Published in final edited form as:

J Pediatr Nurs. 2017 ; 33: 54–62. doi:10.1016/j.pedn.2016.11.008.

Exploration of the Influence of Factors Identified in the Literature on School-Aged Children's Emotional Responses to Asthma

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Abstract

Approximately 6.3 million US children suffer from asthma. The purpose of this study was to explore factors on school-aged children's emotional responses to asthma, N=85, ages 6–12. Correlations included Asthma related child emotional functioning QOL and (a) asthma severity, $r = -.30$, $p < .01$, (b) child internalizing behaviors, $r = -.26$, $p < .05$, (c) child externalizing behaviors $r = -.43$, $p < .001$; Caregiver emotional functioning QOL and (a) asthma severity, $r = -.39$, $p < .001$, (b) child internalizing behaviors, $r = -.22$, $p < .05$, (c) child externalizing behaviors, $r = -.25$; $p < .05$. Multiple regression analysis revealed that asthma severity and child externalizing problems accounted for 26% of the variance in asthma related child emotional functioning QOL, $F(4, 79) = 7.051$, $p < .001$ (asthma severity, $\beta = -.31$, $p < .01$; child externalizing problem behaviors, $\beta = -.43$, $p < .001$). Findings imply that asthma research should consider problem behaviors of school-aged children when addressing asthma related emotional functioning QOL.

Introduction

Approximately 6.3 million (8.6%) children share the diagnosis of asthma, the most common chronic childhood illness in the United States (National Health Interview Survey, 2014). Asthma symptoms, such as coughing, wheezing, chest tightening, and shortness of breath can be triggered by a range of allergens such as pollen, dust-mites, mold, and animal dander. Stress, weather changes, and strong emotional expressions such as crying and laughing hard can also trigger asthma symptoms (Akinbami, Moorman, & Liu, 2011; CDC, 2016; U.S. Department of Health & Human Services USDHHS, 2007). The emotional responses or emotional reactions of children who have asthma, as well as the emotional responses of their caregivers (parents), may be seriously affected by the manifestations of asthma (Walker, 2012, 2013).

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Previous Presentation of Paper: 2014 St. David's CHPR Annual Conference: Promoting Health Communities: Interdisciplinary Perspectives, Date: April 2, 2014, Austin, Texas

The author reports no conflicts of interest.

Two emotional responses that have been repeatedly linked to medical conditions such as asthma are depressive and anxious symptoms (American Psychiatric Association, [APA], 2013; McLeish, Luberto, & O'Bryan, 2016; Trojan et al., 2014). Children who had asthma were reported to have more depressive and anxious symptoms when compared to children who did not have asthma (Friedman, 2007; Meuret, Ehrenreich, Pincus, & Ritz, 2006). An exploratory study of 183 rural school-aged children was conducted that examined relationships among demographic factors, children's coping, asthma self-management, and asthma related quality of life (QOL). In this study, 16% of the variance in child's asthma emotional functioning QOL was accounted for by the variables coping frequency, race/ethnicity, and asthma severity, $R^2 = .16$, $F(3, 163) = 10.04$, $p < .001$ (Horner, Brown, & Walker, 2012). Although this was a statistically significant finding, more than 80% of the variability was unaccounted for, presenting a need for further research to ascertain additional factors influencing child's asthma emotional functioning QOL.

Literature Review

Factors were identified that contributed to the emotional functioning QOL or the emotional responses of school-aged children who have asthma using a systematic and extensive review of the literature (Walker, 2012). The following were identified as pertinent factors associated with the emotional functioning QOL of children who have asthma: (a) asthma severity; (b) missed school days; (c) increased child medical services use; (d) child internalizing behaviors; (e) child externalizing behaviors, and (f) caregiver or parental emotional functioning QOL. These variables had been studied individually with varying statistical methods demonstrating their associations to emotional responses in children who have asthma. However, the exploration of the combined influence of these variables on the frequency of children's emotional responses (reactions) or emotional functioning QOL had not yet been addressed (Walker, 2012).

Asthma Severity

Asthma severity is classified by both impairment and risk and has been defined as the "the intrinsic intensity of the disease process" (USDHHS, 2007). Asthma impairment in children is assessed by measuring the frequency and intensity of asthma symptoms as well as functional limitations due to asthma. Asthma risk in children is determined by ascertaining the likelihood of asthma attacks, progressive decline in lung growth, measurement of lung function, or risk of negative effects from medications (USDHHS, 2007).

Asthma severity has been linked to the emotional responses of children who have asthma (Bender & Zhang, 2008; Blackman & Gurka, 2007; Feldman et al., 2013; Katon et al., 2007; Richardson et al., 2006; Waxmonsky et al., 2006; Winter, Fiese, Spagnola & Anbar, 2011; Wood et al., 2007; Wood et al., 2008; Wood et al., 2006). In general, the literature presents a positive or direct relationship between asthma severity and the increase of internalizing, or anxious and depressive symptoms in children.

Children with severe asthma were found to have more than four times the odds of having problems associated with depression and anxiety than children who did not have asthma, *OR*

= 4.47, 99% CI [2.27, 8.80] (Blackman & Gurka, 2007). Child self-reported anxiety predicted missed school days due to asthma (a factor often used to identify asthma severity), $OR = 1.068$, 95% CI [1.004, 1.136], and child self-reported depression predicted missed school days due to asthma $OR = 1.065$, 95% CI [1.006, 1.127] (Bender & Zhang, 2008). Greater asthma severity was found to be positively and significantly related to greater child internalizing symptoms and positively, though non-significantly related to greater child externalizing symptoms (Winter et al., 2011). Strong associations have been reported between asthma severity, number of asthma symptoms, and asthma symptom days and the emotional responses of children who have asthma (Bender & Zhang, 2008; Blackman & Gurka, 2007; Katon et al., 2007; Richardson et al., 2006; Waxmonsky et al., 2006; Winter et al., 2011; Wood et al., 2008). Findings from these studies align with a systematic literature review of asthma severity and child QOL in pediatric asthma which reported direct correlations between asthma severity and child QOL in 9 out of 14 studies (Everhart & Fiese, 2009).

Missed School Days

Approximately 10.5 million school days are missed each year because of asthma (Akinbami et al., 2011). Children with asthma reportedly missed more school than children who did not have asthma (Blackman & Gurka, 2007; Moonie, Sterling, Figgs, & Castro, 2006). In a study of asthma severity and missed school days ($N = 9014$, Subset $N = 874$ who had asthma; grades K-12; 94% African American, 5.2% White), after adjusting for demographic factors and days of enrollment, mean days absent from school increased as asthma severity increased, $p = .007$. This study not only reported more missed school days for children who had asthma, but reported severity of asthma as a significant link to missed school days (Moonie et al., 2006).

Associations have also been reported between missed school days for children who have asthma and their emotional responses (Bender & Zhang, 2008; Daniel et al., 2012). In one study of children who had asthma ($N = 104$; ages 8–18; 37.5% White, 25.9% African American, 21% Hispanic, 15.3 % Other), children's emotional response scores significantly predicted missed school days, when controlling for medication adherence (Bender & Zhang, 2008). Children's self-rated depression and anxiety scores significantly predicted missed school days, $OR = 1.065$, 95% CI [1.006, 1.127] and $OR = 1.068$, [1.004, 1.136] respectively (Bender & Zhang, 2008).

Increased Child Medical Services Use

According to data presented by the National Center for Health Statistics, children who had asthma between the ages of 0–17 visited primary care facilities and ED centers for asthma at a higher rate than those who were 18 and older and also had asthma (Akinbami et al., 2012). Increased use of medical services has been linked to internalizing disorders in children who have asthma (Goodwin, Messineo, Bregante, Hoven & Kairam, 2005; Morrison, Goli, Van Wagoner, Brown & Khan, 2002) and significantly and negatively associated to health related QOL (Swartz, 2010). Probable diagnosis of depressive and anxiety related disorders were positively associated with higher use of healthcare services for asthma (Goodwin et al.,

2005); higher depressive symptoms in inner city children were associated with asthma related hospitalizations in the last year (Morrison et al., 2002).

A pilot study was conducted with 46 inner-city children, ages 6–17 who had asthma (41% African American, 26% White, 26% Hispanic, 7% other), to examine the relationship between objective measures of asthma severity and severity of depression. Using *t* tests to compare mean depressive symptoms scores, findings included an association between asthma related hospitalizations in the past year and higher scores of depression, $p = .03$ and a 30% prevalence of likely, very likely, or almost certain major depressive disorder found in this population (Morrison et al., 2002).

Child Internalizing Behaviors

Child internalizing behaviors include depressive and/or anxious symptoms, as well as somatic complaints (Achenbach & Edelbrock, 1983; APA, 2013; Meuret et al., 2006). Asthma severity has been positively linked with depressive and anxious symptoms in many studies of childhood asthma (Bender & Zhang, 2008; Blackman & Gurka, 2007; Feldman et al., 2013; Katon et al., 2007; Richardson et al., 2006; Waxmonsky et al., 2006; Winter et al., 2011; Wood et al., 2006, 2007, 2008). In a study of 48 children, ages 8–12 ($n = 27$ with asthma, $n = 21$ without asthma; 75% Black non-Hispanic, 23% Hispanic, 2% American Indian), asthma status was defined as either having a physician diagnosis of asthma, or having no chronic illness. After controlling for age, gender, and asthma status, children with higher levels of anxiety and depression were also found to be more likely to have interpersonal relationship problems, $\beta = -.46$; $p < .01$ and $\beta = -.71$; $p < .001$ respectively. This study however did not find differences between children who had asthma and controls when examining associations between anxiety and depression and interpersonal relationship problems (Berz et al., 2005).

Child Externalizing Behaviors

Externalizing behaviors in children may include impulsivity, hyperactivity, and aggression (Achenbach & Edelbrock, 1983; APA, 2013). After adjusting for race/ethnicity, gender, age, income, and parental educational levels, children with severe asthma also had nearly three times the odds of having ADHD when compared to children who did not have asthma, $OR = 2.93$, 99% CI [1.60, 5.39]. Children who had asthma also had greater odds of having learning disabilities, $OR = 3.21$, 99% CI [1.92, 5.37] and behavioral or conduct problems, $OR = 4.18$, 99% CI [2.20, 7.94] than children who did not have asthma. As asthma severity increased, the odds ratios of having these behavioral problems also increased (Blackman & Gurka, 2007). Youth in one study with at least one anxiety or depressive disorder also had significantly worse psychosocial functioning scores or got into trouble, had more difficulty managing school work, jobs, and interpersonal relationships, $t(765) = 10.42$, $p < .001$ (McCauley, Katon, Russo, Richardson & Lozano, 2007).

CAREGIVER EMOTIONAL FUNCTIONING

Emotional responses in parents have been positively correlated to emotional responses in their children who have asthma (Feldman et al., 2013; Waxmonsky et al., 2006). Caretakers of children who had more severe asthma symptoms were reported to have more anxiety when compared to caretakers of children who had less severe asthma symptoms (Silver, Warman, & Stein, 2005). Children's asthma symptoms were reported to decrease as their mothers' emotional well-being improved (Brown et al., 2008). Negative maternal emotional responses have been linked to decreased self-efficacy in coping with their child's asthma episodes (Bartlett et al., 2001; Barlett et al., 2004), increased use of health services (Brown et al., 2006), and lower warmth/involvement and greater hostility scores when doing interaction tasks (Celano et al., 2008). Asthma symptoms decreased in children who had asthma, as did rates of unscheduled asthma visits when caregivers of children who had asthma were treated successfully for depression (Brown et al., 2008).

Methods

An exploratory, descriptive, cross-sectional, correlational study was conducted using data from a subsample of the parent Asthma in Central Texas Project (ACT) with two additional variables. The parent project was the longitudinal ACT project conducted by Dr. Sharon Horner, with funding from the National Institutes of Health, National Institute for Nursing Research (R01NR007770). The parent project was a stratified randomized control trial intervention with a focus on improving asthma management behaviors in parents and children. The sample came from school-aged children (ages 6–12) and parents of children who have asthma. The participants in this study were recruited from participants already enrolled in year 4 of the parent study. The purpose of this exploratory, descriptive, cross-sectional, correlational study was to explore the influence of factors identified in the literature on school-aged children's emotional responses to asthma. The following are the research questions were addressed:

- What are the relationships among asthma severity, caregiver emotional functioning QOL, child internalizing behaviors, and child externalizing behaviors, asthma morbidity factors (i.e., child hospitalizations, child ED visits, child school absences), and asthma related child emotional functioning QOL?
- To what extent do asthma severity, caregiver emotional functioning QOL, child internalizing behaviors, and child externalizing behaviors, asthma morbidity factors (i.e., child hospitalizations, child ED visits, and child school absences) add to the variance in asthma related child emotional functioning QOL?
- To what extent does SES and race/ethnicity modify the relationship between asthma severity and asthma related child emotional functioning QOL?
- To what extent does caregiver emotional functioning QOL, child internalizing behaviors and child externalizing behaviors, asthma morbidity factors, (i.e., child hospitalizations, child ED visits, child school absences) mediate the relationship between asthma severity and asthma related child emotional functioning QOL?

Study Procedures—The research project went through the institutional review board before it was conducted. Institutional review board approval was received to amend the ACT study by adding an additional survey instrument regarding child behaviors as part of the study.

Sampling and Enrollment—Using 9 predictor variables with $\alpha = .05$, power at .8, and a medium effect size of 0.15, 68 participants were needed for adequate statistical power (Cohen, 1992; Warner, 2008). This study had participation of 85 school-aged children and 85 caregivers of children who had asthma and thus was able to meet the criteria for adequate power (Cohen, 1992; Warner, 2008). The ACT study was a 5 year study. Each year of the study had 4 data collection points. The sample pool contained children in year 4 of the 5 year study. The sample pool was composed of school-aged girls and boys in grades 2–5 with a history of asthma documented on their school records in rural school districts of central Texas. The sample was a convenience cross-sectional sample in a longitudinal study. Sample inclusion criteria for these participants were: (a) parental report that child has an asthma diagnosis made by a medical provider; (b) in the last 12 months has had asthma symptoms; (c) does not have co-morbidity that would prevent participation in study classes, and (d) speaks either the English or Spanish language. Additionally, the parent/guardian who was asked to participate in the study was the caregiver who managed the health of the child in the home.

The parents in year 4 of the ACT study were healthy adults who lived in Hays Consolidated Independent School District and had a child who had asthma. It was permissible for either mothers or fathers to participate in the caregiver questionnaires of the study, but most of the parents who participated in the study were mothers. Surveys were provided in either Spanish or English, so caregivers in the study could answer the survey in their desired language. Children in the study were school-aged children that participated in one of the three randomized groups in the ACT study. The three groups these children were selected from in the ACT study were as follows: School-Home asthma treatment group, Camp-Workshop asthma treatment group, or an in-school attention-control group.

Consent to participate in the study was already given by the participants before the first data collection was conducted at time 1 of the ACT study. The questions regarding their children's behavior as it related to asthma was covered by the original consent form. An additional consent form was not necessary. However, parents were informed of and asked to complete the additional questions in the Behavior Problems Index measure. Implied consent was assumed if parents answered the additional questions.

Data Collection—Data regarding race/ethnicity, and SES were gathered routinely by the Research Assistants at year 4, data collection time 1 in the ACT study. Asthma related caregiver emotional functioning QOL, asthma related child emotional functioning QOL, child behaviors, and asthma severity was gathered at year 4, data collection time 4 (approximately July through August of 2013), of the ACT study. Asthma morbidity factors (number of child ED visits and number of child hospitalizations) was gathered at data collection time 4 and was determined from the three preceding months (from June 2013 through August of 2013) of parent recall. The participants were asked to fill out a survey on

their children's behaviors that took approximately 5 minutes. The total time at time 4 for the regular visit, with the addition of the survey of their children's behaviors was approximately 25 minutes. Privacy of the participants was maintained by administering the surveys in the privacy of the home of the participants.

Eighty-seven caregivers and 87 children of caregivers initially completed the study surveys. However, two caregiver surveys and two corresponding children surveys were removed from the data set before analysis because the caregiver survey instruments had been completed by a teenage sister and a visiting aunt who were not the official caregivers/guardians of the children in the study, and thus did not meet the sample inclusion criteria. The total number in the study that met eligibility criteria was 170 participants, $N = 85$ caregivers (guardians); $N = 85$ children of caregivers. Seventy-two (84.7 %) of the parents that completed the survey instruments were mothers and twelve (14.1%) were fathers; one was a grandmother (1.2%). Mothers and one grandmother ranged in age from 25 to 55 years, $M = 37.03$, $SD = 5.968$. The grandmother's age was 47 years. The twelve fathers who completed the survey at time 4 were not asked their ages, however the ages of their wives ranged from 29 to 55 years, $M = 39.58$, $SD = 7.128$.

Children ranged in age from 7 to 11 years, $M = 8.64$, $SD = 1.184$. The grade level of the children ranged from grades 2 through 5, $M = 3.35$, $SD = 1.131$. There were 25 (29.4%) 2nd graders, 24 (28.2%) 3rd graders, 17 (20.0%) 4th graders, and 19 (22.4%) 5th graders. The race/ethnicity of the children in the study was 52.9% Hispanic, 32.9% White, non-Hispanic, 7.1% African American non-Hispanic, and 7.1% other. There were 52 (61.2%) male children and 33 (38.8%) female children.

Background Information—Information regarding parental age, education and marital status; age of children, gender, grade level in school and race/ethnicity were obtained from the original parent study. Using Hollingshead's Four Factor Index (Hollingshead, 1975), families in the study fell into the following social strata or SES categories ranging from 7.9% major business or professionals to 12.9% unskilled laborers or menial service workers. Educational levels of fathers ranged from 5.9 % with less than a 7th grade education to 5.9% holding a graduate degree. Details are provided in Tables 1 and 2.

Asthma Severity—Asthma severity was measured using the Severity of Chronic Asthma (SCA) scale which is a 3-item 4-point ordinal scale that aligns with current clinical guidelines was used to measure asthma severity (USDHHS, 2007). Parents rate the frequency of their child's daytime and nighttime asthma symptoms and days their child had limited activity in the past month. Responses for frequency of symptoms range from 1 = "2 times or fewer (0–2) each month" to 4 = "all the time"; limited activities range from 1 = "no limits" in the past month to 4 = "no activities" in the past month. Higher scores indicate higher asthma severity. The scale has demonstrated good item-to-total correlations (0.64–0.81) and significant correlations with ED visits, $r = .39$, $p < .01$, child hospitalizations, $r = .38$, $p < .01$, and absenteeism, $r = .32$, $p < .01$ (Horner, Kieckhefer, & Fouladi, 2006).

Missed School Days and Increased Child Medical Services Use—Frequency of child ED visits, child hospitalizations, and child school absences due to asthma was

collected by the ACT study at data collection Times 1, 2, 3, and 4. The data that were used for data analysis in the study was the parents' recollection of child ED visits, child hospitalizations during the period from June through August of 2013 which was collected during time 4 of the ACT study. The data regarding child school absences were taken from the parent's recollection of their children's absences from February to May 2013 which was collected at time 3 of the study. Parent recollection of school absences could not be collected at time 4 of the study because the children were not in school during the months of June-August which was the period of time that the parents were asked to recollect other data such as ED visits and child hospitalizations. The fact that school absences slightly differ in time frame from the measurement of the other variables is a limitation of the study.

Child Internalizing and Child Externalizing Behaviors—Child internalizing behaviors and child externalizing behaviors were measured using the Behaviors Problems Index (BPI) which was the one instrument added to the study that was not in the parent study. The BPI is a 28 item; 3 point ordinal parent response scale that addresses type, range, and frequency of children's behaviors and is used with children from ages 4–17 (Guttmanova, Szanyi, & Cali, 2008; Peterson & Zill, 1986). Each behavior is rated as: often true = 1, sometimes true = 2, not true = 3. Higher scores indicate more behavioral problems. The Spanish version of the BPI that was used in this study has been used by the U.S. Bureau of Labor Statistics successfully from 1997 to present (National Longitudinal Surveys, 2013). The BPI has an externalizing behavior subscale of 16 items and an internalizing behavior subscale of 8 items. Three items are unique in that they load simultaneously for both internalizing and externalizing behaviors, and 1 item in the scale does not load on either of the externalizing or internalizing dimensions. The tool has demonstrated good internal consistency for the overall tool, $\alpha = .90$; the externalizing subscale $\alpha = .87$, as well as the internalizing subscale, $\alpha = .79$ (Fagnano, Conn, & Halterman, 2008).

Caregiver Emotional Functioning QOL: ACT Instrument—Caregiver emotional functioning QOL was measured using a 9 item subscale of Juniper's PACQLQ 7 point scale (1 = all of the time to 7 = none of the time) which measures caregiver emotional functioning related to their children's asthma. Higher scores indicate greater emotional functioning QOL. Reliability was supported with an intra-class correlation coefficient for the emotional functioning subset at .80 (Juniper et al., 1996a). The PACQLQ has been validated for use with families that speak Spanish (Canino et al., 2008).

Child Emotional Functioning QOL: ACT Instrument—Child emotional functioning QOL was measured using an 8 item subscale of Juniper's PAQLQ which was revised from a 7 to 5-point Likert response set (1 = never; 5 = always) for children's ease of understanding (Horner et al., 2012); Higher scores indicate worse emotional functioning QOL. Questions focus on emotional experiences related to asthma in the last week (Juniper et al., 1996b; Petteway, Valerio, & Patel, 2011). Reliability has been supported with an intra-class correlation coefficient of .89 (Horner et al., 2012); internal consistency has been demonstrated with $\alpha = .88$ (females; $N=119$); $\alpha = .90$ (males; $N=153$) in children ages 7–17 (Wood et al., 2007).

Data Analysis—The Statistical Package for the Social Science (SPSS Statistics 20) was used to analyze the data collected in this study. The level of significance that was selected for this study was $\alpha = .05$. Prior to performing the statistical analysis, data screening steps were taken to examine the data for entry errors, missing values, and outliers of undue influence. Entry errors were checked and corrected by returning to the original survey instruments if there was a questionable entry. Data screening checks included checking assumptions of linearity, normal distribution of errors, homoscedasticity, and multicollinearity. Reliability checks of all survey instruments were run using Cronbach's α (Field, 2009).

Only one child was hospitalized for 1 day and only 3 children went to the emergency room during the report period and thus the variables *days hospitalized due to asthma* and *times to the ER due to asthma* were both removed from the data analysis as well as from subsequent research questions. Eighteen children missed school for a total of 28 missed school days. Due to this small number of children who missed school, this variable was transformed to a dichotomous variable for subsequent analysis, missed school days (yes, no; Warner, 2008).

Bivariate correlations were run using Pearson's r for all variables except for the dichotomous variable *missed school days*, which was run with Spearman rho (see Table 4). Child emotional functioning QOL scores were reverse coded so that higher scores represented less frequency of feelings such as worry, frustration, anger related to asthma or better QOL. Child problems behaviors (both internalizing and externalizing) scores were also reverse coded so that higher scores represented more child problem behaviors. The strength and the direction of the bivariate correlations were next examined between each predictor variable to predictor variable, and each predictor variable to the outcome variable using an alpha of .05. Using Cohen's d Effect Size Index (Cohen, 1992; Warner, 2008).

Multiple regression was then used to examine the extent that asthma severity, caregiver emotional functioning QOL, child internalizing behaviors and child externalizing behaviors, asthma morbidity factor (child school absences) potentially would add to the variance in asthma related child emotional functioning QOL. Moderated multiple regression analysis was next used to test the interaction between SES and asthma severity as predictors of child emotional functioning QOL as well as to consider the possible interaction effects between race/ethnicity and asthma severity as predictors of child emotional functioning QOL. A series of multiple regression analyses were also run to determine ability of the study variables to mediate the relationship between asthma severity and asthma related child emotional functioning QOL.

Findings

Variable Correlation Analysis: Descriptive Statistics for study measures are reported in Table 3. Asthma related child emotional functioning QOL was significantly and negatively correlated with asthma severity, externalizing child problem behaviors, and internalizing child problem behaviors. Greater asthma severity was associated with worse emotional functioning in children related to asthma, $r = -.30$, $p < .01$. More externalizing, and internalizing, child problem behaviors were reported when children reported more negative feelings regarding their asthma, $r = -.43$, $p < .001$ and $r = -.26$, $p < .05$ respectively.

Caregiver emotional functioning QOL was significantly correlated with asthma severity, and with both children's externalizing and internalizing problem behaviors. Greater asthma severity was correlated with more caregiver negative feelings related to their children's asthma, $r = -.39$, $p < .001$. Greater externalizing and internalizing problem behaviors in children were associated with decreased caregiver emotional functioning QOL, $r = -.25$; $r = -.22$, $p < .05$ respectively.

Multiple Regression Analysis: Multiple regression was run in order to address the second research question which examined the extent of influence of asthma severity, caregiver emotional functioning QOL, child internalizing and child externalizing behaviors, on asthma related child emotional functioning QOL. The variable that was removed from the model due to its non-significant relationships with all other variables in the model was *missed school days*. The model accounted for 26% of the variance in asthma related child emotional functioning. The model fit was good, $F(4, 79) = 7.051$, $p < .001$. Significant predictors of asthma related child emotional functioning QOL were as follows: asthma severity, $\beta = -.31$, $p < .01$; child externalizing problem behaviors, $\beta = -.43$, $p < .001$. The results of the regression analyses are shown in Table 5.

Moderated Multiple Regression Analysis: Moderated multiple regression analysis was then used to address Research Question 3 which questioned the extent SES and race/ethnicity modified the relationship between asthma severity and asthma related child emotional functioning QOL. As is shown in table 6, Model 1 demonstrates a good model fit, $F(2, 81) = 5.450$, $p = .006$; 11.9% of the variance in asthma related child emotional functioning QOL was explained by asthma severity and SES, $R^2 = .119$. Model 2 illustrates the results after adding the product term (socio-economic status-centered * asthma severity centered) into the model. After adding the product term in model 2, the R^2 change was .000, $F(1, 80) = .002$, $p = .97$. This represented a non-significant change in the R^2 ; there was no evidence of moderating effect of SES or an interaction effect between the variables asthma severity and SES when predicting the outcome variable asthma related child emotional functioning QOL (Aguinis, 2004).

As shown in table 7, Model 1 demonstrates a good model fit, $F(4, 79) = 2.695$, $p < .05$; 12% of the variance in asthma related child emotional functioning QOL is explained by asthma severity and race/ethnicity, $R^2 = .120$. Model 2 illustrates the results after adding the product terms, (a) asthma severity * White; (b) asthma severity * Hispanic, (c) asthma severity * African American into the model. After adding the three product terms in model 2, the R^2 change was .007, $F(3, 76) = .200$, $p = .90$. This represented a non-significant change in the R^2 ; there was no evidence of moderating effect of race/ethnicity or an interaction effect between the variables asthma severity and race/ethnicity when predicting the outcome variable asthma related child emotional functioning QOL (Aguinis, 2004).

Mediator Analysis: The final research question addressed the extent that the variables caregiver emotional functioning QOL, child internalizing behaviors, and child externalizing behaviors, mediate the relationship between asthma severity and asthma related child emotional functioning QOL. The significantly predictive power of the variable asthma severity on the outcome variable asthma related child emotional functioning QOL has

already been reported in a previous study (Horner et al., 2012), thus meeting the appropriateness of testing the relationship between these variables for mediating effects (Miles and Shevlin, 2006). Additionally, the predictive power of asthma severity in relation to asthma related child emotional functioning QOL was also supported in this study, $\beta = -.309, p < .01$. The other variable that was found to be a significant predictor of asthma related child emotional functioning QOL, was child externalizing behaviors, $\beta = -.432, p < .001$. When running multiple regression it was found that only one variable (caregiver emotional functioning QOL, $\beta = -.389, p < .001$) met the criteria of being a significant predictor of asthma related child emotional functioning as well as a significant outcome variable of asthma severity. However, caregiver emotional functioning QOL was determined to be a non-significant predictor of asthma related child emotional functioning QOL. Thus, no study variable was not found to mediate the relationship between asthma severity and asthma related child emotional functioning QOL (Miles & Shevlin, 2006).

STUDY LIMITATIONS

Study limitations include the use of a sample in a southern state of the country, thus limiting generalizability to other regions of the country. Additionally, the internalizing behaviors instrument only yielded a Cronbach's alpha of .636, showing low internal consistency, or reliability in this study, thus possibly affecting the data analysis. It is also important to note that although the findings of this multiple regression study are considered statistically significant, they only account for 36% of the variance, demonstrating a need for further research and investigation.

IMPLICATIONS AND RECOMMENDATIONS

Implications for Nursing Practice—Health care providers could potentially use the findings of this study to verify the importance of intervening with school aged children who have asthma and who also exhibit problem behaviors such as impulsivity, temper tantrums, and getting into trouble (Guttmannova et al., 2008; Peterson & Zill, 1986). Understanding that externalizing behaviors may be related to the emotional functioning QOL of school aged children who have asthma may provide early cues for health care providers when working with these children. Problem behaviors in school aged children who have asthma may mean that these children also have negative feelings regarding their asthma that need to be addressed. These findings suggest that it is important for health care providers to look at more than the physiological symptoms of school aged children who have asthma when performing assessments and interventions. A more holistic approach would strongly support the routine assessment of the emotional impact of asthma on the school aged child.

Health care providers should also consider educating and intervening with caregivers of school aged children who have asthma (Swerczek et al., 2013; Tzeng, Chiang, Hsueh, Ma, & Fu, 2010). Educating parents regarding the potential of external behaviors predicting worse emotional functioning could indirectly, yet effectively work toward the mitigation of the negative emotional feelings in children regarding their asthma. Nursing educational interventions might include teaching parents to query their children regarding their asthma related feelings when they observe the problem behaviors of their children increasing. Parents could also be instructed on how to teach their children problem solving techniques

when faced with negative situations concerning their asthma (Seid, Varni, Gidwani, Gelhard, & Slymen, 2010). As children learn to problem solve situations that influence feelings of worry, fear, or frustration associated with their asthma, their emotional functioning QOL may improve as well as their problem behaviors. Additionally, nursing interventions could include teaching parents to use role playing to help children simulate methods of handling difficult situations their children may face when dealing with their asthma (Stewart, Masuda, Letourneau, Anderson, & McGhan, 2011). Important in these recommendations is the fact that the nursing profession should enlist the help of trained professionals to assist school aged children with problems related to their emotional functioning. It would be advisable for nurses to gather and have mental health resources, such as names and phone numbers of trained community professionals, available for school aged children and their caregivers who are identified as having emotional difficulties associated with their asthma. Part of what is essential in this preparation is to approach asthma in a manner that addresses both the physiological as well as the emotional difficulties that are encountered by school aged children and their caregivers due to asthma.

Implications for Nursing Research—Intervention research with focus on problem behaviors of school aged children who have asthma would seem appropriate considering the findings of this study. Perhaps interventions could focus on determining the causes of the problem behaviors and strategizing how to improve the identified problems. Are children acting out because of being teased or singled out at school in relation to their asthma (Walker, 2013)? Are their problem behaviors a manifestation of their worry, anger, frustration, or concern related to their asthma symptoms? Interventions could include working with both school aged children who have asthma as well as their caregivers to ascertain how to improve school aged children's emotional functioning QOL.

Teaching children and caregivers how to manage asthma may be one potential strategy to use to work toward decreasing negative emotional feelings associated with asthma (Juniper et al., 1996a). Additionally, interventions teaching effective coping strategies to children as well as caregivers could be beneficial in affecting the emotional functioning of school aged children who have asthma (Horner et al., 2012). Education regarding asthma management techniques has been offered by researchers such as Dr. Sharon Horner in the Asthma in Central Texas Project (R01NR007770) to children who have asthma as well as their caregivers. Interventions such as these will most likely have a positive effect on the emotional functioning of both the caregivers and the children.

Continuing to focus on the specific age group of school aged children versus combining results of adolescents with younger children is another suggestion for future nursing research. Data from these age-specific studies may enhance the ability of nursing researchers to design age appropriate intervention tools that work with problem behaviors as well as the root of problem behaviors of school aged children who have asthma.

Other study considerations include enlisting larger sample sizes to test the model of asthma severity as a predictor of asthma related child emotional functioning QOL. A final suggestion is for future nursing research to continue to consider the directionality of the model of asthma severity as a main predictor of asthma related child emotional functioning

QOL. Studies that consider the potential of asthma related child emotional functioning QOL as a predictor of asthma severity also provide a potential model of study when considering the relationships between the variables asthma severity and asthma related child emotional functioning (Wood et al., 2007; Wood et al., 2008; Wood et al., 2006), as the answer of which variables precede the others has not yet been determined.

Conclusions

The findings from this study demonstrate that school aged children's increased externalizing behaviors may be a potentially stronger predictor than school aged children's internalizing behaviors of their decreased asthma related emotional functioning QOL. It may be possible that children who have asthma and also have more asthma related feelings of frustration and fear, and /or feelings of being different and left out (Juniper et al., 1996b) may also be driven to act out more than children who have less emotional feelings related to asthma. These findings have similarity with previous studies that report more frequent recognition of emotional problems by parents and the health care system of children who have asthma and act out externally when compared to children who have asthma and only exhibit internalizing behaviors (Katon, Richardson, Russo, Lozano, & McCauley, 2006; Rockhill et al., 2007).

A possible reason for these somewhat different study findings, which highlight externalizing behaviors as a significant predictor of asthma related emotional functioning QOL, may be the somewhat unique and sole use of school aged children in our study. This study did not combine reports of both school aged children and adolescents in the statistical analysis which is a current common approach used by researchers when studying these problems (Bush et al., 2007; Goldberg, 2011; Koinis-Mitchell et al., 2009; Rockhill et al., 2007; Santos, Crespo, Silva, & Canavarro, 2012; Verkleij et al., 2011). Thus, it may have afforded a potentially more accurate report of school aged children's emotional responses to the daily effects asthma, possibly accounting for the difference in the findings. Additionally, current literature supports the idea that younger children who have emotional difficulties related to anxiety and depression are often more likely to respond in an outward, irritable fashion, versus the more traditional sullen or internalizing fashion more commonly expressed by adolescents (National Institute of Mental Health, 2013). This fact would account for the difference in the way our sample responded to the emotional effects of asthma when compared to many current studies that report more internalizing behaviors when studying children (often ranging from ages 0–17 years) who have asthma.

SUMMARY

School aged children may act out using externalizing behaviors versus displaying internalizing behaviors to predict the negative emotional impact of asthma in their lives. Moderators and mediators to the model of asthma severity as a main predictor of child emotional functioning QOL should continue to be investigated. Identifying moderators and mediators may assist health care providers in targeting and developing appropriate intervention tools to use when considering the emotional functioning QOL of school aged children who have asthma.

Acknowledgments

The author alone is responsible for the content and the writing of the paper, and does not necessarily represent the official views of the National Institute of Nursing Research or the National Institutes of Health. Editorial support was provided by the Cain Center for Nursing Research and the Center for Transdisciplinary Collaborative Research in Self-management Science (P30, NR015335) at the University of Texas at Austin School of Nursing. The work was supported with a diversity supplement to the grant (PI: Sharon D. Horner, R01 NR007770-S1) funded by the National Institutes of Health, National Institute of Nursing Research. There is no commercial financial support for this study. Special thanks to Dr. Sharon D. Horner for providing me with mentorship and guidance.

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Highlights

Factors were explored regarding school-aged children's emotional responses to asthma.

Significant predictors of child emotional functioning QOL were asthma severity and child externalizing problems.

Research should consider problem behaviors of school-aged children when addressing emotional functioning QOL.

Table 1

SES of Caregivers using Hollingshead's Four Factor Index

Five Social Strata Categories	Scores	Re-categorized Scores	n	%
Major business and professional	66-55	66-55	6	7.9
Medium business, minor Professional, technical	54-40	54.50-40	27	31.8
Skilled craftsmen, clerical, sales workers	39-30	39.50-30	17	20.0
Machine operators, semiskilled workers	29-20	29.50-20	24	28.2
Unskilled laborers, menial service workers	19-8	19.50-8	11	12.9

Note: A conservative approach was used to re-categorized scores with 0.5 decimal points. Lower versus higher social strata ranges were selected for scores 54.50, 29.50, and 19.50.

Table 2

Educational Level of Caregivers

Educational Level	Mothers		Fathers	
	n	%	n	%
Less than 7th grade	4	4.7	5	5.9
Junior high school (9th grade)	4	4.7	6	7.1
Partial high school (10th or 11th grade)	4	4.7	5	5.9
High school graduate	25	29.4	23	27.1
Partial college/specialized training	17	20.0	28	32.9
Standard college or university graduate	24	28.2	13	15.3
Graduate degree	7	8.2	5	5.9

Table 3

Descriptive Statistics of Variables

Variable	N	Range	Minimum	Maximum	Mean	Std. Deviation	α
Child Problem Behaviors Total (24 items)	85	29.00	24.00	53.00	31.36	6.407	.889
Child Problem Behaviors Internalizing Subset (7 items)	85	6.00	7.00	13.00	8.40	1.575	.529
Child Problem Behaviors Externalizing Subset (17 items)	85	25.00	17.00	42.00	22.96	5.384	.889
QOL Child Emotional Functioning (8 items)	84	20.00	20.00	40.00	34.15	5.861	.790
QOL Caregiver Emotional Functioning (9 items)	85	45.00	18.00	63.00	55.61	9.456	.896

Table 4

School-Aged Children’s Emotional Functioning QOL

Variable	2	3	4	5	6
1) Child emotional functioning QOL	.15	-.30 **	-.43 ***	-.26 *	.071
2) Caregiver emotional functioning QOL		-.39 ***	-.25 *	-.22 *	.105
3) Asthma severity			.06	.13	-.17
4) Child problem behaviors externalizing				.57 ***	-.102
5) Child problem behaviors internalizing					.004
6) Missed school days (yes, no) ^a					

Note: Pearson’s r used for all correlations except for *missed school days*

Key* = < .05; ** = < .01; *** = < .001;

^a Spearman rho

Table 5

Child Emotional Functioning QOL Regression Model

Variables	<i>B</i>	<i>SE</i>	β	<i>p</i>	<i>R</i> ²
Constant	55.603	6.774	-	<.001	
Asthma severity	-2.462	.84	-.31	.004	
Caregiver emotional functioning QOL	-.048	.07	-.08	.48	
Child problem behaviors externalizing	-.470	.13	-.43	<.001	
Child problem behaviors internalizing	.034	.44	.01	.94	
					.26

Note: *B* = unstandardized coefficient; β = standardized coefficient; *R*² = coefficient of determination or variance

Table 6

Model Summary using SES as a Potential Moderator

Model	R	R ²	Adjusted R ²	SE	R ²	F	Sig.	F Change
1	.344	.119	.097	5.570	.119	5.450		.006
2	.344	.119	.086	5.604	.000	.002		.966

Table 7

Model Summary using Race/Ethnicity as a Potential Moderator

Model	R	R ²	Adjusted R ²	SE	R ²	F	Sig.	F Change
1	.347	.120	.076	5.635	.120	2.695		.037
2	.356	.127	.047	5.723	.007	.200		.896