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Factors related to Health-Related Quality of Life (HRQoL) among children with ADHD in Europe at entry into treatment

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Abstract *Objective* To describe the associations between a range of baseline factors (demographic, family and clinical) and parent-reported health-related quality of life (HRQoL) of children with ADHD taking part in the ADORE study. *Methods* HRQoL was rated using the Parent Report Form of the Child Health and Illness Profile-Child Edition (CHIP-CE). Forward-stepwise linear regression models were used to investigate associations with 26 independent variables. Separate models were fitted for each of the five CHIP-CE domains (Satisfaction, Comfort, Resilience, Risk Avoidance and Achievement) and two subdomains of Achievement (Academic Performance and Peer Relations). *Results* CHIP-CE domain mean scores were lower than community norms, especially for Risk Avoidance and Achievement, indicating a low level of HRQoL. Clinical factors significantly associated with a poorer HRQoL included ADHD symptoms (inattention, hyperactivity-impulsivity), conduct problems, peer relationship problems, having asthma, multiple other somatic symptoms and co-ordination problems. Family factors, such as having a parent with a health or mental health problem possibly caused by the child's illness, child not living with both parents and maternal smoking during pregnancy were also associated with a worse HRQoL in some CHIP-CE domains/subdomains. *Conclusions* Numerous factors independently impact on the HRQoL of children with ADHD.

Key words ADHD – children – Europe – health-related quality life

Abbreviations

ADHD	Attention-Deficit/Hyperactivity Disorder
ADORE	Attention-deficit/hyperactivity Disorder Observational Research in Europe
ADHD-RS	ADHD Rating Scale
CD	Conduct Disorder
CGAS	Children's Global Assessment Scale
CGI-S	Clinical Global Impression-Severity scale
CHIP-CE	Child Health and Illness Profile – Child Edition
HRQoL	Health-Related Quality of Life
ODD	Oppositional Defiant Disorder

ECAP 1006

PRF Parent Report Form
SDQ Strengths and Difficulties Questionnaire

Introduction

Health related quality of life (HRQoL) is a resource for adaptation and healthy growth. When HRQoL is depleted, a child is less likely to be able to cope effectively, develop normally and mature into a healthy adult [5]. The cardinal characteristics of attention-deficit/hyperactivity disorder (ADHD) are often described as problems in self-regulation that manifest as hyperactivity, inattention, and impulsiveness and are known to interact and impair functioning in many aspects of a child's life [1, 2, 8, 9, 16].

As assessment of children's HRQoL has improved, evidence is emerging that the deficits that underlie ADHD are also associated with reductions in many other domains of HRQoL, including the sense of well-being, self-worth, resiliency, overall health and psychosocial functioning. Recently, children with ADHD have been shown to have significantly worse levels of HRQoL than 'normal' controls [10, 17, 20]. Even compared to children with asthma, children who are newly diagnosed with ADHD have significantly worse psychosocial HRQoL across multiple scales [4].

The importance of assessing children's HRQoL has been highlighted by the American Academy of Paediatrics, which recommends that clinicians monitor children's quality of life in addition to tracking symptoms and behaviour, as this is a critical step in improving outcomes in these children [14]. Although it is easy to understand how typical ADHD-related behaviours, such as disruptive and intrusive behaviours, can lead to reductions in HRQoL due to the negative consequences they engender, much needs to be learned about how ADHD core symptoms are associated with reductions in HRQoL [7]. Additionally, it is important to investigate the relative contribution of other factors commonly associated with ADHD but not always present.

In the current study, we take into account not only the ADHD behaviours that are likely to be related to poor HRQoL, but also other factors common in the lives of these children that may help to further explain reduced HRQoL. These include their increased likelihood of having other psychiatric or neurological disorders, having somatic health problems whether due to injuries or not, living with parents who have ADHD or health and emotional problems, and perinatal factors.

The Attention-deficit/hyperactivity Disorder Observational Research in Europe (ADORE) study attempts to address these aims by using a comprehensive measurement assessment in a naturalistic setting, i. e. physicians' offices where evaluation and treatment are initially sought.

An accompanying article in this supplement describes the associations between baseline demographic, family and clinical factors and clinician-rated measures of global impairment in children taking part in the ADORE study [3].

Methods

The ADORE study is a pan-European study of child health outcomes associated with ADHD. It utilised an observational, non-interventional, prospective study design with study sites located in 10 different countries. Approximately 1,500 parents of children between the ages of 6 and 18 years were recruited by 244 investigators. The methods and design employed in the ADORE study are described in detail elsewhere [11].

Recruitment and sample

At the child's first visit to a psychiatrist or primary care physician for assessment and/or treatment of ADHD or Hyperkinetic Disorder, parents and guardians who agreed to participate in the study were asked to complete an initial (baseline) assessment about the child, with a particular focus on the child's HRQoL. Physicians also completed an evaluation of the children. At this point, children may have been diagnosed with ADHD but had never received treatment for this disorder (see Preuss, et al. [11]). A total of 1,478 children were included in the baseline assessment.

Measures

Children's HRQoL (the outcome/dependent variable) was assessed using the parent report form (PRF) of the Child Health and Illness Profile-Child Edition (CHIP-CE), which describes children's health, well-being and functioning from the perspective of the parent. The CHIP-CE comprises five domains (Satisfaction, Comfort, Resilience, Risk Avoidance and Achievement) and 12 subdomains (see Table 1), the scoring of which has been described in detail elsewhere, together with the results of the validity and reliability of the CHIP-CE in the ADORE sample [15]. For this study, the two subdomains of the Achievement domain (i. e. Academic Performance and Peer Relations) were used as outcome variables because they assess distinct aspects of functioning that may differ markedly for children with ADHD. The internal consistency of each of the five domains and the two subdomains of Academic Performance and Peer Relations was good, with estimates of Chronbach $\alpha > 0.70$.

Higher CHIP-CE scores indicate better health. For example, higher scores on Satisfaction suggest greater

Table 1 CHIP-CE: Parent Report Form (PRF) domain and subdomain definitions (N = 1,478)

Domains and *subdomains*	Domain mean (SD)
SATISFACTION DOMAIN: The parent's assessment of the child's well-being and self-esteem (11 items) 1. Satisfaction with health: overall perceptions of well-being and health 2. Self-esteem: general self-concept	32.8 (14.4)
COMFORT DOMAIN: Parent's assessment of the child's experience of physical and emotional symptoms and positive health sensations and observed limitations of activity (22 items) 1. Physical comfort: positive and negative somatic feelings and symptoms 2. Emotional comfort: positive and negative emotional feelings and symptoms 3. Restricted activity: restrictions in day-to-day activities due to illness	42.5 (10.6)
RESILIENCE DOMAIN: Level of child's participation in family, coping abilities and physical activity (19 items) 1. Family involvement: level of activities with family and perceived family support 2. Social problem-solving: active approaches to solving an interpersonal problem 3. Physical activity: level of involvement in activities related to fitness	36.0 (12.2)
RISK AVOIDANCE DOMAIN: Degree to which the child avoids behaviours that increase the likelihood of illness, injury, or poor social development (14 items) 1. Individual risk avoidance: avoidance of activities that threaten individual health and development 2. Threats to achievement: avoidance of behaviours that typically disrupt social development	29.9 (13.6)
ACHIEVEMENT DOMAIN: Extent to which the child meets expectations for role performance in school and with peers (10 items) 1. Academic performance: school performance and engagement 2. Peer relations: relationships with peer group	30.3 (10.6)

US community mean scores = 50; standard deviation, SD = 10. Higher scores indicate better HRQoL

well-being, higher Comfort scores indicate fewer painful body sensations, distressing emotions, and limitations due to illness, while higher scores on the Risk Avoidance scale denote that the child engages in fewer risk behaviours than its counterparts. The adaptation and validation of the CHIP-CE in Spain produced a similar factor structure and reliability as in the US [13].

Independent variables Twenty-six factors were investigated for their relationship to each aspect of children's HRQoL on the CHIP-CE. The 26 independent variables are the same as those described by Coghill et al. [3], with the addition of the Clinical Global Impression-Severity (CGI-S) scale. The CGI-S was forced into the regression model at the end in addition to the ADHD Rating Scale (ADHD-RS; see Döpfner et al. this issue) subscales (Inattention and Hyperactivity-Impulsivity) scores, age and gender, and clinician ratings of parent reports of ADHD symptoms on the ADHD-RS subscales. The independent variables include socio-demographic factors, family history of ADHD, pre- and peri-natal exposures, parental or clinician reports of medical and psychiatric co-existing disorders and problems, and assessments by parents of problem and prosocial behaviour on the Strengths and Difficulties Questionnaire (SDQ; see Becker et al. this issue). Co-existing conditions were defined by clinical ratings based on a 7-point Likert scale. Co-existing problems were considered as clinically significant when rated at least moderately impaired for that particular domain (see Steinhausen et al. [19]). The presence (or absence) of physical or emotional problems in either parent that were possibly caused by the child's problems was assessed by the physician during the parent interview.

Analytical approach

All analyses were performed using SAS software. Descriptive statistical analyses of all child and family factors were conducted by country and for the full sample to ensure adequate cross-country consistency in means.

Forward-stepwise linear regression analysis was performed to investigate the contribution each factor (independent variable) made to the baseline HRQoL. Separate models were fitted for each of the following outcome variables: the five CHIP-CE domains of HRQoL and the two subdomains of Achievement (Academic Performance, Peer Relations). Factors were retained in the final model if they were significant at the $p \leq 0.10$ level using Type I sums of squares; i.e. each factor was adjusted for the factors already present in the model. The 10 % significance level was used as it is conservative and keeps in the model variables that are showing any effect on the outcome variable. Once the final model was found, the factors CGI-S, ADHD-RS subscales Inattention and Hyperactivity-Impulsivity, age and gender were forced into the model and, thus, were not part of the stepwise selection.

Three sets of regression analyses were conducted for each dependent variable; a random sample of two-thirds of the data was first used to create the final model, this model was then re-run using the other third of the data and then the same model was run again with the full

population. The models produced were essentially similar in all cases, providing confidence in the stability of the relationships observed in the final model. Standardised beta (β) estimates, 95 % confidence intervals (CI) and p-values (Type III) for each factor significant at the $p < 0.05$ are presented. Each factor's beta (β) coefficient reflects the strength of its effect, adjusted for the factors already present in the model. The mean and standard deviations (SD) for the categorical variables associated with the baseline CHIP-CE domain scores are also presented.

Results

A total of 1,478 children were eligible for analyses. The mean scores for each domain of the CHIP-CE (see Table 1) ranged from 29.9 for Risk Avoidance to 42.5 for Comfort. Compared with expected score of 50 for 'average' HRQoL and standard deviation of 10 (community norms from the US), the children in this study were approximately 1–2 standard deviations below the community norm in all domains, showing reduced HRQoL. This dramatically low level of HRQoL was consistent across the subsamples from each country, and for younger and older youth, and girls and boys [15]. It is also similar to the CHIP-CE scores obtained on a sample of children entering treatment for ADHD in a separate study in Spain [12].

Tables 2 and 3 present the results of the stepwise forward linear regression analyses for the full sample of parent reports about their child on the CHIP-CE.

The R^2 values for the CHIP-CE domains of Satisfaction (0.425), Comfort (0.404), Resilience (0.288), Risk Avoidance (0.607) and Achievement (0.490) show that the model accounts for variability in the CHIP-CE domain scores ranging from 28.8 % for Resilience to 60.7 % for Risk Avoidance. For the subdomains of the Achievement domain, $R^2 = 0.643$ for Peer Relations and $R^2 = 0.254$ for Academic Performance.

As seen in Table 2, children who lived with both their parents were significantly more likely to have better CHIP-CE Satisfaction and Comfort scores, that is, they have a stronger sense of well-being and fewer physical and emotional symptoms, according to their parent. Having a family history of ADHD did not make a contribution to quality of life, independent of the other factors in the models.

Parents' reports on the Strengths and Difficulties Questionnaire (SDQ) tap into characteristics that are sometimes, but not always, present in children with ADHD. When children had high emotional symptoms on the SDQ they were likely to have significantly lower Satisfaction, Comfort, Risk Avoidance and Achievement; with the Peer Relations subdomain of Achievement being significantly worse in children with higher SDQ emotional symptom scores. High levels of Conduct Problems and Peer Relationship Problems on the SDQ were also broadly related to poorer quality of life in these children, although Satisfaction was not significantly associated with Conduct Problems and Comfort was not significantly associated with Peer Problems. Interestingly, parents' ratings of Hyperactivity on the SDQ were associated with lower Academic Performance (as would have been expected). In contrast, there was a positive association between Academic Performance and physician-rated Hyperactivity-Impulsivity on the ADHD-RS.

Co-ordination problems were significantly associated with lower Satisfaction and Achievement scores. As can be seen in Table 4, which provides the mean (SD) scores for categorical variables associated with baseline CHIP-CE domains, children with and without co-ordination problems had modest differences in the Satisfaction (difference in means = 4.6 points) and Achievement (difference in means = 3.5 points) domain scores. CHIP-CE Satisfaction and Comfort scores were decreased for children with asthma compared with children without asthma, as seen in previous studies [6]. Somatic symptoms were associated with a reduced HRQoL in terms of Comfort. Table 4 shows that two or more doctor-reported somatic symptoms such as headaches, stomach aches, and sleep problems were associated with an increase in risk avoidance scores compared with one somatic symptom, but this did not reach statistical significance. Children with two or more somatic symptoms had lower mean Comfort and Resilience scores by 9.2- and 6.3-points, respectively, compared with children who did not have these problems. If physicians reported that the parent had an emotional or health condition potentially caused by the child's problems (family health problem), the child had significantly lower Resilience and Risk Avoidance scores.

Physician-rated global impairment in functioning on the CGI-S was only significantly associated with Satisfaction, inversely, so that children with greater impairment were less satisfied (Table 2).

Physician-ratings of high inattention on the ADHD-RS indicated that children would have worse Satisfaction, more risk behaviour, and lower Achievement. Only the Academic Performance component of Achievement was significantly related to ADHD-RS inattention score (Table 3). The ADHD-RS subdomains Inattention and Hyperactivity-Impulsivity had no relationship to Comfort, the level of physical and emotional symptoms experienced by children.

Hyperactivity-impulsivity as rated by physicians on the ADHD-RS was significantly associated with four of the five domains of CHIP-CE, but in an inconsistent manner, such that children with high hyperactivity-impulsivity engaged in more risk behaviours, but had higher parent-reported Satisfaction, Resilience and

Table 2 Factors associated with the CHIP-CE domains of HRQoL – linear regression models

Independent variables	Satisfaction		Comfort		Resilience		Risk avoidance		Achievement	
	β (95% CI)	p-value	β (95% CI)	p-value	β (95% CI)	p-value	β (95% CI)	p-value	β (95% CI)	p-value
Living with both parents (Y vs. N)	1.75 (0.26, 3.23)	0.022	1.12 (0.11, 2.13)	0.029	NS		NS			
Number of children living with patient (0,1,2,3,4 +)					NS		NS		NS	
Family history of ADHD	NS									
Maternal drug/alcohol abuse during pregnancy (Y vs. N)					NS					
Low birth weight (Y vs. N)							NS			
Maternal smoking during pregnancy (Y vs. N)			NS		NS		−2.20 (−3.41, −0.98)	< 0.001	NS	
SDQ: Hyperactivity			NS		−0.49 (−0.90, −0.08)	0.018	−0.67 (−1.00, −0.34)	< 0.001	−0.76 (−1.05, −0.47)	< 0.001
SDQ: Emotional symptoms	−2.39 (−2.70, −2.09)	< 0.001	−2.07 (−2.28, −1.86)	< 0.001	NS		−0.28 (−0.0.49, −0.06)	0.012	−0.40 (−0.59, −0.21)	< 0.001
SDQ: Conduct problems	NS		−0.79 (−1.01, −0.56)	< 0.001	−0.81 (−1.12, −0.49)	< 0.001	−3.10 (−3.36, −2.85)	< 0.001	−0.49 (−0.72, −0.26)	< 0.001
SDQ: peer problems	−0.94 (−1.25, −0.62)	< 0.001			−0.76 (−1.04, −0.48)	< 0.001	−0.30 (−0.53, −0.08)	0.009	−1.82 (−2.02, −1.62)	< 0.001
SDQ: Prosocial behaviour (positive behaviours)	1.43 (1.11, 1.75)	< 0.001			1.63 (1.34, 1.92)	< 0.001	0.72 (0.49, 0.96)	< 0.001	0.83 (0.62, 1.03)	< 0.001
Anxiety and/or depression (Y vs. N)	NS		NS		NS					
CD and/or ODD (Y vs. N)									NS	
Tics and/or Tourette's (Y vs. N)					NS				NS	
Co-ordination problems (present vs. not present)	−3.03 (−4.46, −1.59)	< 0.001							−1.45 (−2.38, −0.52)	0.002
Asthma (present vs. not present)	−4.18 (−6.69, −1.66)	0.001	−3.48 (−5.23, −1.74)	< 0.001	NS		NS			
No. somatic symptoms (0 vs. 2 +)			4.35 (1.81, 6.89)	< 0.001	NS		NS			
No. somatic symptoms (1 vs. 2 +)			3.52 (0.82, 6.23)	0.011	NS		NS			
Family health problem (Y vs. N)			NS		−1.96 (−3.19, −0.72)	0.002	−1.35 (−2.36, −0.35)	0.008		
CGI-S	−0.99 (−1.84, −0.14)	0.023	NS		NS		NS		NS	
ADHD-RS: Inattention	−0.25 (−0.42, −0.09)	0.002	NS		NS		−0.23 (−0.35, −0.12)	< 0.001	−0.52 (−0.63, −0.41)	< 0.001
ADHD-RS: hyperactivity-impulsivity	0.26 (0.13, 0.39)	< 0.001	NS		0.17 (0.04, 0.30)	0.012	−0.15 (−0.26, −0.05)	0.005	0.26 (0.17, 0.36)	< 0.001
Age	−0.70 (−0.98, −0.42)	< 0.001	NS		−0.65 (−0.91, −0.40)	< 0.001	NS		NS	
Gender (female vs. male)	NS		NS		NS		2.36 (1.04, 3.68)	< 0.001	NS	

Empty cells indicate variable did not reach significance (type I $p \geq 0.1$) for entry into the final model
NS not significant; *CI* confidence interval; *CGI-S* Clinical Global Impression-Severity scale; *SDQ* Strengths and Difficulties Questionnaire; *ADHD-RS* ADHD rating scale; *Y* yes; *N* no
Factors not significantly related to any CHIP-CE domain: Premature birth; Maternal drug/alcohol use in pregnancy; Low birth weight; Other pregnancy problems; Doctors report presence/absence of: obsessive compulsive disorder, conduct disorder (CD)/oppositional defiant disorder (ODD), Tics/Tourette's
An increase in CHIP-CE score indicates a better HRQoL

Table 3 Linear regression models for Peer Relations and Academic Performance (subdomains of Achievement)

Independent variables	Peer relations		Academic performance	
	β (95% CI)	p-value	β (95% CI)	p-value
Born prematurely (Y vs. N)	NS			
Maternal drug/alcohol abuse (Y vs. N)			NS	
Maternal smoking (Y vs. N)			−1.52 (−2.79, −0.24)	0.02
SDQ: Hyperactivity	NS		−1.15 (−1.49, −0.80)	< 0.001
SDQ: Emotional symptoms	−0.62 (−0.82, −0.42)	< 0.001	NS	
SDQ: Conduct problems	−0.37 (−0.61, −0.14)	0.002	−0.55 (−0.82, −0.29)	< 0.001
SDQ: Peer relationship	−3.68 (−3.89, −3.47)	< 0.001		
SDQ: Prosocial behaviour	0.83 (0.62, 1.05)	< 0.001	0.58 (0.34, 0.82)	< 0.001
Anxiety and/or depression (Y vs. N)			NS	
Co-ordination problems (present vs. not present)	−1.69 (−2.65, −0.72)	< 0.001	NS	
Asthma (present vs not present)	NS			
Number of somatic symptoms (0 vs 2 +)	NS			
Number of somatic symptoms (1 vs 2 +)	NS			
CGI-S	NS		NS	
ADHD-RS: Inattention	NS		−0.71 (−0.83, −0.59)	< 0.001
ADHD-RS: Hyperactivity-impulsivity	NS		0.37 (0.26, 0.48)	< 0.001
Age	0.38 (0.19, 0.56)	< 0.001	−0.46 (−0.67, −0.24)	< 0.001
Gender	NS		NS	

NS not significant; *CI* confidence interval; *CGI-S* clinical Global Impression -Severity; *SDQ* Strengths and Difficulties Questionnaire; *ADHD-RS* ADHD rating scale; *Y* yes; *N* no
Empty cells indicate variable did not reach significance (Type I $p \geq 0.1$) for entry into the final model. An increase in CHIP-CE score indicates a better HRQoL

Achievement scores. As seen in Table 3, the effect of the ADHD-RS hyperactivity-impulsivity score on the Achievement domain score was exerted through the Academic Performance subdomain, since the Peer Relations subdomain was not significantly associated with hyperactivity-impulsivity.

Younger children were reported to have better Satisfaction, Resilience, and Academic Performance, while being older was associated with better peer relationships.

Risk Avoidance was the worst aspect of HRQoL for these children with ADHD, indicating that they frequently engaged in behaviours that are likely to lead to injury and poor health. Risk behaviour was strongly related to having conduct problems, being male, having family health problems and having a mother who reported smoking during pregnancy. Achievement was the next lowest area of HRQoL for the sample overall, and was associated almost exclusively with the core symptoms of ADHD.

Discussion

HRQoL was severely and pervasively compromised among these children 6–18 years of age who were showing symptoms of ADHD, as reported by their parents, primarily mothers. In this large and diverse sample, children were very much more likely to engage in risk and disruptive behaviours that imperil health (poor Risk Avoidance) and to perform poorly in social and academic settings (poor Achievement), compared with children in community samples in the US. Additionally, these children also had very low levels of well-being and self-worth (Satisfaction), poor coping and family involvement (Resilience), as well as high levels of emotional and somatic symptoms (Comfort).

The negative effect of hyperactivity was only observed when it was reported by parents on the SDQ. The level of hyperactivity rated by physicians on the ADHD-RS during or immediately after their visit with the child and parent was unexpectedly associated with better parent-reported academic performance. Having peer problems and emotional symptoms on the SDQ was pervasively associated with poor HRQoL outcomes, over and above the contribution made by the other variables. Other factors affecting certain aspects of HRQoL included having asthma, having multiple other somatic symptoms, co-ordination problems, and having a parent with a health or mental health problem possibly caused by the child's illness.

This study provides a unique perspective on the factors that contribute to the reduction in HRQoL of children with ADHD over and above that associated with the core symptoms of ADHD. In particular, the importance of somatic symptoms and illnesses in reducing the

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Table 4 Means and standard deviations (SD) for categorical variables associated with baseline CHIP-CE domain scores

Independent variables	Level Mean (SD)	Satisfaction Mean (SD)	Comfort Mean (SD)	Resilience Mean (SD)	Risk avoidance Mean (SD)	Achievement
Living with both parents	Yes	33.9 (14.2)	43.2 (10.4)	36.9 (12.1)	31.1 (13.2)	
	No	30.3 (14.4)	40.8 (10.9)	34.0 (12.4)	27.3 (14.0)	
Family history of ADHD	Yes	32.5 (14.4)				
	No	33.7 (14.2)				
Maternal drug/alcohol abuse during pregnancy	Yes			33.3 (12.9)		
	No			36.1 (12.2)		
Low birth weight	Yes				28.5 (15.3)	
	No				30.0 (13.4)	
Maternal smoking during pregnancy	Yes		40.5 (10.9)	33.8 (12.7)	25.4 (15.2)	28.4 (11.2)
	No		43.0 (10.4)	36.7 (12.1)	31.1 (12.8)	30.8 (10.4)
Anxiety and/or depression	Yes	26.3 (14.8)	38.0 (10.3)	34.0 (12.8)		
	No	34.3 (13.8)	43.5 (10.4)	36.5 (12.0)		
CD and/or ODD	Yes					27.4 (10.9)
	No					32.3 (10.0)
Tics and/or Tourette's	Yes			34.8 (13.1)		28.0 (11.8)
	No			36.1 (12.1)		30.5 (10.5)
Coordination problems	Not present	34.2 (14.0)				31.4 (10.4)
	Present	29.6 (14.7)				27.9 (10.9)
Asthma	Not present	33.1 (14.1)	43.0 (10.3)	36.1 (12.2)	30.2 (13.5)	
	Present	27.6 (16.1)	36.8 (11.9)	34.0 (12.4)	27.4 (14.8)	
Number of somatic symptoms	0		43.4 (10.4)	36.9 (12.1)	30.6 (13.4)	
	1		39.8 (10.4)	33.3 (12.1)	26.8 (14.1)	
	2+		34.2 (9.9)	30.6 (12.3)	29.6 (14.4)	
Family health problem	Yes		40.7 (10.6)	33.6 (11.7)	26.9 (14.2)	
	No		44.0 (10.3)	38.1 (12.2)	32.4 (12.5)	
Gender	Female	31.6 (15.0)	40.8 (10.4)	36.7 (12.5)	32.8 (13.5)	30.0 (10.0)
	Male	32.9 (14.3)	42.7 (10.6)	35.9 (12.2)	29.3 (13.5)	30.4 (10.8)

A higher score indicates better HRQoL

quality of life of children with ADHD has not previously been identified in this population, yet many children had asthma and many others had two or more symptoms such as headaches, stomach aches and sleep disturbance. Interestingly, one aspect of HRQoL, risk avoidance, was slightly better (not significant) among children with multiple somatic symptoms compared with those with one somatic symptom. This supports a previous finding that youth with diagnosed medical conditions have greater risk avoidance than youth who are well [18]. Although physician-identified 'co-ordination problems' is non-specific, it clearly has meaning to parents and physicians since the identification of these problems contributed significantly to the reduction in children's sense of well-being and to having poor relationships with peers.

Several family factors were of particular interest. The presence of parental health or mental health problems identified by the physician during the clinical interview as being caused by the child's problems was associated with more risk behaviour and worse resilience. Resilience is operationalised as the child's coping and involvement with family, core aspects of HRQoL that are affected by the child's ADHD symptoms. Not living with both parents made a contribution to poorer HRQoL, in terms of more emotional and physical health symptoms and lower comfort. Maternal smoking during pregnancy was associated with a significantly worse level of risk behaviours among these children with ADHD. This suggests the potential for testing alternative hypotheses as to whether the smoking affected fetal development in a manner that increases children's risk taking behaviours, or whether prenatal smoking is simply a marker for a general tendency to take risks in both mother and child.

For HRQoL assessments to be used effectively in evaluating and improving treatments for children with ADHD, research such as this study will be necessary to fully understand the factors that make independent contributions to reductions in the quality of life for children with ADHD.

References

1. Barkley RA (1998) Attention-deficit hyperactivity disorder. Sci Am 279:66–71
2. Becker A, Steinhausen HC, Baldursson G, Dalsgaard S, Lorenzo MJ, Ralston SJ, Döpfner M, Rothenberger A and the ADORE study group (2006) Psychopathological screening of children with ADHD: Strengths and Difficulties Questionnaire in a pan-European study. Eur Child Adolesc Psychiatry 15(Suppl 1):56–62
3. Biederman J, Mick E, Faraone SV (1998) Normalized functioning in youths with persistent attention-deficit/hyperactivity disorder. J Pediatr 133:544–551
4. Coghill D, Spiel G, Baldursson G, Döpfner M, Lorenzo MJ, Ralston SJ, Rothenberger A and the ADORE study group (2006) Which factors impact on clinician-rated impairment in children with ADHD? Eur Child Adolesc Psychiatry 15(Suppl 1):30–37
5. Döpfner M, Steinhausen HC, Coghill D, Dalsgaard S, Poole L, Ralston SJ, Rothenberger A and the ADORE study group (2006) Cross-cultural reliability and validity of ADHD assessed by the ADHD Rating Scale in a pan-European study. Eur Child Adolesc Psychiatry 15(Suppl 1):46–55
6. Escobar R, Soutullo CA, Hervas A, Gastaminza X, Polavieja P, Gilaberte I (2005) Worse quality of life for children with newly diagnosed attention-deficit/hyperactivity disorder, compared with asthmatic and healthy children. Pediatrics 116: e364–e369
7. Forrest CB, Riley AW (2004) Childhood origins of adult health: a basis for life-course health policy. Health Aff (Millwood) 23:155–164
8. Forrest CB, Starfield B, Riley AW, Kang M (1997) The impact of asthma on the health status of adolescents. Pediatrics 99(2):e1
9. Harpin VA (2005) The effect of ADHD on the life of an individual, their family, and community from preschool to adult life. Arch Dis Child [doi:10, 1135/adc 0, 2004, 059006] 90:2–7
10. Hechtman L (2000) Assessment and diagnosis of attention-deficit/hyperactivity disorder. Child Adolesc Psychiatric Clin N Am 9:481–498
11. Johnston C, Mash EJ (2001) Families of children with attention-deficit/hyperactivity disorder: review and recommendations for future research. Clin Child Fam Psycholol Rev 4:183–207
12. Landgraf JM, Rich M, Rappaport L (2002) Measuring quality of life in children with attention-deficit/hyperactivity disorder and their families: Development and evaluation of a new tool. Arch Pediatr Adolesc Med 156:384–391
13. Preuss U, Ralston SJ, Baldursson G, Falissard B, Lorenzo MJ, Pereira RR, Vlasveld L, Coghill D and the ADORE study group (2006) Study design, baseline patient characteristics and intervention in a cross-cultural framework: results from the ADORE study. Eur Child Adolesc Psychiatry 15(Suppl 1): 4–14
14. Rajmil L, Serra V, Estrada MD, Fernandez de Sanmamed MJ, Guillamon I, Riley AW, Alonso J (2004) Adaptacion de la version espoanola del Perfil de Salud Infantial (Child Health and Illness Profile-Child Edition, CHIP-CE). An Pediatr 60:522–529
15. Ralston SJ, Lorenzo MJ (2004) ADORE – Attention-Deficit Hyperactivity Disorder Observational Research in Europe. Eur Child Adolesc Psychiatry 13(Suppl 1):36–42
16. Reiff MI, Stein MT (2003) Attention-deficit/hyperactivity disorder evaluation and diagnosis: a practical approach in office practice. Pediatr Clin N Am 50:1019–1048
17. Riley AW, Coghill D, Forrest CB, Lorenzo MJ, Ralston SJ, Spiel G and the ADORE study group. Validity of the health-related quality of life assessment in the ADORE study: Parent Report Form of the CHIP-CE edition. Eur Child Adolesc Psychiatry 15(Suppl 1):63–71
18. Rothenberger A, Danckaerts M, Dopfner M, Sergeant J, Steinhausen HC (2004) EINAQ – a European educational initiative on Attention-Deficit Hyperactivity Disorder and associated problems. Eur Child Adolesc Psychiatry 13(Suppl 1):31–35
19. Sawyer MG, Whaites L, Rey JM, Hazell PL, Graetz BW, Baghurst P (2002) Health-related quality of life of children and adolescents with mental disorders. J Am Acad Child Adolesc Psychiatry 41: 530–537
20. Starfield B, Forrest CB, Ryan SA, Riley AW, Ensminger ME, Green BF (1996) Health status of well vs. ill adolescents. Arch Pediatr Adolesc Med 150: 1249–1256
21. Steinhausen HC, Nøvik TS, Baldursson G, Curatolo P, Lorenzo MJ, Pereira RR, Ralston SJ, Rothenberger A and the ADORE study group (2006) Co-existing psychiatric problems in ADHD in the ADORE cohort. Eur Child Adolesc Psychiatry 15(Suppl 1):25–29
22. Topolski TD, Edwards TC, Patrick DL, Varley P, Way ME, Buesching DP (2004) Quality of life of adolescent males with attention-deficit hyperactivity disorder. J Atten Disord 7:163–173