

PEDIATRICS

The Role of Maternal Illness Perceptions in Perceived Asthma Symptoms in School-Aged Children

LINDA RINGLEVER, M.SC.,^{1,*} ROY OTTEN, PH.D.,¹ ONNO C. P. VAN SCHAYCK, M.D., PH.D.,² AND
RUTGER C. M. E. ENGELS, PH.D.¹

¹*Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, the Netherlands.*

²*Care and Public Health Research Institute (CAPHRI), Maastricht University, Maastricht, the Netherlands.*

Objective. To examine the unique contribution of perceptions held by mothers about their children's asthma in relation to the symptoms as reported by their children. **Methods.** Families with a child diagnosed with asthma participating in a larger smoking prevention study were invited to participate. For all, 89 children (mean age 10.1 years) and 87 mothers questionnaire and lung function data during home visits were provided. The main outcome of this study involved asthma symptoms as measured by the Pediatric Quality of Life Inventory. Mothers' and children's reports of symptoms, as well as the lung function parameter of percentage of predicted Forced Expiratory Volume in one second (% of predicted FEV₁), were analyzed in relation to maternal illness perceptions. **Results.** Mothers' perceptions of illness were not associated with % of predicted FEV₁. However, while controlling for gender and children's baseline asthma symptoms, four out of eight mothers' perceptions of illness (i.e., identity, consequences, concern, and emotional influence) were associated with children's asthma symptoms. Additional analyses controlling for % of predicted FEV₁ in the models with subjective asthma symptoms reports of mother and child did not change the study findings. **Conclusions.** This pilot study provides evidence that, in addition to children's lung function and baseline symptoms, maternal perception of illness contributes to symptom-related quality of life (QoL) of children. More research on underlying mechanisms, which addresses the linking of mothers' perceptions of concern and emotion to the QoL symptoms as reported by children is necessary.

Keywords childhood, parents, pediatric, quality of life

INTRODUCTION

Asthma, characterized by symptoms such as coughing, wheezing, breathlessness, and/or chest tightness, is a common chronic disease in childhood in the Netherlands (1) and worldwide (e.g., (2)). Objective physical measures (as measured in lung function testing) cannot always verify the intensity of these symptoms (e.g., 3, 4). Patients with similar severity levels of asthma symptoms, as established with objective measures, may have different perceptions of quality of life (QoL) (5). It is important to understand the perception of both symptoms and factors that may affect perception of asthma severity, because both under- and overperception of symptoms can result in serious medical consequences and asthma management errors (6).

A recent review by Hagger and Orbell (7) offered convincing evidence of the importance of illness perception as a psychological construct that contributes to illness outcome. Studies described in this review focused primarily on adult populations, utilized cross-sectional methods, and included only one informant, increasing the risk for shared method variance. Parents are the important socializing agents during childhood in terms of health behaviors and attitudes (8, 9). Several familial psychological factors, such as family conflict, stress, and caregivers' psychological dysfunctioning (10), family routines (11), and par-

ental support (12), have been associated with childhood asthma outcomes. For example, in families whose adolescents perceived significant parental support, adolescents reported higher QoL than adolescents in families in which parents were perceived as less supportive (12). In the present study, we aimed to examine the association between mothers' perceptions of their children's asthma and the children's perceived symptoms 1 year later.

Illness Perceptions and Illness Outcomes

In general, patients with asthma spend limited time with health care professionals, who provide them with objective information (13). Consequently, they have many opportunities to create and develop subjective mental representations about the causes, consequences, duration, identity, emotional influence, and controllability of asthma. These so-called "illness perceptions" reflect cognitive and emotional components and are believed to affect illness outcomes via coping strategies (14). Particularly in the case of asthma's unpredictable course, illness outcomes are hypothesized to be highly dependent on patients' illness perceptions (15). Studies have demonstrated the importance of familial factors in children's illness outcomes (e.g., 10, 12, 16–18). More specifically, concerning parental perceptions, Spurrier et al. (16) showed that parents who perceived their child as more vulnerable were more likely to (1) visit a general practitioner, (2) keep their child home from school, and (3) give their child regular preventive medication. Children of parents, who perceived their child as more vulnerable also, had higher levels of social

*Corresponding author: Linda Ringlever, Behavioural Science Institute, Radboud University Nijmegen, P.O. Box 9104, 6500 HE Nijmegen, the Netherlands; Tel: +31 24 361 1818; Fax: +31 24 361 2776; E-mail: l.ringlever@bsi.ru.nl

anxiety (17). Furthermore, most parents had strong beliefs of necessity for their children's asthma medication in the study of Conn et al. (18), but parental perception of concern about controller medication had a greater impact on children's adherence. These findings suggest that parental perceptions of illness might influence the way in which a child manages, copes, and lives with asthma.

In summary, this study aims to examine the unique contribution of maternal perceptions of asthma to the QoL of children, as reported by both the mother and the child. We expect that mothers' perceptions of their child's illness will contribute to their reports of their child's asthma symptoms 1 year later (intrapersonal hypothesis). In addition, we expect that maternal perceptions of illness will contribute to children's subjective reports of asthma symptoms 1 year later (interpersonal hypothesis), above and beyond the objective severity.

METHODS

Procedure

Data were collected from a subsample of mother-child dyads participating in a larger study evaluating a home-based smoking prevention program (see Ref. (19)). At the baseline of the prevention study, 220 mothers (15%) out of 1478 participating mothers indicated that their children ever had asthma and/or that the children had ever received a diagnosis of asthma. If they answered both questions positively and their family participated in the prevention study of 15 months post-baseline ($n = 214$), they were considered to be candidates for an additional home visit to conduct a spirometer lung function test and for a more in-depth study on asthma-related topics. The Dutch translation of the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire (20) was used to verify the present asthma symptoms via a phone call. In 108 cases, mothers indicated that their child was not presently on asthma medication or had not experienced asthma symptoms in the past 12 months, leading to 106 eligible families. Fourteen families were not willing to participate and three families did not respond. The chi-square tests and the t -test did not reveal any demographic differences for age, nationality of the child, or maternal education between participating and nonparticipating families. A marginally significant difference was found for gender, with boys being slightly overrepresented in the participating families (65.2% in the participating families and 41.2% in the nonparticipating families, $\chi^2(1106) = 3464$, $p = .063$). Furthermore, two mothers appeared not to be at home during the home visit and did not return the questionnaire, which was left at the home. Therefore, data used in this study are from 87 mothers and 89 children. The children's mean age at baseline was 10.1 years (range = 8–12 years, $SD = 0.87$) and 96.6% had Dutch nationality. Most of the children lived with both of their biological parents (78.7%); the remaining children lived with their mothers or were in a situation of co-parenting. Almost all children presently used asthma

medication (97%); 21% used short-acting β -agonists exclusively and the remaining used long-acting β -agonists (in combination with or without a short-acting β -agonist). Mothers generally had a high educational level; 12% obtained up to preparatory secondary school for vocational education, 43% obtained intermediate vocational education and preuniversity education, and 43% followed higher professional education and university education. Before visiting the families at home, the questionnaires were piloted to check their readability and length. During the home visits, the mother and child were asked to fill in their questionnaires individually. All children attended regular primary schools, except one girl who attended special education. During the home visit, this one child could not read all the questions within the 1 hour of the home visit and the researcher helped this child by reading the questions aloud. Five families refused a home visit but agreed to fill in questionnaires by post. To maintain confidentiality of family members, these families received two separate return envelopes, one for the mother and one for the child. In addition, the families received a gift coupon after participating and completing the questionnaires. The study was approved by the ethics committee of the Faculty of Social Sciences at the Radboud University Nijmegen.

Measures

Maternal illness perceptions were measured at baseline of the prevention study using an adapted version of the Brief Illness Perception Questionnaire (B-IPQ) (21). Five cognitive perceptions (i.e., identity, time line, personal control, treatment control, and consequences), two emotional perceptions (i.e., concern and emotion), and one item measuring "understanding" were modified to allow mothers to report their child's asthma by phone (see Appendix 1). For example, the original item assessing consequences ("How much does your illness affect your life?") was changed to "How much does the asthma of your child affect his/her life?" Similar adaptations of the original Illness Perception Questionnaire-Revised (22) were made by Law (23), who adapted the original items to measure mothers' perception of their child's diabetes. Furthermore, to enable telephone interviewing, the original 10-point response format was transformed into a format with four response options, with higher scores indicating greater belief in that specific perception.

Child asthma symptoms at follow-up (henceforth referred to as QoL symptoms) were measured during home visits, using the symptom sub-scale of the Pediatric Quality of Life Inventory (PedsQL, asthma module) (24), which has showed high levels of reliability, validity, and responsiveness required in pediatric asthma care (25). Asthma symptoms were measured with items covering differential asthma symptoms in children aged 8–12 years, such as wheezing, coughing, and experiencing problems when playing outside or with pets. Mean scores of the 11 items measured on a five-point scale ranging from "almost never" to "almost always" were calculated, with higher scores indicating higher QoL at the asthma

symptom level. The PedsQL has a child and a parent version. Both were assessed during the home visit. Cronbach's alpha was 0.85 for the mothers' version and 0.81 for the children's version.

Child lung functioning was measured with a spirometer during the home visits (Pt-medical, the Netherlands) to obtain an indication of the child's physical lung function. To conform to American Thoracic Society standards, all spirometry tests were performed at least 4 h after using short-acting β -agonists and 12 h after long-acting β -agonists. For each child, the maneuver with the highest sum of the FEV₁ and the Forced Vital Capacity (FVC) was chosen after the child performed three reproducible maneuvers, which was the case for 84 children (94%). The percentage of the predicted FEV₁ value was used as an indicator of lung functioning.

Covariates

We controlled the gender and child baseline asthma symptoms which were measured during the baseline assessment of the prevention study using the Dutch version of an asthma screening tool for children aged 7–13 developed by the American College of Allergy, Asthma, and Immunology (ACAAI) (26). Children had to indicate whether they experienced any of the seven asthma symptoms using the responses "never," "sometimes," or "a lot." A "sometimes" or an "a lot" answer was scored as 1, "never" as 0. A score of 3 or more indicated that the child should consult a general practitioner (26). The scores were dichotomized, with 0 = no risk and 1 = above the risk score for asthma consultation. This screening score served as a control measure for symptoms that a child experiences at baseline. α was 0.74.

Strategy for Analyses

In the first step of the analyses, descriptive statistics were provided. In the second step, separate linear regression analyses were performed for each illness perception (eight) to test associations between illness perceptions and the objective lung function measure %FEV₁ (regression model 1), between illness perceptions and maternal report of children's symptoms (regression model 2), and between illness perceptions and children's own reports of symptoms (regression model 3). Finally, the regression analyses with the subjective QoL symptoms reports (i.e., models 2 and 3) were conducted once more with %FEV₁ added as an additional covariate to examine whether this would change the findings.

RESULTS

Sample Characteristics

At follow-up, children reported a mixture of symptoms on the QoL symptoms scale ($M = 3.75$, $SD = 0.62$). Mothers had similar scores ($M = 3.77$, $SD = 0.67$) on this same scale ($r = 0.50$, $p < .001$). As shown in Table 1, mothers of boys reported higher QoL for their children. Children who scored above the threshold for asthma referral on the asthma

TABLE 1.—Number of participants (%) for the sample characteristics and means (SD) for the subjective measures QoL symptoms of the children, reported by mother (middle column) and by child (right column).

	N (%)	QoL symptoms	
		Mother report Mean (SD)	Child report Mean (SD)
Gender			
Boy	58 (65.2%)	3.90 (0.59)	3.79 (0.58)
Girl	31 (34.8%)	3.52 (0.74)*	3.67 (0.69)
Age			
8–9	22 (24.7%)	3.63 (0.67) ^a	3.60 (0.65)
10	40 (44.9%)	3.95 (0.63)	3.88 (0.58)
11–12	27 (30.3%)	3.60 (0.66)	3.65 (0.62)
Education mother ^b			
Low	11 (12.4 %)	3.40 (0.80)*^c	3.54 (0.53)
Middle	38 (43.0 %)	3.58 (0.61)**^c	3.63 (0.58)
High	38 (43.0 %)	4.05 (0.60)	3.90 (0.64)
Baseline asthma screening score ^b			
No risk	24 (27.0%)	3.99 (0.57)	4.22 (0.52)
Risk score	61 (68.5%)	3.67 (0.70)*	3.54 (0.55)***

* $P < .05$; ** $p < .01$; *** $p < .001$ (two tailed).

^a P -value for the Analysis of Variance (ANOVA) for age and mother report is marginal significant ($p = .065$).

^bDoes not add up to 100% because of two missing values for education mother and four missing values for asthma screening score.

^cBonferroni *ad hoc* tests show that lower- and higher-educated and middle- and higher-educated mothers differ significantly.

screening list at baseline (68.5%) reported a lower QoL 1 year later. Furthermore, the mean percentage of predicted FEV₁ was 93.82 ($SD = 10.49$), indicating good lung function in general. Six children had a value of $\leq 80\%$ FEV₁, indicating seriously affected lung function (27).

Parental Illness Perceptions Predicting QoL Symptoms

As seen in Table 2, column 1 depicts that none of the maternal illness perceptions was related to the lung function indicator %FEV₁. In contrast, as depicted in columns 2 and 3, when including the subjective indicator of symptoms, four maternal illness perceptions were associated with children's disease outcome as reported by the mother (intrapersonal perspective), and when children reported their own asthma symptoms (interpersonal perspective). Specifically, a stronger belief that asthma would affect the child's life (perception: consequences), a conviction that the child experienced more symptoms (perception: identity), a greater concern (perception: concern), and more emotional responses to the child's asthma (perception: emotional response) were associated with lower scores on the child's QoL, as reported by both mothers and children 1 year later.¹

DISCUSSION

The way in which patients perceive their illness is known to affect their disease outcomes (14). In addition, several familial influences (e.g., family stress) have been found to relate to a child's asthma outcomes (10). However, little is known about whether and how parental illness perceptions of asthma affect children's asthma outcomes. The present

TABLE 2.—Linear regression coefficients for the eight illness perceptions predicting the objective outcome measure (%FEV₁) and subjective measures (Child QoL-symptoms). Adjusted for gender and child's reported baseline symptoms (screening risk).

	% FEV ₁				QoL-symptom scale (Mother report)				QoL-symptom scale (Child report)			
	β	B	95% CI B (lower/upper)	p	β	B	95% CI B (lower/upper)	p	β	B	95% CI B (lower/upper)	p
Step 1												
Gender ^a	0.14	3.09	-2.12/8.30	.24	-0.22	-0.31	-0.61/-0.01	.04	0.01	0.02	-0.25/0.28	.90
Screening risk ^b	-0.15	-3.63	-9.12/1.89	.20	-0.21	-0.31	-0.62/0.01	.06	-0.50	-0.69	-0.97/-0.42	<.001
Steps 2 Perceptions												
1: Consequences	-0.15	-2.74	-6.85/1.38	.19	-0.34	-0.38	-0.61/-0.14	.002	-0.24	-0.24	-0.45/-0.04	.02
2: Time Line	-0.01	-0.17	-3.74/3.39	.92	-0.14	-0.14	-0.35/0.08	.21	0.01	0.01	-0.18/0.19	.96
3: Personal control	-0.05	-0.74	-4.18/2.70	.67	-0.07	-0.06	-0.27/0.14	.54	-0.04	-0.03	-0.20/0.14	.70
4: Treatment control	0.11	1.69	-1.20/5.37	.37	0.09	0.09	-0.14/0.31	.45	0.01	0.01	-0.18/0.20	.93
5: Identity symptoms	-0.17	-3.04	-7.11/1.04	.14	-0.35	-0.40	-0.65/-0.15	.002	-0.22	-0.22	-0.43/-0.02	.03
6: Concern	-0.02	-0.26	-3.40/2.87	.87	-0.29	-0.27	-0.46/-0.08	.007	-0.27	-0.21	-0.37/-0.06	.007
7: Understanding	0.07	1.31	-2.77/5.39	.52	0.10	0.12	-0.13/0.36	.35	0.03	0.04	-0.17/0.24	.74
8: Emotional Response	-0.10	-1.23	-4.28/1.82	.42	-0.31	-0.26	-0.44/-0.08	.006	-0.25	-0.19	-0.34/-0.04	.01

^aBoys are reference category.^bChildren scoring under the cutoff score of risk for asthma are reference category.^cThis table reflects eight separate linear regressions: step 1 is the same for all regressions but step 2 constitutes of one perception per linear regression which is replaced by another perception each time.

study aimed to extend the current literature on parental involvement in childhood illness by examining the unique contribution of eight separate perceptions of mothers regarding their children's asthma and asthma symptoms as reported by their children (i.e., QoL). The results indicated that some maternal illness perceptions (depending on the content) indeed contribute to asthma outcome measures reported by both mother and child.

Maternal perceptions of child asthma were not associated with physical lung functioning (indicated by %FEV₁). Limited accuracy in the relationship between perceptions and objective measures has also been found in a number of studies including adult populations (e.g., 3, 28, 29) and childhood asthma samples (3, 4, 30). However, moderately strong associations between parental perception of changes in severity of children's symptoms with physiological measures were found in children aged 7–10, but these correlations were low in children aged 11–17, which is within the age range of our present sample (31). On an average, children in this sample showed high values of FEV₁, indicating relatively adequate lung functioning. Perhaps larger sample sizes or more diversity in the sample are needed to find significant associations between objective lung function indicators and maternal perception of asthma.

However, when examining whether maternal perceptions of child asthma were associated with future *subjective* symptom outcome measures (i.e., child asthma symptoms), we found associations with four perceptions. These associations were found longitudinally when symptoms were reported by mothers 1 year later. More specifically, when mothers (1) attributed more consequences to asthma of their children, (2) perceived more frequent asthma symptoms, (3) were more concerned about asthma, or (4) perceived asthma as having higher emotional effects; mothers and children were more likely to report a lower QoL 1 year later. Therefore, the results show that illness

perceptions, although presently not concerning the mothers' own illness but rather the child's illness, are associated with disease outcome (i.e., subjective physical functioning, defined by QoL symptoms).

In a second step, as stated in the endnote¹, this analysis was repeated with the inclusion of %FEV₁. Above and beyond this indicator of lung function, results show that perceptions of the mother predicted QoL. Although the present study is exploratory, we found primary support for the idea that maternal perceptions of children's asthma affect children's symptoms reported 1 year later. We recommend that future studies examine the role of parents' illness perceptions in child illness outcomes, to examine more closely any confounding factors. We mention maternal education as a confounding variable in our results, but other factors may also play a role. For example, parenting strategies, parents' own asthma history, asthma knowledge, and child factors such as coping behavior or personality but also concurrent allergies and other child health conditions, may affect caregivers' perceptions. Our results remained similar after inclusion of maternal education in the model, except for perceptions of the consequences and symptoms identity, which became nonsignificant in the analyses with child QoL outcome report. Maternal perceptions of concern and emotional impact of her child's asthma were consistently associated with mothers' and children's QoL reports in all analyses. The latter is in line with Kaugers et al. (10), who demonstrated that caregivers' psychological characteristics affect child asthma outcomes. Furthermore, positive caregiver expectations (defined as expectations about the ability to manage the child's asthma) were associated with better child functional status measured by sleeping, eating, energy level, and mood (32). Thus, it may be interesting to examine how parents with different psychological characteristics think of, and perceive the asthma of, their child, because when

parents are more concerned and emotional, they and their children are likely to report more symptoms. Consequently, this may result in an overattribution of symptoms on which the child may act, leading to consequences such as inadequate asthma management or overuse of medications (6). From a prevention perspective, it is important to gain insight into the coping mechanisms of mothers who are more concerned or emotional about their child's asthma, as researchers have argued that these perceptions affect disease outcomes through coping mechanisms (15).

Similar to our main findings, Hagger and Orbell (7) showed in their meta-analysis that particular perceptions of identity (i.e., the attribution of symptoms to one's illness) and consequences (i.e., the consequences of one's illness) were negatively related to physical functioning (among other outcomes). Although in Hagger and Orbell's meta-analysis perceptions of control were related to more adaptive outcomes, the present study did not reveal such relationships with asthma symptoms.

Regardless of the question of who is the best provider of information about the child's QoL (e.g., 33–35), which is frequently mentioned in the literature, we suggest that it is preferable to discuss asthma with *both* parents and children, especially when the child is approximately 11 years old or younger. The present results revealed that a child's asthma symptom report is not free of parental influences, although at first sight it may seem independent. This presents challenges associated with clinical practice that may focus too strongly on the physical status of the child, underestimating other psychosocial aspects such as parental concern.

Study Limitations and Strengths

Some limitations of this study should be mentioned. In this study, we used an adapted version of the B-IPQ (21), giving the study an exploratory character. Although we found support for the effect of parental illness perceptions on asthma symptoms reported by children while controlling for important variables, replication with other perception questionnaires is absolutely warranted. In addition, it may be interesting to consider the child's own perceptions using the B-IPQ or, when possible, a questionnaire that is disease specific (e.g., the Asthma Illness Representation Scale (36)) and that may cover more specific beliefs about asthma and medication use. Also, more measurement points throughout the year may complement insight into the relationship between illness perceptions and outcome variables. Data collection of the follow-up wave took place in March and April, which is just before the peak of the Dutch pollen season. This may have created interference with seasonality for our outcome measures, as asthma is found to be related with seasonality with respect to, for example, asthma hospitalizations (37). On the other hand, responses to questions about lifetime prevalence and 12-month-period prevalence of symptoms of asthma generally did not reach statistical significance when evaluating the effect of season-of-responses in questions of the

ISAAC (38). Still, seasonal asthma and other concurrent allergies of the child may influence mother's perceptions of asthma as well. Future research might benefit from testing seasonal influences on associations between theory-driven predictor variables and asthma outcomes. Finally, replication including children's asthma severity and asthma control is warranted, as the relationship between psychosocial factors of maternal perceptions and child symptom report may differ depending on severity and controlled versus uncontrolled asthma (39).

One of the strengths of this study is that we used a subjective as well as an objective indicator of asthma severity when predicting QoL. Although it would have been more accurate to control for baseline QoL symptoms when predicting specific QoL symptoms 1 year later, we controlled the baseline asthma severity by including an asthma screening list (core symptoms characteristic of childhood asthma such as wheezing, coughing, and exercise-induced breathlessness) and a lung function test. Second, we included the perspectives of mothers and children. Hence, the present study included information from multiple informants with respect to the main study outcome variable and the baseline control variable of asthma symptoms measured from the children's point of view as well.

CONCLUSIONS

In summary, this pilot study suggests that maternal illness perceptions might contribute to a lower symptom-related QoL in children. In childhood asthma, clinicians may obtain a more complete picture of different disease-related aspects by means of the perception of asthma held by mothers (e.g., by asking mothers to complete a B-IPQ (21) prior to consultation). Nevertheless, more research is necessary to understand the underlying mechanisms. For instance, it may be that maternal perceptions lead to adapted asthma management skills or certain coping styles of parents and children. Insight into the mechanisms may contribute to more effective education and intervention programs which, in turn, could result in better disease outcomes and QoL. In addition to the perception of mothers, children's own perceptions of asthma could be valuable, since they may or may not overlap with their parents' point of view and may exert a different influence on the disease outcomes.

DECLARATION OF INTEREST

This work was supported with research grants from the Dutch Asthma Foundation [AF: 3.4.07.041] and the Netherlands Organization for Health Research and Development [ZonMw: 50-50110-96-511].

ENDNOTE

¹As mentioned in the "Methods" section, we also tested whether results would change if we included the %FEV₁

value as a covariate, but this was not the case. Furthermore, we tested the model with maternal education as an additional covariate at step 1. Results for perceptions 1, 5, 6, and 8 for mothers' report of QoL remained similar, while for children's report of QoL, perceptions 6 and 8 remained significant.

REFERENCES

1. Van de Ven MO, Van den Eijnden RJ, Engels RC. Atopic diseases and related risk factors among Dutch adolescents. *Eur J Public Health* 2006; 16:549–558.
2. Williams H, Robertson C, Stewart A, Ait-Khaled N, Anabwani G, Anderson R, Asher I, Beasley R, Björkstén B, Burr M, Clayton T, Crane J, Ellwood P, Keil U, Lai C, Mallol J, Martinez F, Mitchell E, Montefort S, Pearce N, Shah J, Sibbald B, Strachan D, Mutius von E, Weiland SK. Worldwide variations in the prevalence of symptoms of atopic eczema in the International Study of Asthma and Allergies in childhood. *J Allergy Clin Immunol* 1999; 103:125–138.
3. Stahl E. Correlation between objective measures of airway caliber and clinical symptoms in asthma: a systematic review of clinical studies. *Resp Med* 2000; 94:735–741.
4. Rietveld S, Prins PJM, Colland VT. Accuracy of symptom perception in asthma and illness severity. *Child Health Care* 2001; 30:27–41.
5. Guyatt GH, Feeny DH, Patrick DL. Measuring health-related quality of life. *Ann Intern Med* 1993; 118:622–629.
6. Lane MM. Advancing the science of perceptual accuracy in pediatric asthma and diabetes. *J Pediatr Psychol* 2006; 31:233–245.
7. Hagger MS, Orbell S. A meta-analytic review of the common-sense model of illness representations. *Psychol Health* 2003; 18:141–184.
8. Lau RR, Quadrel MJ, Hartman KA. Development and change of young adults' preventive health beliefs and behavior: influence from parents and peers. *J Health Soc Behav* 1990; 31:240–259.
9. Tinsley BJ. Multiple influences on the acquisition and socialization of children's health attitudes and behavior: an integrative review. *Child Dev* 1992; 63:1043–1069.
10. Kaugers AS, Klinnert MD, Bender BG. Family influences on pediatric asthma. *J Pediatr Psychol* 2004; 29:475–491.
11. Fiese BH, Wamboldt FS, Anbar RD. Family asthma management routines: connections to medical adherence and quality of life. *J Pediatr* 2005; 146:171–176.
12. Rhee H, Belyea MJ, Brasch J. Family support and asthma outcomes in adolescents: barriers to adherence as a mediator. *J Adolesc Health* 2010; 47:472–478.
13. McWilliam CL. Patients, persons or partners? Involving those with chronic disease in their care. *Chronic Illn* 2009; 5:277–292.
14. Leventhal H, Meyer D, Nerenz D. The Common Sense Model of Illness Danger. In: Rachman, S, ed. *Contributions to Medical Psychology*. New York: Pergamon Press, 1980:7–30.
15. Kaptein AA, Klok T, Moss-Morris R, Brand PLP. Illness perceptions: impact on self-management and control in asthma. *Curr Allergy Clin Immunol* 2010; 10:194–199.
16. Spurrier NJ, Sawyer MG, Staugas R, Martin AJ, Kennedy D, Streiner DL. Association between parental perception of children's vulnerability to illness and management of children's asthma. *Pediatr Pulmonol* 2000; 29:88–93.
17. Anthony KK, Gil KM, Schanberg LE. Brief report: parental perceptions of child vulnerability in children with chronic illness. *J Pediatr Psychol* 2003; 28:185–190.
18. Conn KM, Halterman JS, Fisher SG, Yoos HL, Chin NP, Szilagyi PG. Parental beliefs about medications and medication adherence among urban children with asthma. *Ambul Pediatr* 2005; 5:306–310.
19. Hiemstra M, Ringlever L, Otten R, Jackson C, Van Schayck OCP, Engels RCME. Efficacy of smoking prevention program 'Smoke-free Kids': study protocol of a randomized controlled trial. *BMC Public Health* 2009; 9:477.
20. Asher MI, Keil U, Anderson HR, Beasley R, Crane J, Martinez F, Mitchell EA, Pearce N, Sibbald B, Stewart AW, Strachan D, Weiland SK, Williams HC. International study of asthma and allergies in childhood (ISAAC): rationale and methods. *Eur Respir J* 1995; 8:483–491.
21. Broadbent E, Petrie KJ, Main J, Weinman J. The brief illness perception questionnaire. *J Psychosom Res* 2006; 60:631–637.
22. Moss-Morris R, Weinman J, Petrie KJ, Horne R, Cameron LD, Buick D. The Revised Illness Perception Questionnaire (IPQ-R). *Psychol Health* 2002; 17:1–16.
23. Law GU. Dissimilarity in adolescent and maternal representations of Type 1 diabetes: exploration of relations to adolescent well-being. *Child Care Health Dev* 2002; 28:369–378.
24. Varni JW, Burwinkle TM, Rapoff MA, Kamps JL, Olson N. The PedsQL™ in pediatric asthma: reliability and validity of the Pediatric Quality of Life inventory generic core scales and asthma module. *J Behav Med* 2004; 27:297–318.
25. Seid M, Limbers CA, Driscoll KA, Opari-Arrigan LA, Gelhard LR, Varni JW. Reliability, validity, and responsiveness of the Pediatric Quality of Life inventory (PedsQL™) generic core scales and asthma symptoms scale in vulnerable children with asthma. *J Asthma* 2010; 47:170–177.
26. Redline S, Gruchalla RS, Wolf RL, Yawn BP, Cartar L, Gan V, Nelson P, Wollan P. Development and validation of school-based asthma and allergy screening questionnaires in a 4-city study. *Ann Allerg Asthma Immunol* 2004; 93:36–48.
27. National Institutes of Health; National Heart, Lung, and Blood Institute. Expert panel report 2: guidelines for the diagnosis and management of asthma. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute; 1997. NIH Publication No. 97–4051.
28. Kendrick AH, Higgs CM, Whitfield MJ, Laszlo G. Accuracy of perception of severity of asthma: patients treated in general practice. *Brit Med J* 1993; 307:422–424.
29. Nguyen BP, Wilson SR, German DF. Patient's perceptions compared with objective ratings of asthma severity. *Ann Allerg Asthma Immunol* 1996; 77:209–215.
30. Yoos HL, Kitzman H, McMullen A, Sidora K. Symptom perception in childhood asthma: how accurate are children and their parents? *J Asthma* 2003; 40:27–39.
31. Juniper EF. Quality of life in adults and children with asthma and rhinitis. *Allergy* 1997; 52:971–977.
32. Wade SL, Holden G, Lynn H, Mitchell H, Ewart C. Cognitive-behavioural predictors of asthma morbidity in inner-city children. *J Dev Behav Pediatr* 2000; 21:340–346.
33. Guyatt GH, Juniper EF, Griffith LE, Feeny DH, Ferrie PJ. Children and adult perceptions of childhood asthma. *Pediatrics* 1997; 99:165–168.
34. Le Coq EM, Boeke AJP, Bezemer PD, Colland VT, Van Eijk JThM. Which source should we use to measure quality of life in children with asthma: the children themselves or their parents? *Qual Life Res* 2000; 9:625–636.
35. Rutishauser C, Sawyer SM, Bowes G. Quality of life assessment in children and adolescents with asthma. *Eur Respir J* 1998; 12:486–494.
36. Sidora- Arcoleo K, Feldman J, Serebrisky D, Spray A. Validation of the Asthma Illness Representation Scale (AIRS). *J Asthma* 2010; 47:33–40.
37. Crighton EJ, Mamdani MM, Upshur REG. A population based times series analysis of asthma hospitalizations in Ontario, Canada: 1988 to 2000. *BMC Health Serv Res* 2001; 1:7.
38. Stewart AW, Asher MI, Clayton TO, Crane J, D'Souza W, Ellwood PE, Ford RPK, Mitchell EA, Pattemore PK, Pearce N. The effect of season-of-response to ISAAC questions about asthma, rhinitis and eczema in children. *Int J Epidemiol* 1997; 26:126–136.
39. Meijer AM, Griffioen RW, Van Nierop JC, Oppenheimer L. Intractable or uncontrolled Asthma: psychosocial factors. *J Asthma* 1995; 32: 265–274.

APPENDIX 1. ORIGINAL ITEMS: THE BRIEF ILLNESS PERCEPTION QUESTIONNAIRE

- (1) How much does your illness affect your life?
- (2) How long do you think your illness will continue?
- (3) How much control do you feel you have over your illness?
- (4) How much do you think your treatment can help your illness?
- (5) How much do you experience symptoms from your illness?

- (6) How concerned are you about your illness?
- (7) How well do you feel you understand your illness?
- (8) How much does your illness affect you emotionally?

The items of the Brief Illness Perception Questionnaire, transformed to mother's perception concerning the children's asthma. Items were asked in Dutch.

- (1) How much does the asthma affect your child's life?

- (2) How long do you think the asthma of your child will continue?
- (3) How much control do you feel you have over your child's asthma?
- (4) How much do you think your child's treatment helps your child's asthma?
- (5) How much does your child experience the symptoms of his/her asthma?
- (6) How concerned are you about your child's asthma?
- (7) How well do you feel you understand your child's asthma?
- (8) How much does your child's asthma affect you emotionally?

Copyright of Journal of Asthma is the property of Taylor & Francis Ltd and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.