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Magali Lahaye [a][b] , Carole Fantini-Hauwel [c] , Nady Van Broeck [a][d] ,
Eddy Bodart [e] & Olivier Luminet [a][b]

[a] Psychological Sciences Research Institute, Université catholique
de Louvain, Place Cardinal Mercier 10, B-1348 Louvain-la-Neuve,
Belgium

[b] Belgian National Fund for Scientific Research (FNRS-FRS), Rue
d'Egmont 5, Brussels, Belgium

[c] Research Center in the Psychology of Cognition, Language and
Emotion, Aix-Marseille University, Aix-en-Provence, France

[d] Department of Psychology, University of Leuven, B-3000 Leuven,
Belgium

[e] Department of Paediatrics, Cliniques universitaires de Mont-
Godinne, Université catholique de Louvain, Yvoir, Belgium

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Emotional competence and quality of life of children with asthma: The mediating effect of coping strategies

Magali Lahaye[ab]*, Carole Fantini-Hauwel[c], Nady Van Broeck[ad],
Eddy Bodart[e] and Olivier Luminet[ab]

[a]*Psychological Sciences Research Institute, Université catholique de Louvain, Place Cardinal Mercier 10, B-1348 Louvain-la-Neuve, Belgium;* [b]*Belgian National Fund for Scientific Research (FNRS-FRS), Rue d'Egmont 5, Brussels, Belgium;* [c]*Research Center in the Psychology of Cognition, Language and Emotion, Aix-Marseille University, Aix-en-Provence, France;* [d]*Department of Psychology, University of Leuven, B-3000 Leuven, Belgium;* [e]*Department of Paediatrics, Cliniques universitaires de Mont-Godinne, Université catholique de Louvain, Yvoir, Belgium*

This study explored the mediating effect of coping strategies on the relationship between emotional competence (EC) and quality of life (QOL) among children with asthma. Participants were 87 children (*M* age = 11.72, SD = 2.58) with controlled and partially controlled asthma, undergoing everyday treatment. They filled in questionnaires assessing EC, coping strategies and QOL. Results showed that the association between some ECs and the QOL of children with asthma was fully mediated by two maladaptive cognitive coping strategies. Among children with asthma, a greater ability to differentiate their emotions, a reduced attention to bodily signals of emotions and a reduced analysis of their current emotional state were related to decreased engagement in two coping strategies ('Ignoring Asthma' and 'Worrying about Asthma'), which in turn increased their QOL. These findings show that EC has an indirect effect on QOL through very specific coping strategies. They also emphasise the importance of screening EC in children with asthma and the importance of developing and using multidisciplinary interventions for them.

Keywords: asthma; quality of life; children; emotional competence; emotional regulation

Introduction

From the first years of life, children show marked individual differences in the way they are able to identify, express, understand, analyse, regulate and use their emotions and the emotions of others. The concept of emotional competence (EC) aims to capture this variability. EC is an umbrella concept, including a large set of emotional responses (e.g. identification of emotions, regulation of emotions, emotional expression, understanding others' emotions, empathy, etc.). Other terms, such as emotional intelligence (EI) or alexithymia, are frequently used to

capture individual differences in emotional functioning. Alexithymia refers to a difficulty identifying one's own emotions, verbalising them, and an externally oriented thinking style (Nemiah, Freyberger, & Sifneos, 1976), but does not include aspects related to the regulation of emotions, or to the processing of others' emotions. By contrast, EI is defined as a set of dispositions and perceptions related to the way with which individuals are able to identify, express, understand, regulate and utilise emotions (Mikolajczak, Quoidbach, Kotsou, & Nélis, 2009), but EI measures (e.g. The Trait Emotional Intelligence Questionnaire; Petrides & Furnham, 2003) include more dimensions than EC (e.g. well-being or self-control skills). We, therefore, prefer to use the term of EC because alexithymia is an under-inclusive construct and EI is an over-inclusive one.

Much research with adult populations have found that EC is related to physical and mental health (Mikolajczak, Luminet, & Menil, 2006; Schutte, Malouff, Thorsteinsson, Bhullar, & Rooke, 2007). Among healthy children, recent studies demonstrated that EC was negatively associated with social problems such as exclusions from school, difficulties in peers' interactions (Petrides, Frederickson, & Furnham, 2004; Petrides, Sangareau, Furnham, & Frederickson, 2006), and with subjective physical and psychological problems such as anxiety, depression and somatic complaints (Lahaye, Luminet, Van Broeck, Bodart, & Mikolajczak, 2010; Mavroveli, Petrides, Rieffe, & Bakker, 2007; Rieffe et al., 2010).

In medical populations, studies also indicated that a lack of EC may lead to the development or aggravation of some illnesses, such as type 1 diabetes (Luminet, de Timary, Buysschaert, & Luts, 2006) or gastrointestinal disorders (Porcelli et al., 2003). Among children, some recent studies showed that a lack of EC is associated with poor glycaemic control in type 1 diabetes (Housiaux, Luminet, Van Broeck, & Dorchy, 2010; Meunier, Dorchy, & Luminet, 2008).

However, to the best of our knowledge, no study has investigated the association between EC and the physical and psychological health of children who have asthma, a chronic inflammatory disease of the airways, despite the fact that asthma is the most common chronic illness in childhood and adolescence (Bacharier et al., 2008). Therefore, the first aim of this study was to examine the direct link between EC and the quality of life (QOL) of children with asthma. In addition to physical symptoms such as wheezing, coughing and shortness of breath, asthma could also have a negative impact on the QOL of children (Hallstrand, Curtis, Aitken, & Sullivan, 2003; Sawyer et al., 2000).

Furthermore, although the direct pathway between EC and health-related outcomes has been supported (Schutte et al., 2007), other studies showed that this relationship might be mediated by behavioural (e.g. alcohol, drugs or tobacco consumption; Limonero, Tómas-Sábado, & Fernández-Castro, 2006; Riley & Schutte, 2003), cognitive (appraisal of situations; Mikolajczak & Luminet, 2008) and/or biological processes (cortisol secretion during a social stress task; Mikolajczak, Roy, Luminet, Filee, & de Timary, 2007). According to the multifactorial model of health psychology (Sarafino, 2008), coping strategies could mediate the relationship between dispositional characteristics (such as EC) and QOL. Coping strategies are cognitive and behavioural responses that people use in order to manage their stress (Lazarus & Folkman, 1984). Studies demonstrated that people with higher EC scores used more adaptive coping strategies, such as positive re-evaluation, information seeking or acceptance than people with lower EC scores (Mikolajczak, Nelis, Hansenne, & Quoidbach, 2008). Mikolajczak et al. (2008)

also demonstrated that EC scores were negatively associated with dysfunctional approach coping strategies such as self-blame, catastrophisation or ruminative thoughts. These results converged with those of Velasco, Fernández, Páez, and Campos (2006), who showed that a lack of EC is positively related to denying and hiding emotions, and negatively associated with positive re-evaluation and social support. However, we did not find any study that examined the impact of EC on coping with paediatric chronic illness. Thus, our second aim was to investigate the associations between EC and specific coping strategies among children with asthma.

Moreover, previous research has examined if coping strategies were related to the QOL of patients with asthma. In adult populations, general coping strategies such as avoidant coping (avoidance, denial coping) is associated with a poorer QOL, whereas active coping (planning, information seeking, etc.) is associated with a higher QOL (Adams, Wilson, Smith, & Ruffin, 2004). These results concur with those from Van den ven, Engels, Sawyer, Otten, and Van Den Eijden (2007), who used a specific coping inventory for asthma (the Asthma Specific Coping Scale; Aalto, Harkapaa, Aro, & Rissanen, 2002). They showed that among adolescents, positive re-appraisal is associated with a higher QOL, whereas a Restricted Lifestyle, Worrying about Asthma and Hiding Asthma are associated with a lower QOL. Therefore, our third aim was to examine whether the associations between coping strategies and QOL are also found in children with asthma.

Finally, as we have observed that the choice of coping strategies partly depends on the level of EC, and as studies have shown that some coping strategies can reduce the negative impact of asthma on the QOL, the last aim of this study was to test the mediating effect of coping strategies that are relevant for children with asthma in the association between EC and QOL.

Based on the research described above, we tested two main hypotheses. First, we postulated that a positive association exists between the EC and QOL of children with asthma. Second, we expected that coping strategies (assessed through the Asthma Specific Coping Scale; Aalto et al., 2002) would mediate the relationship between EC and QOL. More specifically, we postulated that high scores on EC would be associated with (1) low scores on Hiding Asthma, (2) low scores on Restricted Lifestyle, (3) low scores on Ignoring Asthma, (4) low scores on Worrying about Asthma, (5) high scores on Information Seeking, and (6) high scores on Positive Reappraisal. In turn, these scores would be associated with high scores on QOL. To the best of our knowledge, this study is the first to investigate direct and indirect pathways between EC and QOL among children with asthma.

Method

Study sample

Participants were 87 Belgian French-speaking children (58 boys, 29 girls) with asthma, undergoing everyday treatment. Participants were between 8 and 18 years old ($M = 11.72$, SD $= 2.58$). In this sample, 48 children partly controlled their asthma and 39 had controlled asthma. Of the 86 parents who responded, 80.2% were mothers, 16.3% were fathers and 3.5% were other caregivers. Among parents, 74.4% lived together, 20.9% were divorced or separated and 4.7% defined themselves as 'other'. The educational level of the parents was assessed by the highest degree they obtained. The educational level of mothers was divided as follows: 3.4% primary

education diploma, 24.1% general secondary education diploma, 24.1% technical and vocational secondary education diploma, 39.1% advanced degree, 5.7% university degree and 3.4% declined to respond to this question. Among fathers, it was the following distribution: 11.5% primary school diploma, 18.4% general secondary education diploma, 27.6% technical and vocational secondary education diploma, 25.3% advanced degree, 14.9% university degree and 2.3% declined to respond.

Procedure

The study was approved by the ethics committee of the Mont Godinne University Hospital (Belgium). Consent forms were presented to the children and their parents. After obtaining consent, the paediatrician introduced the investigator to the patient and accompanying parents following their routine appointment within the paediatric department. The aim of the study was presented to the participants as follows: 'We would like to better understand how youths with asthma live with their illness and which factors could be associated with their QOL'. Children and their parents were informed about the confidentiality of their data and about their freedom to ask any question they had and to stop participating in the study at any time without explanations. They were also informed that their paediatrician would not have any access to their responses to the questionnaires. Finally, to avoid biased responses, we told the parents and child that the child should respond independently, without help from the parents. Children filled in a battery of questionnaires in the presence of the investigator. We explained that there were no good or wrong answers; when children hesitated between two answers, they were asked to try to respond based on how it happens most of the time. Testing time was around 1 h.

Measures

Emotional competence

EC was assessed using the Emotion Awareness Questionnaire (EAQ30; Rieffe, Oosterveld, Miers, Terwogt, & Ly, 2008; French validation, Lahaye et al., 2010). The EAQ30 is a self-report questionnaire of 30 items rated on a three-point scale from 1 (not true) to 3 (true) and includes the six scales described in Table 1. Twenty items are negatively formulated and thus reverse-scored. The questionnaire is suitable for children and adolescents between 9 and 16 years old. The French version of the EAQ30 has been shown to have good psychometric properties as well as convergent, discriminant and concurrent validity. The internal consistency coefficients of the EAQ30 subscales are satisfactory (Lahaye et al., 2010).

Coping strategies

Coping strategies were assessed through the Asthma Specific Coping Scale (Aalto et al., 2002; adapted in French for this study[1]), a self-report questionnaire comprising 28 items rated on a four-point scale from 1 (hardly ever) to 4 (almost always). The questionnaire includes the six subscales described in Table 1. The internal consistencies of the six subscales varied between 0.62 for Worrying about Asthma and 0.84 for Restricted Lifestyle (Aalto et al., 2002).

Table 1. Description of the different scales.

Dimensions	High scores on the dimension reflect	Examples of items
Emotion Awareness Questionnaire		
Differentiating Emotions	The ability to differentiate discrete emotions and locate their antecedents	When I am upset, I don't know if I am sad, scared or angry[a]
Verbal Sharing of Emotions	The ability to communicate one's feelings to others	I find it difficult to explain to a friend how I feel[a]
Not Hiding Emotions	The tendency not trying to conceal your feelings	When I am angry or upset, I try to hide this[a]
Bodily Awareness	The tendency to have low bodily reactivity in emotional situations	When I am scared or nervous, I feel something in my tummy[a]
Attending to Others' Emotions	The tendency to be interested in the emotions of others	If a friend is upset, I try to understand why
Analyses of Emotions	The willingness to face one's emotions	When I have a problem, it helps me when I know how I feel about it
Asthma Specific Coping Scale		
Restricted Lifestyle	The tendency to limit activities to avoid asthma attacks	I avoid exertion
Hiding Asthma	The tendency not to show or talk about asthma	I avoid talking about my asthma
Ignoring Asthma	The tendency to deny or ignore asthma	I avoid thinking about my asthma
Information Seeking	The tendency to seek asthma-relevant information	I try to find out more about my asthma
Worrying about Asthma	The tendency to be worried about asthma	I am afraid that my asthma will get worse
Positive Reappraisal	The tendency to consider asthma in a positive way	I try to learn something positive about my asthma and related experiences
Pediatric Asthma Quality of Life Questionnaire		
Activity Limitation	That children are less bothered by their limitation in activities	How often did you feel you couldn't keep up with others because of your asthma during the past week?
Symptoms	That children are less bothered by physical symptoms of asthma	How much did coughing bother you in the past week?
Emotional Function	That children feel less negative emotions due to asthma	How often did your asthma make you feel frustrated during the past week?

Note: [a]reversed items.

Quality of life

We assessed the QOL through the Pediatric Asthma Quality of Life Questionnaire (PAQLQ; Juniper et al., 1996), a self-report questionnaire which includes 23 items rated on a seven-point scale from 1 (not at all) to 7 (always). The PAQLQ is a commonly used measure of the QOL of children with asthma (Bushnell, Martin, & Parasuraman, 2003). It involves the three dimensions described in Table 1.

The PAQLQ was validated in French and showed good reliability and validity (Juniper et al., 1996).

Asthma control

Asthma control was assessed by a physician with expertise in paediatric pulmonology, according to the Global Initiative for Asthma (2009), which categorised asthma control in three groups: uncontrolled, partly controlled and controlled asthma.

Demographic data

Demographic information such as age, gender, marital status and parent's education were reported in a questionnaire by the caregiver of the child.

Results

Descriptive statistics

The means and SDs of the subscales of the EAQ30, the Asthma Specific Coping Scale, and the PAQLQ are presented in Table 2.

Partial least square analysis

A path model was performed to test associations between EC and QOL and the mediating effect of coping strategies on the relationship between EC and QOL using partial least squares path modelling (PLS-PM; Tenenhaus, Esposito Vinzi, Chatelin, & Lauro, 2005) through XLSTAT-PLS-PM software (Addinsoft). The PLS-PM differs from classic structural equation models because it uses ordinary least squares and not maximum likelihood estimations of the parameters based on the variance–covariance matrix. This analysis has several advantages. First, it makes the model possible to be tested with a smaller sample and with fewer distributional assumptions. The PLS-PM is also less sensitive to normality problems and more suitable for avoiding indeterminacy problems (Fornell & Bookstein, 1982). Two models were used to describe the PLS-PM: (1) the measurement model (also called the outer model) connecting the manifest variables (items) to their latent variables (dimensions) and (2) the structural model (also called the inner model) relating some latent variables to others. Therefore, model validation involves the validation of the measurement and the structural model (Tenenhaus et al., 2005; Esposito Vinzi, Trinchera, & Amato, 2010).

First and foremost, given the large number of constructs and variables we examined (Figure 1), a major goal of the path analysis was to simplify the model by eliminating null paths and those manifest variables that contributed little to underlying constructs. Manifest variables were eliminated if they shared less than 30% of their variance with the latent variable they indexed (loadings ≤0.55; Hulland, 1999). One latent variable (Attending to Others' Emotions) was eliminated due to the absence of a path link with any other latent variables. Then, after their elimination, the 'trimmed' model was re-run.

Table 2. Means, SDs and measurement model for EC, coping strategies and QOL.

Latent variables	Conceptual model			Measurement model				
	Items	*M*	SD	Manifest variables	Loadings	Block communality	D–G Rho	AVE
Emotional competence								
Differentiating Emotions	7	2.25	0.44	a11r	0.782	0.559	0.716	0.569
				a15r	0.711			
Not Hiding Emotions	5	1.96	0.43	a32r	0.723	0.657	0.791	0.641
				a33r	0.890			
Verbal Sharing of Emotions	3	2.01	0.62	a23	0.703	0.697	0.818	0.712
				a21r	0.948			
Bodily Awareness	5	1.94	0.55	a42r	0.724	0.550	0.786	0.548
				a44r	0.768			
				a45r	0.733			
Analyses of Emotions	5	2.20	0.44	a61	0.735	0.673	0.803	0.668
				a65	0.898			
Attending to Others' Emotions	5	2.40	0.46					
Coping strategies								
Restricted Lifestyle	4	2.06	0.76	coping15	0.824	0.716	0.834	0.714
				coping19	0.868			
Hiding Asthma	4	2.32	0.74	coping3	0.852	0.632	0.836	0.620
				coping7	0.836			
				coping11	0.687			
Positive Reappraisal	4	2.21	0.78	coping8	0.822	0.623	0.832	0.629
				coping13	0.735			
				coping30	0.809			
Information Seeking	4	1.90	0.76	coping6	0.860	0.766	0.868	0.771
				coping10	0.890			
Ignoring Asthma	4	2.24	0.79	coping17	0.896	0.682	0.810	0.674
				coping21	0.748			
Worrying about Asthma	3	2.01	0.79	coping9	0.874	0.714	0.833	0.709
				coping29	0.814			
Quality of life								
Symptoms	10	5.33	1.57	PAQLQ4	0.726	0.673	0.953	0.668
				PAQLQ6	0.773			
				PAQLQ8	0.859			
				PAQLQ10	0.778			
				PAQLQ12	0.907			
				PAQLQ14	0.875			
				PAQLQ16	0.797			
				PAQLQ18	0.840			
				PAQLQ20	0.836			
				PAQLQ23	0.793			
Activity Limitation	5	5.84	1.09	PAQLQ1	0.669	0.605	0.858	0.593
				PAQLQ3	0.672			
				PAQLQ19	0.876			
				PAQLQ22	0.870			
Emotional Function	8	5.83	1.35	PAQLQ5	0.876	0.638	0.933	0.622
				PAQLQ7	0.781			
				PAQLQ9	0.725			

(*continued*)

Table 2. Continued.

Latent variables	Conceptual model			Measurement model				
	Items	*M*	SD	Manifest variables	Loadings	Block communality	D–G Rho	AVE
				PAQLQ11	0.682			
				PAQLQ13	0.849			
				PAQLQ15	0.854			
				PAQLQ17	0.859			
				PAQLQ21	0.742			

Notes: The loadings are equal to *r* correlation coefficients. Information about loadings for all manifest and latent variables are available on request to the first author.
$N = 87$, 29 girls, 58 boys; D–G Rho, Dillon–Goldstein's Rho; and AVE, average variance extracted.
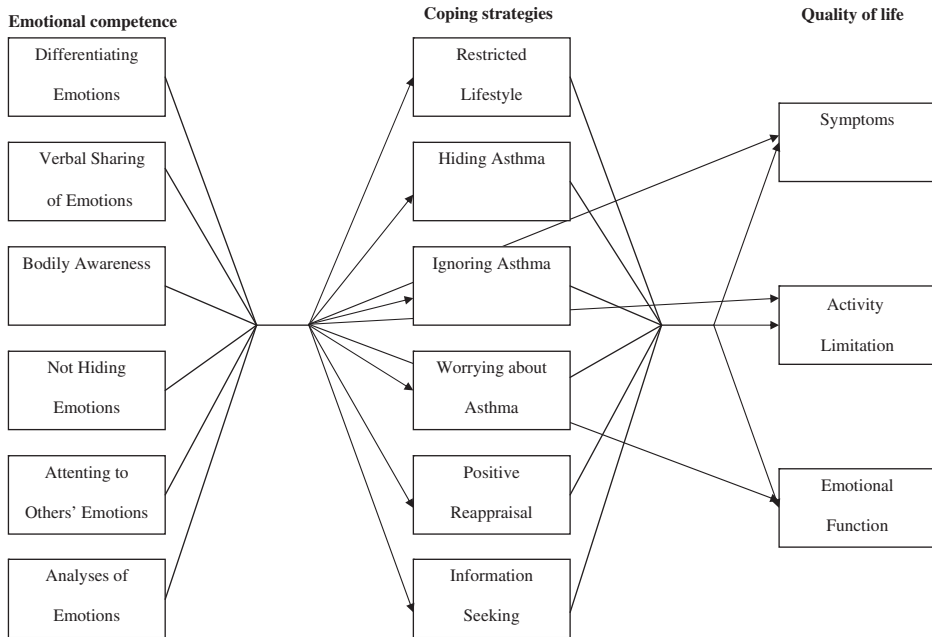

Figure 1. Conceptual model.

Measurement model

The final model showed satisfying properties (Table 2). First, in a reflective model (wherein each manifest variable reflects its latent variable), each block is assumed to be unidimensional and homogeneous. In order to check the unidimensionality and homogeneity of all blocks, two indices were used: the principal component analysis of each block (the first eigenvalue had to be greater than 1), and the composite reliability through the Dillon–Goldstein's rho (Werts, Linn, & Jöreskog, 1974) greater than 0.70 (Esposito Vinzi et al., 2010). The Dillon-Goldstein's rho is

considered as a more accurate and a better indicator for path models than Cronbach's alpha (Chin, 1998). The results showed that all the blocks were considered homogenous and unidimensional because the Dillon–Goldstein's rho was always larger than 0.70, ranging from 0.716 to 0.953, and only the first eigenvalue for each block was greater than one, while the other values were smaller.

Second, the goodness of the measurement model depends on the discriminant and the convergent validity of the measures. An indicator of these validities is the average variance extracted (AVE). The discriminant validity was satisfying for all latent variables because AVE was not greater than the square correlation of the other constructs. Moreover, the results showed evidence of convergent validity because AVE of all blocks was greater than 0.50 (Chin, 2010). The convergent validity was also assumed because manifest variables had high loadings (generally greater than 0.60, ranging from 0.654 to 0.920), and block communalities were greater than 0.50 (ranging from 0.669 to 0.948), indicating good convergent validity.

Structural model

In order to test the validity of the model, we used a combination of different indices, such as the R^2 and the goodness-of-fit index (GoF; Tenenhaus, Amato, & Esposito-Vinzi, 2004). The R^2 measures the quality of each structural equation. The R^2 values are computed for each dependent variable. The results are presented as path coefficients and their bootstrap (1000 resamples) with 95% confidence interval (CI). These path coefficients are similar to standardised beta coefficients in a classic regression analysis. Effects are considered as significant when 0 is outside the CI. Effect sizes were measured by using f^2, with values of 0.02, 0.15 and 0.35 considered as small, medium and large, respectively (Chin, 2010). The GoF is a descriptive index of the validity of the global model (Chin, 1998; Gefen, Straub, & Boudreau, 2000) and values over 0.90 indicate that the overall model fits well (Chin, 2010).

For the 'trimmed' model, the relative GoF was 0.86, the GoF for the outer model was 0.99, and the GoF for the inner model was 0.87, indicating a good model. The R^2 values for Symptoms, Activity Limitation and Emotional Function were, respectively, 0.30, 0.39 and 0.49. However, in the overall model, none of the five EC dimensions was directly related to QOL latent variables, highlighting mediating paths between some EC and QOL variables, through coping strategies. Associations between EC, coping strategies and QOL were presented in Table 3 (boldface lines correspond to the significant links).

On the basis of these significant results, we finally re-ran the model with only the latent variables that were significantly related to QOL dimensions to obtain their respective path coefficients without the effect of latent variables that did not contribute to QOL dimensions (Figure 2).

As expected, the relative, outer and inner GoF indices (0.93, 0.99 and 0.94, respectively) were better than those of the overall model. The results showed that three EC dimensions (Bodily Awareness, Analyses of Emotions and Differentiating Emotions) were associated with QOL dimensions. However, analyses of total, direct and indirect effects indicated that these relationships were all mediated by Worrying about Asthma and Ignoring Asthma (Table 4).

First, examining path direction indicated that higher scores on Bodily Awareness were related to less Worrying about Asthma and Ignoring Asthma, which in turn led to less limitation of activities. Second, Analyses of Emotions was associated with

Table 3. Structural model for pathways between EC, coping strategies and QOL.

Dependent variable	Independent variable	R^2 Adj.	β	f^2	95% Bootstrap CI	
Coping strategies						
Restricted Lifestyle	Differentiating Emotions	0.276	−0.154	0.029	−0.402	0.081
	Not Hiding Emotions		0.000	0.000	−0.209	0.190
	Verbal Sharing of Emotions		−0.195	0.044	−0.384	0.070
	Bodily Awareness		**−0.414**	**0.198**	**−0.584**	**−0.206**
	Analyses of Emotions		0.159	0.035	−0.035	0.341
Hiding Asthma	Differentiating Emotions	0.190	0.037	0.001	−0.192	0.221
	Not Hiding Emotions		**−0.237**	**0.053**	**−0.458**	**−0.012**
	Verbal Sharing of Emotions		−0.042	0.002	−0.280	0.214
	Bodily Awareness		**−0.353**	**0.129**	**−0.550**	**−0.158**
	Analyses of Emotions		0.049	0.003	−0.162	0.237
Positive Reappraisal	Differentiating Emotions	0.186	−0.070	0.005	−0.297	0.128
	Not Hiding Emotions		−0.106	0.011	−0.327	0.129
	Verbal Sharing of Emotions		−0.192	0.038	−0.408	0.142
	Bodily Awareness		**−0.291**	**0.087**	**−0.468**	**−0.095**
	Analyses of Emotions		0.173	0.037	−0.029	0.368
Information Seeking	Differentiating Emotions	0.232	−0.156	0.028	−0.374	0.058
	Not Hiding Emotions		−0.121	0.015	−0.357	0.106
	Verbal Sharing of Emotions		−0.118	0.015	−0.342	0.114
	Bodily Awareness		−0.114	0.014	−0.298	0.086
	Analyses of Emotions		**0.376**	**0.183**	**0.199**	**0.542**
Ignoring Asthma	**Differentiating Emotions**	0.231	**−0.252**	**0.072**	**−0.436**	**−0.063**
	Not Hiding Emotions		−0.044	0.002	−0.243	0.135
	Verbal Sharing of Emotions		−0.133	0.019	−0.338	0.086
	Bodily Awareness		**−0.290**	**0.091**	**−0.488**	**−0.065**
	Analyses of Emotions		0.139	0.025	−0.066	0.339
Worrying about Asthma	Differentiating Emotions	0.227	−0.110	0.014	−0.324	0.097
	Not Hiding Emotions		0.103	0.011	−0.109	0.312
	Verbal Sharing of Emotions		−0.235	0.060	−0.457	0.032
	Bodily Awareness		**−0.367**	**0.146**	**−0.564**	**−0.174**
	Analyses of Emotions		**0.228**	**0.067**	**0.038**	**0.406**
Quality of life						
Symptoms	Differentiating Emotions	0.296	−0.032	0.001	−0.243	0.193
	Not Hiding Emotions		−0.004	0.000	−0.211	0.202
	Verbal Sharing of Emotions		0.053	0.003	−0.144	0.248
	Bodily Awareness		0.188	0.033	−0.076	0.414
	Analyses of Emotions		−0.053	0.004	−0.265	0.169
	Restricted Lifestyle		−0.205	0.040	−0.471	0.089
	Hiding Asthma		−0.054	0.003	−0.317	0.163
	Positive Reappraisal		−0.069	0.005	−0.349	0.203
	Information Seeking		−0.004	0.000	−0.234	0.274
	Ignoring Asthma		−0.104	0.011	−0.340	0.182
	Worrying about Asthma		**−0.208**	**0.040**	**−0.464**	**−0.035**
Activity Limitation	Differentiating Emotions	0.390	0.008	0.000	−0.173	0.218
	Not Hiding Emotions		−0.083	0.008	−0.270	0.112
	Verbal Sharing of Emotions		0.094	0.012	−0.121	0.331
	Bodily Awareness		0.081	0.007	−0.122	0.315
	Analyses of Emotions		−0.101	0.015	−0.285	0.081
	Restricted Lifestyle		−0.121	0.016	−0.360	0.148
	Hiding Asthma		−0.127	0.019	−0.369	0.094

Table 3. Continued.

Dependent variable	Independent variable	R^2 Adj.	β	f^2	95% Bootstrap CI	
	Positive Reappraisal		0.040	0.002	−0.182	0.263
	Information Seeking		0.016	0.000	−0.207	0.297
	Ignoring Asthma		**−0.327**	**0.126**	**−0.515**	**−0.106**
	Worrying about Asthma		**−0.237**	**0.061**	**−0.445**	**−0.027**
Emotional Function	Differentiating Emotions	0.491	0.020	0.001	−0.134	0.197
	Not Hiding Emotions		−0.058	0.005	−0.231	0.125
	Verbal Sharing of Emotions		0.034	0.002	−0.127	0.242
	Bodily Awareness		0.118	0.018	−0.070	0.312
	Analyses of Emotions		0.008	0.000	−0.156	0.173
	Restricted Lifestyle		−0.153	0.031	−0.369	0.061
	Hiding Asthma		−0.140	0.027	−0.375	0.041
	Positive Reappraisal		−0.009	0.000	−0.240	0.214
	Information Seeking		−0.063	0.005	−0.255	0.216
	Ignoring Asthma		−0.188	0.050	−0.371	0.038
	Worrying about Asthma		**−0.351**	**0.159**	**−0.525**	**−0.174**

Notes: Boldface lines correspond to the significant associations.
f^2, effect size; β, direct effect.
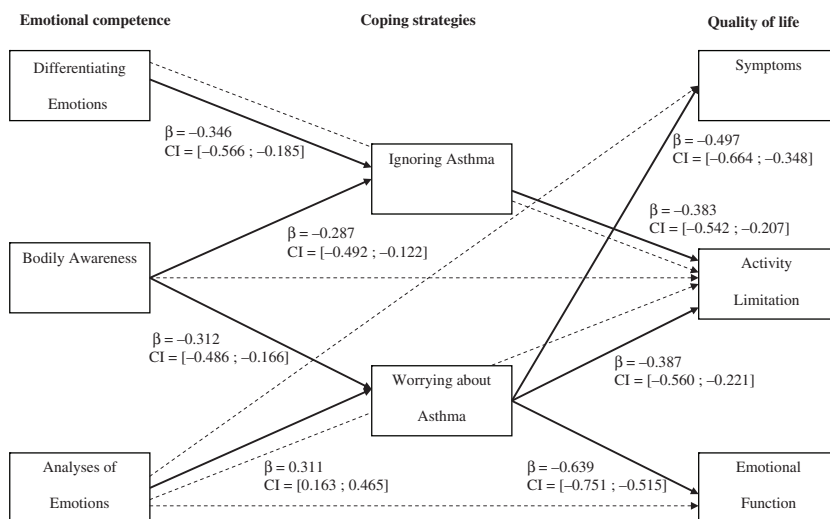
Notes: CI = Confidence Interval; β = direct effect. Dotted lines correspond to significant total effects that disappear when mediators are added.

Figure 2. Direct and mediating effects.

greater worries about asthma, which in turn led to a greater limitation of activities, reduced emotional functioning, and more symptoms. Third, higher scores on Differentiating Emotions was associated with lower scores on Ignoring Asthma, which in turn led to less limitation of activities. All of these results persisted when we added asthma control in the model. No significant difference between the two groups

Table 4. Total, direct and indirect effects between EC, coping strategies and QOL.

Predictor (EC)	Mediator (coping strategies)	Outcome (QOL)	Total effect	Direct effect	Indirect effect	
			β	β	β	95% Bootstrap CI
Bodily Awareness	Worrying about Asthma and Ignoring Asthma	Activity Limitation	0.32**	0.05	0.25*	[0.13 to 0.47]
Analyses of Emotions	Worrying about Asthma	Activity Limitation	−0.28**	−0.11	−0.17*	[−0.30 to −0.07]
Analyses of Emotions	Worrying about Asthma	Emotional Function	−0.22*	−0.01	−0.20*	[−0.37 to −0.08]
Analyses of Emotions	Worrying about Asthma	Symptoms	−0.21*	−0.06	−0.15*	[−0.30 to −0.06]
Differentiating Emotions	Ignoring Asthma	Activity Limitation	0.25*	0.02	0.23*	[0.12 to 0.38]

Notes: *$p < 0.05$, **$p < 0.01$. The total effect is the effect of a predictor on a dependent variable without considering possible mediators. The direct effect is the effect of a predictor on a dependent variable when mediators are controlled. The indirect effect is the effect between a predictor and a dependent variable through the mediator.
EC, emotional competence; QOL, quality of life; and CI, confidence interval.

of children (with controlled or partly controlled asthma) were observed for all these mediation analyses.

Discussion

This study was the first to explore the mediating effect of coping strategies on the relationship between EC and QOL among children with asthma. First, we hypothesised that high scores on EC dimensions would be associated with high scores on QOL. Indeed, past research has brought to light the associations of EC with psychological health among healthy children (Lahaye et al., 2010; Mavroveli et al., 2007; Rieffe et al., 2010) and with physical health among children with diabetes (Housiaux et al., 2010). Our findings partly support those results and demonstrate that some EC dimensions are associated with the QOL of children having asthma.

Among the EC dimensions, we observed that the more children were able to differentiate their emotions, the better was their QOL in terms of an increase in activities. Moreover, we found that Analyses of Emotions and Bodily Awareness were associated with some of the QOL subscales. However, if a positive association was found between Bodily Awareness and QOL, a negative one was found between Analyses of Emotions and QOL. In order to understand these results, it is important to recall that high scores on Analyses of Emotions indicate that children pay greater attention to why their emotions have happened and why they feel upset about something, but that high scores on Bodily Awareness actually reflect a lower attention to bodily sensations. Therefore, low scores on Bodily Awareness and high scores on Analyses of Emotions are both related to a deep analysis of emotional functioning (being cognitive or physical). These results suggest that paying too much attention to the analysis of cognitive and physical aspects of emotions would be detrimental for the QOL of children with asthma. It could be that recurrent attention to different aspects of emotions leads to greater rumination and worries, which in turn have a negative effect on subjective and objective health (Brosschot, Gerin, & Thayer, 2006; Thomsen et al., 2004).

In addition, Verbal Sharing of Emotions and Attending to Others Emotions were not related to the QOL of children with asthma while they were among healthy children (Lahaye et al., 2010). These results are at odds with the idea that interpersonal aspects of EC are also an important predictor of health. It could be that children with asthma are less sensitive to interpersonal aspects of EC because they focus their attention on their illness, its everyday demands (treatment, avoidance of triggers, etc.), and its associated emotions, which may distract attention away from others and their emotions. However, these differences may also be explained by the instruments that were used to measure psychological and physical health. Indeed, in this study we used a specific questionnaire for children with asthma, whereas Lahaye et al. (2010) used assessments of depression, anxiety and somatic complaints that are applicable to a general population. If these results reflect real differences in the way that EC and subjective health are associated in children with and without asthma, future research should investigate this issue by comparing healthy children and children with asthma.

Our second group of hypotheses concerning indirect pathways between EC and QOL via coping strategies was partly supported. First, results indicated that some EC dimensions were negatively associated with behavioural avoidant coping (Hiding

Asthma and Restricted Lifestyle), cognitive avoidant coping (Ignoring Asthma) and unproductive cognitive approach coping (Worrying about Asthma). These results are in line with those of Mikolajczak, Petrides, and Hurry (2009), who showed a negative association between EC and avoidant coping in adolescents, and those of Mikolajczak et al. (2008), who demonstrated a negative association between EC and dysfunctional approach coping strategies such as rumination. However, we did not find any positive association between EC and a priori functional approach coping (such as Information Seeking and Positive Reappraisal). These findings are inconsistent with previous studies that showed that EC predicts the use of adaptative approach coping strategies such as re-evaluation and information seeking (Mikolajczak et al., 2008). Even though these results are unexpected, they may be explained by the fact that we did not investigate all possible coping strategies. It could be that children having asthma with high EC scores use other approach coping strategies that were not assessed here, such as acceptance. If children accept their illness, they do not need to use other coping strategies because asthma is totally integrated in their lives. In contrast, children with low EC scores seek information or use re-evaluation as coping strategies to change the situation or the meaning of the situation. This strategy, however, seems to be ineffective. The idea that acceptance renders other coping strategies unnecessary is indirectly supported by the results of Hayes et al. (1999) and McCracken and Eccleston (2003), who showed that among children suffering from chronic pain, the acceptance of pain is associated with a better psychological and physical functioning. Future studies will have to examine this hypothesis more thoroughly, investigating the acceptance of illness as a new coping strategy.

Second, our findings revealed that coping strategies such as Worrying about Asthma and Ignoring Asthma were negatively related to the QOL of children, which concur with the results of Van de ven et al. (2007) and Adams et al. (2004). However, we did not find any associations between a priori functional approach coping strategies and QOL dimensions. These findings are incongruent with those of previous studies that found positive associations between active coping (planning, information seeking, etc.) and QOL (Adams et al., 2004; Van den ven et al., 2007). It could be that children use less cognitive coping strategies such as information seeking and positive reappraisal than adults because the development of cognitive abilities still is in process during childhood and adolescence. Further studies could test this hypothesis, examining the links between cognitive development, coping strategies and QOL.

Finally, our results demonstrated that the pathway between EC and QOL is fully mediated by Worrying about Asthma and Ignoring Asthma. This means that among children with asthma, having high scores on Differentiating Emotions and Bodily Awareness and low scores on Analyses of Emotions is related to a reduction in Ignoring Asthma and Worrying about Asthma, that in turn increases the QOL.

These encouraging results contribute to both the asthma and EC literatures. Indeed, these findings facilitate our understanding of the role of EC in children's well-being. In the adult literature, the importance of EC for the individual's general adaptation to the environment has been repeatedly demonstrated (Mikolajczak et al., 2006; Schutte et al., 2007). Moreover, research suggesting an indirect pathway by behavioural, cognitive and biological processes between EC and QOL is growing (Mikolajczak et al., 2007). However, in the childhood literature, research on EC, health and mediating processes is still very scarce. Therefore, this study is a worthwhile contribution to the empirical knowledge about EC and QOL in children.

In addition, whereas several studies have documented the role of medical factors (such as asthma severity) on the QOL of children with asthma, this study underlined the role of psychological variables (EC) in the subjective physical and psychological health of children having asthma. Moreover, from a clinical perspective, our results emphasise the importance of developing psychological interventions for children with asthma. The implementation of a programme that focuses on both EC and coping strategies in the global treatment of children with asthma would be an innovative development in health psychology, and this original approach could also be considered for other paediatric chronic diseases, with specific adjustments to the type of population involved.

However, some limitations of this research must be acknowledged. First, we measured all variables through self-reports. Future research should use multiple sources of informants (e.g. parents, paediatrician, etc.) and include objective measures of children's health to confirm the mediating effect of coping between EC and QOL. Second, because of the transsectional nature of the design, we are not able to confirm the direction of the relationships. For example, we suggest that EC has an impact on coping strategies, but we cannot rule out the possibility that coping strategies and EC are influenced by a third common variable, such as parents' emotional functioning. Moreover, we suggest that coping strategies such as ignoring and worrying about asthma have a negative impact on QOL, but it could be that impairments in the QOL of children result in more worries about asthma or more denial of their illness. Therefore, longitudinal studies would be necessary to test causal directions among EC, coping strategies, and QOL. Third, the Asthma Specific Coping Scale was translated into French for this study, and research has yet to examine the psychometric properties of this self-report in French.

Finally, although we tested both direct and indirect pathways (through coping strategies) between EC and QOL, we did not integrate socio-demographic variables in our model. Socio-demographic factors (e.g. gender, age, educational level, etc.) could affect EC, coping or QOL. For example, being a girl (Alvim et al., 2009) or having a low family income (Erickson et al., 2002) are associated with a lower QOL in children with asthma. However, a recent study showed that EC remains a significant predictor of the QOL over and above socio-demographic, asthma-related, and personality factors (Lahaye, Van Broeck, Bodart, & Luminet, in preparation). In addition, asthma management should also be considered in further studies. Previous research has shown that a lack of EC is often associated with unhealthy behaviours such as alcohol, drug or tobacco consumption (Limonero et al., 2006; Riley & Schutte, 2003). More specifically, in adult populations, a lack of EC seems to be associated with non-optimal asthma management (Chugg, Barton, Antic, & Crockett, 2009; Feldman, Lehrer, & Hochron, 2002). Therefore, EC may have an impact on asthma management that, in turn, would be associated with coping strategies or QOL. Further research could provide more information about the impact of socio-demographic and asthma-related factors on the model of mediating effect of coping strategies in the association between EC and QOL.

Note

1. The translation of the questionnaire was performed according to the International Test Commission guidelines for test adaptation (Hambleton, 2001). Items were first translated into French and then back-translated into English. The translation/back-translation process was conducted entirely by bilingual people, and supervised by the first and the last authors. After the back-translation, problematic items were reviewed and discussed.

References

Aalto, A.M., Harkapaa, K., Aro, A.R., & Rissanen, P. (2002). Ways of coping with asthma in everyday life – Validation of the Asthma Specific Coping Scale. *Journal of Psychosomatic Research, 53*, 1061–1069.

Adams, R.J., Wilson, D., Smith, B.J., & Ruffin, R.E. (2004). Impact of coping and socioeconomic factors on quality of life in adults with asthma. *Respirology, 9*, 87–95.

Alvim, C.G., Picinin, I.M., Camargos, P.M., Colosimo, E., Lasmar, L.B., Ibiapina, C.C., . . . , Andrade, C.R. (2009). Quality of life in asthmatic adolescents: An overall evaluation of disease control. *Journal of Asthma, 46*, 186–190.

Bacharier, L., Boner, A., Carlsen, K., Eigenmann, P., Frischer, T., Gotz, M., . . . , Wildhaber, J. (2008). Diagnosis and treatment of asthma in childhood: A PRACTALL consensus report. *Allergy, 63*, 5–34.

Brosschot, J.F., Gerin, W., & Thayer, J.F. (2006). The perseverative cognition hypothesis: A review of worry, prolonged stress-related physiological activation, and health. *Journal of Psychosomatic Research, 60*, 113–124.

Bushnell, D., Martin, M., & Parasuraman, B. (2003). Electronic versus paper questionnaires: A further comparison in persons with asthma. *Journal of Asthma, 40*, 751–762.

Chin, W. (1998). The partial least squares approach for structural equation modeling. In G.A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295–336). London: Lawrence Erlbaum Associates.

Chin, W. (2010). How to write up and report PLS analyses. In V. Esposito Vinzi, W. Chin, J. Henseler, & H. Wang (Eds.), *Handbook of partial least squares: Concepts, methods and applications* (pp. 655–690). New York, NY: Springer.

Chugg, K., Barton, C., Antic, R., & Crockett, A. (2009). The impact of alexithymia on asthma patient management and communication with health care providers: A pilot study. *Journal of Asthma, 46*, 126–129.

Erickson, S.R., Munzenberger, P.J., Plante, M.J., Kirking, D.M., Hurwitz, M.E., & Vanuya, R.Z. (2002). Influence of sociodemographics on the health-related quality of life of pediatric patients with asthma and their caregivers. *Journal of Asthma, 39*, 107–117.

Esposito Vinzi, V., Trinchera, L., & Amato, S. (2010). PLS path modeling: From foundations to recent developments and open issues for model assessment and improvement. In V. Esposito Vinzi, W. Chin, J. Henseler, & H. Wang (Eds.), *Handbook of partial least squares: Concepts, methods and applications* (pp. 47–82). New York, NY: Springer.

Feldman, J.M., Lehrer, P.M., & Hochron, S.M. (2002). The predictive value of the Toronto Alexithymia Scale among patients with asthma. *Journal of Psychosomatic Research, 53*, 1049–1052.

Fornell, C., & Bookstein, F. (1982). A comparative analysis of two structural equation models: LISREL and PLS applied to market data. In C. Fornell (Ed.), *A second general of multivariate analysis* (pp. 289–323). New York, NY: Praeger.

Gefen, D., Straub, D.W., & Boudreau, M.-C. (2000). Structural equation modelling and regression: Guidelines for research practice. *Communications of the Association for Information Systems, 4*, 1–70.

Global Initiative for Asthma (2009). *Global strategy for asthma management and prevention*. Retrieved from http://www.ginasthma.com/Guidelineitem.asp??l1 = 2&l2 = 1&intId = 1561

Hallstrand, T.S., Curtis, J.R., Aitken, M.L., & Sullivan, S.D. (2003). Quality of life in adolescents with mild asthma. *Pediatric Pulmonology, 36*, 536–543.

Hambleton, R.K. (2001). The next generation of the ITC test translation and adaptation guidelines. *European Journal of Psychological Assessment, 17*, 164–172.

Hayes, S., Bissett, R., Korn, Z., Zettle, R., Rosenfarb, I., Cooper, L., & Grundt, A. (1999). The impact of acceptance versus control rationales on pain tolerance. *The Psychological Record, 49*, 33–47.

Housiaux, M., Luminet, O., Van Broeck, N., & Dorchy, H. (2010). Alexithymia is associated with glycaemic control of children with type 1 diabetes. *Diabetes & Metabolism, 36*, 455–462.

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal, 20*, 195–204.

Juniper, E.F., Guyatt, G.H., Feeny, D.H., Ferrie, P.J., Griffith, L.E., & Townsend, M. (1996). Measuring quality of life in children with asthma. *Quality of Life Research, 5*, 35–46.

Lahaye, M., Luminet, O., Van Broeck, N., Bodart, E., & Mikolajczak, M. (2010). Psychometric properties of the Emotion Awareness Questionnaire for children in a French-speaking population. *Journal of Personality Assessment, 92*, 317–326.

Lahaye, M., Van Broeck, N., Bodart, E., & Luminet, O. (in preparation). Predicting behaviour adjustment and quality of life of children with asthma: The role of asthma control, personality traits, and emotional competence.

Lazarus, R.S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York, NY: Springer.

Limonero, J.T., Tomas-Sabado, J., & Fernandez-Castro, J. (2006). Perceived emotional intelligence and its relation to tobacco and cannabis use among university students. *Psicothema, 18*, 95–100.

Luminet, O., de Timary, P., Buysschaert, M., & Luts, A. (2006). The role of alexithymia factors in glucose control of persons with type 1 diabetes: A pilot study. *Diabetes & Metabolism, 32*, 417–424.

Mavroveli, S., Petrides, K.V., Rieffe, C., & Bakker, F. (2007). Trait emotional intelligence, psychological well-being and peer-rated social competence in adolescence. *British Journal of Developmental Psychology, 25*, 263–275.

McCracken, L.A., & Eccleston, C. (2003). Coping or acceptance: What to do about chronic pain? *Pain, 105*, 197–204.

Meunier, J., Dorchy, H., & Luminet, O. (2008). Does family cohesiveness and parental alexithymia predict glycaemic control in children and adolescents with diabetes? *Diabetes & Metabolism, 34*, 473–481.

Mikolajczak, M., & Luminet, O. (2008). Trait emotional intelligence and the cognitive appraisal of stressful events: An exploratory study. *Personality and Individual Differences, 44*, 1445–1453.

Mikolajczak, M., Luminet, O., & Menil, C. (2006). Predicting resistance to stress: Incremental validity of trait emotional intelligence over alexithymia and optimism. *Psicothema, 18*, 79–88.

Mikolajczak, M., Nelis, D., Hansenne, M., & Quoidbach, J. (2008). If you can regulate sadness, you can probably regulate shame: Associations between trait emotional intelligence, emotion regulation and coping efficiency across discrete emotions. *Personality and Individual Differences, 44*, 1356–1368.

Mikolajczak, M., Petrides, K.V., & Hurry, J. (2009). Adolescents choosing self-harm as an emotion regulation strategy: The protective role of trait emotional intelligence. *British Journal of Clinical Psychology, 48*, 181–193.

Mikolajczak, M., Quoidbach, J., Kotsou, I., & Nélis, D. (2009). *Les compétences émotionnelles [Emotional competence]*. Paris: Dunod.

Mikolajczak, M., Roy, E., Luminet, O., Fillee, C., & de Timary, P. (2007). The moderating impact of emotional intelligence on free cortisol responses to stress. *Psychoneuroendocrinology, 32*, 1000–1012.

Nemiah, J.C., Freyberger, H., & Sifneos, P.E. (1976). Alexithymia: A view of the psychosomatic process. In O.W. Hill (Ed.), *Modern trend in psychosomatic research* (Vol. 3, pp. 430–439). London: Buttersworth.

Petrides, K.V., Frederickson, N., & Furnham, A. (2004). The role of trait emotional intelligence in academic performance and deviant behaviour at school. *Personality and Individual Differences, 36*, 277–293.

Petrides, K.V., & Furnham, A. (2003). Trait emotional intelligence: Behavioural validation in two studies of emotion recognition and reactivity to mood induction. *European Journal of Personality, 17*, 39–57.

Petrides, K.V., Sangareau, Y., Furnham, A., & Frederickson, N. (2006). Trait emotional intelligence and children's peer relations at school. *Social Development, 15*, 537–547.

Porcelli, P., Bagby, R.M., Taylor, G.J., De Carne, M., Leandro, G., & Todarello, O. (2003). Alexithymia as predictor of treatment outcome in patients with functional gastrointestinal disorders. *Psychosomatic Medicine, 65*, 911–918.

Rieffe, C., Oosterveld, P., Miers, A.C., Terwogt, M.M., & Ly, V. (2008). Emotion awareness and internalising symptoms in children and adolescents: The Emotion Awareness Questionnaire revised. *Personality and Individual Differences, 45*, 756–761.

Rieffe, C., Oosterveld, P., Terwogt, M.M., Novin, S., Nasiri, H., & Latifian, M. (2010). Relationship between alexithymia, mood and internalizing symptoms in children and young adolescents: Evidence from an Iranian sample. *Personality and Individual Differences, 48*, 425–430.

Riley, H., & Schutte, N.S. (2003). Low emotional intelligence as a predictor of substance-use problems. *Journal of Drug Education, 33*, 391–398.

Sarafino, E.P. (2008). *Health psychology: Biopsychosocial interactions*. New York, NY: Wiley.

Sawyer, M.G., Spurrier, N.J., Whaites, L., Kennedy, D., Martin, A.J., & Baghurst, P. (2000). The relationship between asthma severity, family functioning and the health-related quality of life of children with asthma. *Quality of Life Research, 9*, 1105–1115.

Schutte, N.S., Malouff, J.M., Thorsteinsson, E.B., Bhullar, N., & Rooke, S.E. (2007). A meta-analytic investigation of the relationship between emotional intelligence and health. *Personality and Individual Differences, 42*, 921–933.

Tenenhaus, M., Amato, S., & Esposito Vinzi, V. (2004). *A global goodness-of-fit index for PLS structural equation modelling*. Paper presented at the Proceedings of the XLII SIS Scientific Meeting, Padova, Italy.

Tenenhaus, M., Esposito Vinzi, V., Chatelin, Y.M., & Lauro, C. (2005). PLS path modeling. *Computational Statistics & Data Analysis, 48*, 159–205.

Thomsen, D.K., Mehlsen, M.Y., Olesen, F., Hokland, M., Viidik, A., Avlund, K., & Zachariae, R. (2004). Is there an association between rumination and self-reported physical health? A one-year follow-up in a young and an elderly sample. *Journal of Behavioral Medicine, 27*, 215–231.

Van de ven, M., Engels, R., Sawyer, S., Otten, R., & Van Den Eijnden, R. (2007). The role of coping strategies in quality of life of adolescents with asthma. *Quality of Life Research, 16*, 625–634.

Velasco, C., Fernandez, I., Paez, D., & Campos, M. (2006). Perceived emotional intelligence, alexithymia, coping and emotional regulation. *Psicothema, 18*, 89–94.

Werts, C., Linn, R., & Joreskog, K. (1974). Intraclass reliability estimates: Testing structural assumptions. *Educational and Psychological Measurement, 34*, 25–33.