolescents tend to report lower scores on the IMPACT-III than do their younger peers, indicating worse HRQOL (Otley et al., 2006). Additionally, adolescents with CD report lower HRQOL than healthy teenagers (Loonen, Grootenhuis, Last, Koopman, & Derkx, 2002). Although more research is needed, some speculate that decreased motor functioning and autonomy may limit adolescents' independence from their caregivers, which could be related to lower HRQOL (Loonen et al., 2002). Gender has

also been critically examined and results indicate that males tend to report lower HRQOL than females (De Boer, Grootenhuis, Derkx, & Last, & 2005). Collectively, previous literature would indicate that being an adolescent and being male may be risk factors for lower HRQOL among pediatric patients with IBD.

Clinical Disease Activity

Given the unpredictable and intrusive nature of relapses in IBD, it can be important for clinicians and families to be cognizant of changes in HRQOL that pediatric patients may be experiencing during episodic flare-ups. Clinical disease activity can be measured through different modalities, such as patient self-report, fecal calprotectin (FCAL; Konikoff & Denson, 2006), physician's global assessment (PGA; Greenley, Kunz, Schurman, & Swanson, 2013), C-reactive protein (CRP; Solem et al., 2005), the Pediatric Crohn's Disease Activity Index (PCDAI; Hyams et al., 1991), and the Pediatric Ulcerative Colitis Activity Index (PUCAI; Turner et al., 2007). Despite the difference in modality (i.e., self-report, physician report, biomarkers obtained from blood or stool samples), the purpose of all methods is to determine the severity of disease symptoms. In a study of adult patients diagnosed with UC, physician report of disease activity was more highly correlated with disease activity than the patient's own global assessment (Turner et al., 2010). Therefore, it may be advantageous to utilize physician reports (i.e., PCDAI, PUCAI) or objective lab values (i.e., FCAL, CRP) over pediatric patients' self-reports to measure objective disease activity or inflammation.

In the pediatric IBD literature, greater disease activity has been found to be related to lower HRQOL (Gray, Denson, Baldassano, & Hommel, 2011). Specifically, children with moderate to severe disease activity, as reported by the PGA, have been found to have poor HRQOL on the IMPACT-III compared to those with quiescent disease (Otley, et al. 2006).

These results were supported in another study using a different physician-reported measure of disease activity for pediatric patients with CD, the PCDAI. Results indicated that higher disease activity scores on the PCDAI were associated with lower HRQOL on the IMPACT-III (Marcus et al., 2009). Taken together, greater disease activity is likely to be associated with lower HRQOL in pediatric patients with IBD.

Disease-related Pain Interference

Abdominal pain, along with a multitude of other uncomfortable physiological symptoms, is one of the most intrusive symptoms of pediatric IBD (Mackner, Sisson, & Crandall, 2004). Although it oftentimes increases due to inflammation in the gastrointestinal tract, it can also occur as a result of medical procedures and treatment (Banez & Cunningham, 2003). In fact, abdominal pain can occur without the presence of significant disease activity, as chronic inflammation can lead to sensitization of sensory pathways and can affect pain processing, even when disease symptoms are low (Bielefeldt, Davis, & Binion, 2009). It is estimated that approximately 20% of adults with IBD experience abdominal pain without active disease. A similar trend could be found in youth, in that youth's pain could be interfering with daily functioning even during periods of disease remission (Bielefeldt et al., 2009).

Although the pain itself can be distressing, the associated impairment can also be substantial and interfering during everyday life. Previous literature has found that disease-related pain can be associated with significant disability and impaired HRQOL among other pediatric illness groups (Palermo, Harrison, & Koh, 2006). Within the pediatric IBD population, associations between abdominal pain and HRQOL also have been found, with high levels of pain being associated with lower HRQOL (Greenley et al., 2013). Although the research is limited,

initial examinations indicate that more pain interference is associated with lower HRQOL for pediatric patients with IBD.

Dual Reporters

Although the IMPACT-III is a well-validated self-report measure, no parent-proxy version has yet been validated in English. Previous literature has found that youth and parent-proxy ratings of HRQOL are sometimes discrepant among other pediatric populations such as diabetes and cancer (Vance, Jenney, Eiser, & Morse, 2001; Varni et al., 2001; Yi-Frazier et al., 2015). Within pediatric IBD populations, there has been moderate agreement between youth and their parents on reports of overall HRQOL (Kunz, Hommel, & Greenley, 2010). Yet, there have been discrepancies when specific domains of HRQOL have been assessed. More specifically, one study found that parents are likely to rate their child's emotional functioning as lower than the patient's self-report (Gallo et al., 2014). Another investigation found that caregivers reported worse physical health, psychological health, and emotional worry compared to a healthy sample, whereas their children only reported an overall physical health domain as lower than their healthy peers (Cunningham et al., 2007).

Given that there may be nuanced discrepancies between parent and child reports of HRQOL, Kunz and colleagues recommend the use of multiple informants to gain a more comprehensive understanding of a patient's functioning in order to facilitate appropriate clinical interventions (Kunz, Hommel, & Greenley, 2010). Moreover, it has been recommended that when comparing parent and child reports, researchers should examine agreement, as opposed to consistency, for a more statistically conservative approach and a potentially more accurate representation of a child's HRQOL (De Civita et al., 2005).

Examining Reliability and Validity in New Measures

To examine the psychometric properties of the new parent IMPACT-III, the current study conducted validity and reliability analyses. The types of validity examined were concurrent criterion validity and construct validity (i.e., convergent and discriminant validity). Concurrent criterion validity, hereby referred to as "criterion validity", is determined when one measure is shown to correlate with some "contemporary criterion", or another established measure of the variable in question (Cronbach & Meehl, 1955). In order to determine whether a new measure meets the requirement for adequate construct validity, both convergent and discriminant validity should be shown (Campbell & Fiske, 1959; Whitely, 1983). The use of multiple methods to confirm distinguished relationships between the variable in question and other domains is known as convergent validity. Discriminant validity is shown when a measure can provide "justification of novel trait", in that it provides more information or accounts for more variance than another measure that shares some common features (Campbell & Fiske, 1959). Reliability of a new measure is also important to consider and can be established with high inter-rater agreement, internal consistency, and item-test correlations (Cronbach & Meehl, 1955).

The Current Study and Hypotheses

As is evidenced by the literature, HRQOL of pediatric patients with IBD is an important domain to examine, as it relates strongly to other aspects of functioning such as pain interference and clinical disease activity. While the child-report version of the IMPACT-III has been validated and is widely utilized, it is imperative to have a parent-proxy report of HRQOL, as this may provide invaluable information regarding children's overall functioning. Therefore, the purpose of the proposed study was to create, implement, and evaluate a parent-proxy version of the IMPACT-III in a population of parents whose children have been diagnosed with IBD.

The current study examined the criterion validity, construct validity (i.e., convergent and discriminant validity), feasibility, item reliability, internal consistency reliability, and inter-rater agreement of a newly developed parent-proxy version of the IMPACT-III. In regards to criterion validity, it was hypothesized that the parent-proxy IMPACT-III would be highly correlated with a parent-proxy, non-disease specific measure of HRQOL, the Pediatric Quality of Life Inventory 4.0 (PedsQL). The parent IMPACT-III was predicted to have good convergent reliability in that it would be strongly, negatively associated with clinical disease activity and pain interference. It was hypothesized that the parent measure would have good discriminant validity in that the magnitude of its relationship with disease activity would be larger than that of other psychosocial measures, such as anxiety and depression symptoms and disease activity. Measures of anxiety and depression were selected because extant literature has indicated associations with disease activity (Giannakopoulos et al., 2016; Reigada et al., 2015). To establish discriminant validity, HRQOL, which is disease-specific, should have a stronger association with disease activity than anxiety or depression. Finally, it was predicted that the parent-proxy IMPACT-III would have high levels of absolute agreement with the child report measure, good overall and subscale internal reliability, good factor and item reliability, and will be feasible to complete.

CHAPTER 2

METHOD

Participants

Participants included 36 youth and their accompanying caregivers, who were being seen at a large pediatric gastroenterology clinic in the Southeastern U.S. Inclusion criteria for youth were that they: (1) were diagnosed with Crohn's disease, ulcerative colitis, or indeterminate colitis within the last 45 days, (2) were fluent in English, (3) had at least one parent or caregiver who was willing to participate, and (4) were between the ages of 8 and 17 years old. Exclusion criteria were a documented history or parent report of a pervasive developmental disorder, autism, or a non-verbal presentation that would impede the ability to complete questionnaires. Inclusion criteria for parents was fluency in English.

A total of 52 eligible families were approached with information regarding the study. Of those, 14 families declined and 38 families consented to participate. Of these 38 families, 38 youth completed all study measures and 36 parents completed all study measures, with 2 parents completing partial measures. This yielded a final participation rate of 73.1% of all families approached, and of these, 94.7% with complete data.

Parent demographic characteristics can be found in Table 1. The present sample represents predominantly female, Caucasian, and married caregivers between the ages of 30 and 55. Most of the caregivers were parents of the youth, with 1 grandparent/legal guardian participating. Given this majority, all participating caregivers will be referred to as "parents" moving forward. Regarding education, a majority of the parents had obtained at least a

bachelor's degree. Parents also reported on their family income, with 60% of families having an annual income of over $75,000.

Child demographic characteristics can be found in Table 2. All youth were between the ages of 8 and 17 years and the majority were female and Caucasian. Most of the youth were not homeschooled. Regarding IBD diagnoses, a large majority of the youth were diagnosed with Crohn's disease compared to ulcerative colitis or indeterminate colitis. The majority of youth (80%) were characterized as having inactive disease by their physician.

Procedures

Participants were screened for eligibility through an electronic medical chart review in collaboration with doctors and nurses at the pediatric gastroenterology clinic. Families were contacted by the research team prior to their clinic appointment taking place within 45 days of an IBD diagnosis. Research staff met parents and children to describe the study and to obtain informed consent and assent for youth < 18 years of age. Parents and children used separate iPads to independently complete measures via Redcap, a secure online platform, while at the clinic appointment. Families were compensated for their time.

Measures

Demographic and medical information. Demographic information for youths and their parents (e.g., age, race, annual income) was collected using a standard demographic questionnaire. Medical information was obtained via electronic chart review (e.g., diagnosis, date of diagnosis).

Health-Related Quality of Life

IMPACT-III—Child Report. Youth HRQOL was assessed using the 35-item child-report IMPACT-III (Otley et al., 2002). The IMPACT-III was specifically designed for assessing

HRQOL in children and adolescents with IBD. It is comprised of 6 domains: Bowel Symptoms (7 items), Systemic Symptoms (3 items), Emotional Functioning (7 items), Social Functioning (12 items), Body Image (3 items), and Treatment/Interventions (3 items). Each item uses a 5-point Likert scale with values ranging from 1 to 5, with higher scores representing better HRQOL. A total score was calculated by summing the responses from all 35 questions. The IMPACT-III has demonstrated excellent internal reliability in previous literature (Cronbach's α = .90; Otley et al., 2002). In the present study, the internal consistency for the child IMPACT-III was excellent (α = .92).

IMPACT-III—Parent Report. A parent-proxy version of the IMPACT-III was created for use in this study to assess parent perspective of their child's IBD-related HRQOL. The parent measure was developed by three research personnel, who consulted with the creator of the original child IMPACT-III, Anthony Otley, M.D. Each item from the child measure was altered so that parents reported on their child's HRQOL, in that items using personal pronouns (i.e., you, your, my) were changed in order to fit the parent-proxy format (i.e., my child, their, him/her). For example, "How often do you think it is unfair that you have inflammatory bowel disease?" was changed to "How often does your child think it is unfair to have inflammatory bowel disease?" The final version of the parent-proxy IMPACT-III was approved by study personnel as well as Dr. Otley (personal communication January 19, 2016). All six domains and the total score were calculated using the same methods as the child-report version. In the present study, the internal consistency for the parent IMPACT-III was excellent (α = .91).

Pediatric Quality of Life Inventory 4.0. The Pediatric Quality of Life Inventory 4.0 (PedsQL) is a widely used 23-item parent-proxy measure used to assess HRQOL in pediatric patients and healthy children (Varni et al., 2001). The PedsQL is comprised of four different

domains: social functioning, school functioning, emotional functioning, and physical health. A total HRQOL score was calculated by averaging all individual subscale scores. Item responses range from 0 (*Never a problem)* to 4 (*Almost always a problem)*. Items are reversed scored and transformed to a 0-100 scale, with higher scores indicating better QOL. Two versions of the PedsQL were administered, one for parents of children 8-12 years old and one for parents of teenagers 13-18 years old. The PedsQL measures general HRQOL and is not IBD-specific. The PedsQL has demonstrated excellent internal reliability (Cronbach's $\alpha = .90$; Varni et al., 2001). In the present study, the internal consistency for the child version was excellent ($\alpha = .97$) and good ($\alpha = .87$) for the teen version.

Clinical Disease Activity

The Abbreviated Pediatric Crohn's Disease Activity Index. Clinical disease activity for patients with Crohn's disease (CD) was examined using the abbreviated *Pediatric Crohn's Disease Activity Index* (abbPCDAI; Loonen, Griffiths, Merkus, & Derkx, 2003). The abbPCDAI is a physician-report measure of patients' disease activity. The total score of the abbPCDAI is a summation of 6 items from the PCDAI assessing general well-being, pain, abdominal tenderness, number of stools per day, body weight, and perirectal disease. The abbPCDAI ranges from 0 to 60, with scores less than 15 indicating inactive disease, 15 to 25 indicating mild disease activity, and over 25 indicating moderate to severe disease activity.

The Pediatric Ulcerative Colitis Activity Index. Clinical disease activity for patients with ulcerative colitis (UC) and indeterminate colitis (IC) was examined using the physician-report *Pediatric Ulcerative Colitis Activity Index* (PUCAI; Turner et al., 2007). The total score of the PUCAI is a summation of 6 items assessing abdominal pain, rectal bleeding, number of stools per 24 hours, stool consistency, activity restriction, and nocturnal bowel movements causing

wakening. The total score of the PUCAI ranges from 0 to 85, with scores less than 10 indicating inactive disease, 10 to 34 indicating mild disease, 35 to 64 indicating moderate disease, and 65 and above indicating severe disease.

To be able to directly compare the disease activity of patients with CD, UC, and IC, PUCAI scores were converted to the abbPCDAI scaling (i.e., 0 to 60) by multiplying each PUCAI score by (60/85). All disease activity scores for patients with CD remained the same as was indicated on the abbPCDAI.

Disease-Related Pain Interference

PROMIS Pediatric Pain Interference. Pain interference was measured using the child-report version of the Patient-Reported Outcomes Measurement Information System—Pain Interference (PROMIS Pain Interference; Ader, 2007). The PROMIS Pain Interference consists of 8 items examining the extent to which participants' pain interfered with normative or preferred activities over the past 7 days. Items responses range from 0 (*Never*) to 4 (*Almost Always*) and were summed to calculate a total score. Total scores were converted to age- and gender-normed T-scores. The PROMIS Pain Interference has demonstrated good internal reliability (Cronbach's $\alpha = .87$; Varni et al., 2014). In the present study, the PROMIS Pain Interference had excellent internal consistency ($\alpha = .92$).

Psychosocial Functioning

Behavior Assessment System for Children—Second Edition. The parent-report version of the Behavior Assessment System for Children- Second Edition (BASC-2; Reynolds & Kamphaus, 2004) was used to examine youths' psychosocial functioning. The current study assessed parent-reported anxiety and depression in their children. The Parent Rating Scale-Child (PRS-C) was administered to parents of children 6 to 11 years old and the Parent Rating Scale-

Adolescent (PRS-A) was administered to parents of adolescents 12 to 17 years old. In the PRS-C, the anxiety and depression subscales each consist of 14 items. In the PRS-A, the anxiety and depression subscales consist of 11 and 13 items, respectively. Parents were asked to indicate their level of agreement with various statements using a 4-point Likert scale ranging from 1 (*never*) to 4 *(almost always*) (e.g., "Worries about making mistakes"). T-scores were calculated based on gender and age norms and were used in analyses. The BASC-2 anxiety and depression subscales have demonstrated good internal reliability, with Cronbach's alpha values ranging from .81-.84 on anxiety subscales and .86-.87 on depression subscales (Reynolds & Kamphaus, 2004). In the present study, the internal consistency for the PRS-C anxiety subscale was excellent (α = .91), PRS-C depression subscale was good (α = .89), PRS-A anxiety subscale was good (α = .87), and PRS-A depression subscale was good (α = .88).

Statistical Analyses

All statistical analyses were conducted using IBM Statistical Package for the Social Sciences, Version 24.0 (SPSS; IBM Corp., Armonk, NY). The overall goal of the study was to create and validate a parent-proxy IMPACT-III to assess HRQOL in youth with IBD.

Preliminary Analyses. Descriptive statistics including means (*M*), standard deviations (*SD*), frequencies, and ranges were calculated for all sociodemographic (i.e., parent and child age, gender, ethnicity, parent marital status, education level, and annual family income) and study variables (i.e., HRQOL, disease activity, anxiety, depression, and pain interference) to characterize the sample. Preliminary analyses (i.e., *t*-tests, bivariate correlations) were also conducted to determine if there were any significant associations between sociodemographic variables and study variables.

Feasibility: Missing Item Responses. Feasibility of completing the parent IMPACT-III was determined by examining the percentage of missing values across all parents.

Validity Analyses. Pearson product-moment correlations were used to investigate the associations between the parent IMPACT-III and all other study variables.

Criterion Validity. The associations between the total scores and comparable domain scores (i.e., emotional functioning, social functioning) on the parent IMPACT-III and the PedsQL were examined to determine criterion validity. Domains that did not overlap between the parent IMPACT-III and PedsQL were not compared (e.g., school functioning domain on the PedsQL).

Construct Validity. Convergent validity was examined by determining the associations between the parent IMPACT-III and measures of disease activity and pain interference. Discriminant validity was assessed by determining whether the magnitude of the association between HRQOL and disease activity was larger than the association between internalizing symptoms (i.e., anxiety and depression) and disease activity. First, bivariate correlations were calculated between HRQOL and disease activity as well as between internalizing symptoms and disease activity. Next, Fisher's *r-to-z* transformations were performed to compare the magnitude of the correlations.

Reliability Analyses. Parent-child agreement, internal consistency, and factor and item-level analyses were examined.

Parent-Child Agreement. Intraclass correlations (ICCs) and paired-samples *t*-tests were used to determine agreement and discrepancies between the parent- and child-report versions of the IMPACT-III. ICCs were used to assess absolute agreement between raters, as opposed to consistency.

Internal Consistency. Internal consistencies were determined for all measures using Cronbach's alpha. For the parent-proxy version of the IMPACT-III, internal consistencies were determined for the overall measure as well as for each of the six domains.

Factor and Item-Level Analyses. An exploratory factor analysis was proposed to examine the structure of the parent IMPACT-III. However, based on the criteria proposed by Guadagnoli and Velicer (1988), a minimum of 150 participants was needed in order to analyze factors with predicted large factor loadings (i.e., > .60). Given that the current sample size was relatively small (N = 36), a factor analysis was not conducted at this time.

However, item-level analyses were conducted to determine item descriptive characteristics, the percentage of missing values for each item, the distribution of item responses, the extent to which items correlated with the overall measure, and whether the internal reliability of the overall measure would increase if particular items were eliminated.

Exploratory Analyses. After all proposed analyses were conducted, questions remained regarding the relationship between HRQOL and disease activity, given that the two variables were unrelated when examining the parent IMPACT-III. Therefore, exploratory analyses were conducted using bivariate correlations to determine whether another measure of HRQOL, the PedsQL, was related to disease activity.

Power Analysis

Sample sizes necessary to detect significant statistical effects were determined a priori using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) with power = .80, $\alpha = .05$, and a medium effect size for correlational analyses = .30 (Cohen, 1988). It was determined that 64 participants will be required to detect effects for correlational analyses. To detect differences between parent and child report using a paired sample *t*-test and to determine reliability using

ICCs, with power = .80, α = .05, and medium effect size (.50), a sample of 34 dyads would be necessary. It was determined that a minimum of 150 participants was needed in order to conduct a factor analysis with large predicted factor loadings (Guadagnoli & Velicer, 1988).

Table 1. *Parent Demographic Information*

Parents	Age (Range = 30-55; *M* = 45.03; *SD* = 5.53)
	N (%)
Gender	
Female	29 (80.6%)
Male	7 (19.4%)
Ethnicity	
Caucasian	25 (69.4%)
African American	8 (22.2%)
Asian	1 (2.8%)
Biracial	1 (2.8%)
Missing	1 (2.8%)
Relationship to Child	
Biological or Adoptive Parent	35 (97.2%)
Grandparent	1 (2.8%)
Annual Family Income	
$10,000 to $24,999	3 (8.3%)
$25,000 to $49,999	3 (8.3%)
$50,000 to $74,999	8 (22.2%)
$75,000 to $99,999	5 (13.9%)
$100,000 to $124,999	7 (19.5%)
$125,000 or greater	9 (25.0%)
Prefer not to disclose	1 (2.8%)
Marital Status	
Married	26 (72.2%)
Divorced/Separated	10 (27.8%)
Educational Background	
High School Diploma/GED	3 (8.3%)
Some College	3 (8.3%)
Associate's Degree	7 (19.4%)
Bachelor's Degree	15 (41.8%)
Advanced Degree	8 (22.2%)

Table 2. *Child Demographic Information*

Child/Adolescent	Age (Range = 8-17; *M* = 14.35; *SD* = 2.46)
	N (%)
Gender	
Female	20 (55.6%)
Male	16 (44.4%)
Ethnicity	
Caucasian	26 (72.2%)
African American	8 (22.2%)
Asian	2 (5.6%)
IBD Diagnosis	
Crohn's Disease	31 (86.1%)
Ulcerative Colitis	4 (11.1%)
Indeterminate Colitis	1 (2.8%)
Homeschooled	
Yes	5 (13.9%)
No	31 (86.1)

CHAPTER 3

RESULTS

Descriptive Data and Preliminary Analyses

Means and standard deviations for all study variables are reported in Table 3. Prior to conducting further analyses, correlations between sociodemographic variables and study variables were conducted to identify potential covariates. Results indicated significant gender differences, with parents reporting significantly more depression symptoms for females (M = 53.75; SD = 11.99) than males (M = 46.25; SD = 6.38; $t(33) = 2.24$, $p = .03$; $d = 0.78$), higher child-reported HRQOL for males (M = 144.75; SD = 12.89) than females (M = 126.35; SD = 21.29; $t(34) = -3.04$, $p = .005$; $d = 1.05$), and more child-reported pain interference for females (M = 51.87; SD = 10.95) than males (M = 43.81; SD = 8.43; $t(34) = 2.43$, $p = .02$; $d = 0.82$). When gender was examined as a covariate in statistical analyses, the same patterns of results emerged. Therefore, analyses did not include gender as a covariate.

Regarding diagnosis type, patients who were diagnosed with CD (M = 11.22; SD = 2.56) endorsed higher HRQOL on the systemic symptoms subscale of the child IMPACT-III compared to the UC/IC diagnosis group (M = 8.50; SD = 3.67; $t(34) = -2.23$, $p = .03$; $d = 0.86$). On the parent IMPACT-III, parents of youth diagnosed with CD (M = 24.78; SD = 4.32) endorsed higher HRQOL on the bowel symptoms subscale than parents of youth diagnosed with UC/IC (M = 19.80; SD = 4.55; $t(34) = -2.39$, $p = .02$; $d = 1.12$). The same pattern of results emerged when diagnosis was included as a covariate in analyses.

Results indicated no significant differences in study variables among Caucasian versus non-Caucasian youth or parents, parents who were married versus those who were not, and youth who were homeschooled versus those who were not. Child age was significantly associated with the Treatment/Interventions subscale of the child-report IMPACT-III, in that as youth age increased, so did their HRQOL related to medical care and treatment ($r = .61$; $p < .001$). When child age was examined as a covariate in statistical analyses, the same patterns of results emerged. Therefore, analyses did not include child age as a covariate. No significant relations were found between parent age and study variables. Results indicated no significant relations between demographic variables and disease activity.

Feasibility: Missing Item Responses

Analyses determined that the percentage of missing item responses on the parent IMPACT-III was 0%, indicating that all parents provided a value for each item.

Validity Analyses

Criterion and construct validity (i.e., convergent and discriminant validity) of the parent IMPACT-III were assessed.

Criterion Validity. Regarding criterion validity, there was a strong, positive relationship between the total score on the parent IMPACT-III and the total score on the PedsQL ($r = .56$, $p < .001$), the parent IMPACT-III emotional functioning and the PedsQL emotional functioning scales ($r = .62$, $p < .001$), and the parent IMPACT-III social functioning and PedsQL social functioning scales ($r = .51$, $p = .001$).

Construct Validity. Regarding construct validity, convergent and discriminant analyses were performed. In examining convergent validity, results indicated a significant, negative relationship between the total parent IMPACT-III and youths' pain interference ($r = -.40$, $p =$

.02), in that youth with higher parent-reported HRQOL endorsed less pain interference. The bowel symptoms (r = -.65, p < .001), systemic symptoms (r = -.47, p < .01), and emotional functioning (r = -.36, p = .03) domains were also negatively associated with pain interference. Results indicated no significant associations between youths' pain interference and social functioning, body image, and treatment/interventions domains. Correlational analyses indicated no significant association between total and domain scores on the parent IMPACT-III and disease activity.

To determine discriminant validity, correlations between anxiety and disease activity and depression and disease activity were compared to the correlation between the parent IMPACT-III and disease activity. First, bivariate correlations were conducted and results indicated a significant negative association between anxiety and disease activity (r = -.36, p = .04) and no significant associations between depression (r = -.23, p > .05) or parent IMPACT-III (r = -.10, p > .05) and disease activity. Next, Fisher's *r-to-z* transformations were performed to transform the correlation coefficients. Results indicated no significant difference between anxiety (Z = -1.08, p > .05) or depression (Z = -0.52, p > .05 and disease activity compared to parent IMPACT-III and disease activity.

Reliability Analyses

Parent-Child Agreement. The agreement between parent and child report of HRQOL was first examined via ICCs. As can be seen in Table 4, significant ICCs between parent and child report were found for the total HRQOL as well as all domain scores. The ICCs for the total score, bowel symptoms, and systemic symptoms were good; the ICCs for emotional functioning, social functioning, and treatment/intervention domains were moderate; and the ICC for the body image domain was poor.

For the total HRQOL score and each domain, paired samples *t*-tests were used to compare parent and child reports. Children reported significantly better overall HRQOL, emotional functioning, and social functioning compared to their parents. There were no significant differences in parents' and children's reported scores on bowel symptoms, systemic symptoms, body image, and treatment/intervention domains.

Internal Consistency. Internal consistency of the total and domain scores for the IMPACT-III was examined using Cronbach's alpha. Internal consistency for the total score was excellent (α = .91), emotional functioning (α = .85) and systemic symptoms (α = .85) were good, bowel symptoms (α = .71) and social functioning (α = .77) were acceptable, and body image (α = .32) and treatment/interventions (α = .42) were unacceptable.

Factor and Item-Level Analyses. The sample size (N = 36) of the current study was deemed inadequate and a factor analysis was not conducted.

See Table 5 for item descriptive characteristics and Table 6 for item correlations with the overall measure and the internal reliability of the overall measure if items were eliminated. Results indicated that 9 items (26%) had a strong correlation, 15 items (43%) had a moderate correlation, and 11 items (31%) had a weak correlation with the overall measure. Additionally, results indicated that the internal reliability of the overall measure would not increase if any item was deleted from the scale and would slightly decrease if any of 14 particular items were deleted.

Regarding item response distributions, a full range for 24 out of the 35 items was demonstrated. Item distributions tended to be skewed toward higher HRQOL.

Exploratory Analyses. Contrary to hypotheses, the parent IMPACT-III was not associated with disease activity. Therefore, exploratory analyses were conducted to determine whether this non-significant relationship was unique to the parent IMPACT-III, in that the

measure itself may be lacking a crucial aspect of HRQOL that is related to disease activity, or whether this may be better explained by another aspect within the disease activity factor. In order to examine this, bivariate correlations were conducted to examine the relations between the PedsQL, an established and validated measure of HRQOL, and disease activity. Results indicated that similar to the parent IMPACT-III, the total score, social functioning, and emotional functioning domains of the parent-reported PedsQL were not significantly associated with disease activity ($p > .05$).

Table 3. *Descriptive Information Regarding Study Variables*

Variable	Mean	Standard Deviation	Range
Parent IMPACT			
Total score	127.19	18.10	81-164
Bowel Symptoms	24.11	4.62	15-33
Systemic Symptoms	10.43	2.52	4-15
Emotional Functioning	23.76	5.67	13-35
Social Functioning	46.86	6.25	31-58
Body Image	10.38	2.09	6-14
Treatment/Interventions	11.65	2.06	6-15
Child IMPACT			
Total score	134.58	19.55	78-165
Bowel Symptoms	25.08	5.02	12-33
Systemic Symptoms	10.79	2.89	4-15
Emotional Functioning	26.24	5.80	15-35
Social Functioning	48.92	5.87	31-58
Body Image	11.21	2.36	5-15
Treatment/Interventions	12.34	2.340	6-15
PedsQL			
Total score	71.71	16.01	31-97
Emotional Functioning	69.03	18.39	35-100
Social Functioning	84.97	15.25	45-100
Anxiety	48.53	11.64	32-81
Depression	50.25	10.27	37-88
Pain Interference	47.99	10.39	34-67
Disease Activity	8.45	7.44	0-25

Table 4. *Parent versus Child Report of HRQOL*
Note: ICC values less than .40 indicate poor reliability, values between .41 and .60 indicate moderate reliability, values between .61 and .80 indicate good reliability, and values between .81-1.00 indicate excellent reliability (Varni et al., 2014).
* $p < .05$, ** $p < .01$, ***$p < .001$

	Child *M* (SD)	Parent *M* (SD)	*M* difference (95% CI)	*t*	Cohen's d	ICC
Total Score	134.65 (19.81)	127.19 (18.10)	7.46 (2.71 to 12.21)	3.18**	.39	.67***
Bowel Symptoms	25.00 (5.07)	24.11 (4.62)	.89 (-0.35 to 2.14)	1.45	.18	.70***
Systemic Symptoms	10.81 (2.92)	10.43 (2.52)	.38 (-0.35 to 1.11)	1.05	.14	.68***
Emotional Functioning	26.35 (5.83)	23.76 (5.67)	2.59 (.70 to 4.49)	2.78**	.45	.47***
Social Functioning	49.03 (5.92)	46.86 (6.25)	2.16 (.33 to 4.00)	2.39*	.36	.56***
Body Image	11.14 (2.35)	10.38 (2.09)	.76 (-0.05 to 1.56)	1.90	.34	.39**
Treatment/ Interventions	12.32 (2.43)	11.65 (2.06)	.68 (-0.04 to 1.39)	1.93	.30	.53***

Table 5. *Descriptive Characteristics of Parent IMPACT-III Items*

Item	Mean	SD
1	3.22	1.12
2	4.19	1.14
3	3.28	1.23
4	3.47	1.23
5	2.67	1.15
6	3.31	.82
7	3.39	1.13
8	2.53	.91
9	3.56	1.25
10	3.42	1.32
11	3.08	1.13
12	3.08	1.38
13	3.86	.99
14	3.58	1.11
15	3.53	1.08
16	3.56	1.03
17	3.81	.95
18	4.83	.51
19	3.75	1.05
20	4.42	.87
21	3.33	1.24
22	3.31	.95
23	4.75	.50
24	4.14	.96
25	4.33	.894
26	3.75	1.30
27	4.39	.80
28	3.67	.86
29	3.83	.85
30	3.64	1.07
31	2.72	.74
32	3.33	1.10
33	3.42	1.00
34	3.42	1.16
35	4.08	1.11

Table 6. *Item to Scale Statistics of Parent IMPACT-III*

Item	Scale mean if item deleted	Scale variance if item deleted	Corrected Item-Total Correlation	Cronbach's alpha if item deleted
1	123.42	309.45	.37	.91
2	122.44	306.31	.45	.91
3	123.36	304.01	.46	.91
4	123.17	297.63	.62	.90
5	123.97	297.80	.67	.90
6	123.33	310.69	.49	.91
7	123.25	317.22	.17	.91
8	124.11	316.04	.27	.91
9	123.08	294.59	.68	.90
10	123.22	306.98	.36	.91
11	123.56	301.74	.57	.90
12	123.56	297.23	.55	.90
13	122.78	303.15	.62	.90
14	123.06	298.28	.68	.90
15	123.11	306.39	.47	.91
16	123.08	304.65	.55	.90
17	122.83	305.34	.58	.90
18	121.81	313.93	.63	.91
19	122.89	310.10	.39	.91
20	122.22	315.49	.30	.91
21	123.31	299.53	.57	.90
22	123.33	308.29	.49	.91
23	121.89	316.84	.47	.91
24	122.50	311.91	.37	.91
25	122.31	304.85	.64	.90
26	122.89	316.90	.15	.91
27	122.25	312.08	.45	.91
28	122.97	304.71	.67	.90
29	122.81	302.62	.75	.90
30	123.00	322.69	.04	.91
31	123.92	324.71	.01	.91
32	123.31	302.28	.58	.90
33	123.22	319.89	.13	.91
34	123.22	305.04	.47	.91
35	122.56	310.25	.36	.91

CHAPTER 4

DISCUSSION

The aim of the current study was to create and examine the psychometric properties of a parent-proxy version of the IMPACT-III, an IBD-specific measure of HRQOL. Criterion validity, construct validity (i.e., convergent and discriminant validity), and various aspects of reliability were examined. Overall, the findings provide good support for both the validity and reliability of the parent IMPACT-III, a parallel measure to the established child IMPACT-III. As hypothesized, criterion validity was supported, as the parent IMPACT-III was strongly associated with a preexisting, validated measure of HRQOL, the PedsQL. This significant association was found between the total scores of these measures as well as between the comparable social and emotional domains. Expanding upon the applicability of the PedsQL, the parent IMPACT-III provides IBD-specific information regarding HRQOL in youth, such as an in-depth examination of bowel symptoms and treatment/interventions.

This study also investigated construct validity (i.e., convergent and discriminant validity). The parent IMPACT-III had good convergent validity, in that youth with higher HRQOL were found to have fewer interruptions in their daily lives due to pain. This finding is consistent with the extant literature (Palermo, Harrison, & Koh, 2006). Contrary to hypotheses, the parent IMPACT-III was not associated with clinical disease activity. However, rather than a shortcoming of the parent IMPACT-III, this is likely due to a limited range of scores in disease activity. An examination of the physicians' report of disease activity revealed that despite being diagnosed with IBD within the past 45 days, the majority of youth (i.e., 80%) were classified as

having inactive disease. It is likely that this may be due to almost half of the patients beginning Remicade immediately upon diagnosis (i.e., before the research visit), which has been found to decrease disease activity in the gut within one week of beginning treatment (Baldassano et al., 2003). Of the 20% with active disease, the range of severity was limited, in that all patients were characterized as having mild disease, with no patients classified as having moderate or severe disease activity. Lastly, exploratory analyses also indicated no significant association between disease activity and the PedsQL, indicating this phenomenon was not unique to the parent IMPACT-III. It is possible that with a wider range of disease activity, as well as a larger sample size, an association between disease activity and HRQOL may emerge.

In addition to convergent validity, clinical disease activity was utilized to determine whether the parent IMPACT-III demonstrated adequate discriminant validity. Contrary to hypotheses, there were no significant associations between the parent measure of HRQOL or depression and disease activity. Additionally, higher disease activity was found to be related to lower anxiety symptoms, which is contrary to findings in the extant literature (Giannakopoulos et al., 2016; Reigada et al., 2015). Given the lack of simple correlational findings and the restricted range of scores in disease activity as noted above, it is not surprising that support for discriminant validity was not found.

In addition to validity, the present study examined the reliability of the parent IMPACT-III. As hypothesized, based on the results of the ICC analyses, inter-rater reliability between parent and child reports of HRQOL was generally moderate to good, with one exception. Specifically, parents and their children tended to report comparable child HRQOL on the overall domain, bowel symptoms, systemic symptoms, and treatment/interventions. The low agreement between parent and child reports on body image may be related to the small sample size and low

number of items, which has been found to reduce inter-rater reliability, especially when using ICCs (Lee et al., 2012). Additionally, parents tended to endorse lower emotional and social HRQOL than their children. These findings replicate the previous literature, in that parents are likely to report their child's emotional and social functioning as lower compared to their children (Gallo et al., 2014; Kunz, Hommel, & Greenley, 2010).

An additional goal of this study was to examine the internal consistency of the overall parent IMPACT-III as well as the domains. Generally, the overall measure and its domains were considered to have adequate to good reliability, with the exception of the body image and treatment/interventions domains. This supports previous literature that has recommended reconsideration of both domains in the child IMPACT-III. Specifically, Abdovic and colleagues noted low internal consistency issues within the body image domain on the child-report measure and Ogden and colleagues recommended adding items to the domain (Abdovic et al., 2013; Ogden et al., 2011). Additionally, some extant literature has recommended eliminating the treatment/interventions domain altogether from the child report (Ogden et al., 2011). It is possible that the small number of items (i.e., 3) in both the body image and treatment/interventions domains may be contributing to low internal reliability, given that fewer items restrict the potential range and variability of scores. Therefore, despite finding low internal consistency for both domains, results are consistent with previous examinations of the child IMPACT-III.

Overall, the parent IMPACT-III proved to be a feasible measure, as parents provided values for all items. This is comparable to the feasibility of the child IMPACT-III, in which children also had high response patterns (Otley et al., 2002). Additionally, most items were adequately correlated with the overall measure and results indicated that deleting items from the

measure could potentially decrease the overall internal reliability. This implies that each of the 35 items are appropriate to include in the overall measure. Therefore, the parent and child report versions of the IMPACT-III are comparable in terms of structure.

In addition to the aforementioned strengths, the creation of the parent IMPACT-III has notable implications. First and foremost, this measure has filled a gap in research and clinical settings, in that there is now a psychometrically sound parent-proxy report of IBD-specific HRQOL. With this new inventory, clinicians and researchers will be able to gather information about parents' perceptions of their children's HRQOL, as child and parent perceptions may differ. Moreover, having a reliable and valid way to assess parent report is imperative for those children who may not be able (i.e., due to non-verbal developmental delays or younger age) or are unwilling (i.e., due to refusal to complete questionnaires) to provide self-report. The feasibility and relatively short nature of the parent IMPACT-III also lends itself to effective and efficient use.

While this study provides novel and important contributions to the existing literature, it is not without limitations. A larger sample size may support broader generalization, increase statistical power, allow for larger ranges of disease activity scores, and support the use of factor analyses to examine structure. Previous literature has found that the factor structure of the child IMPACT-III may be better suited by a 4- or 5-domain measure (Abdovic et al., 2013; Ogden et al., 2011) as opposed to the current 6-domain structure and it seems likely that this may be the case for the parent measure as well. Given that this was not examined in the current study, it is recommended that future studies investigate the domain structure of the parent IMPACT-III. Although common in pediatric IBD research, another limitation of the current study is a low level of participant diversity. The current sample was predominately Caucasian and had a high

annual family income. However, this tends to be common in the extant literature (e.g., Hommel, Davis, & Baldassano, 2008), as IBD is most often seen in people with higher SES (Sonnenberg, 1989). Although common, it is not clear how these results apply to minority and lower SES families and children with IBD. Lastly, utilizing a longitudinal, as opposed to a cross-sectional design, could examine the longitudinal stability of HRQOL as assessed by the parent IMPACT-III. It is recommended that future studies consider these limitations and suggestions for future research.

In summary, the parent IMPACT-III appears to be an adequately reliable and valid measure of HRQOL in youth diagnosed with IBD. The development of this measure should provide clinicians and researchers with a means to examine parent-proxy reports of HRQOL, as well as provide a method to directly compare parent and child perceptions. Further, in situations where child report is not feasible or might not be valid, the parent IMPACT-III provides a viable method of assessing this important construct. This measure can also help identify youth with low HRQOL, who may be at risk of other related, negative outcomes and who may benefit from targeted interventions or additional support. The development and validation of the parent IMPACT-III fills the long-standing gap in the literature and provides researchers and clinicians with a psychometrically sound parent measure of HRQOL in pediatric patients with IBD.

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