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## **A Closer Look at the Developmental Interplay Between Parenting and Perceived Health in Adolescents with Congenital Heart Disease**

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## ABSTRACT

The present study examined associations between parenting and perceived health in adolescents with congenital heart disease (CHD) using a longitudinal trajectory approach. Adolescents with CHD were selected from the database of pediatric and congenital cardiology of the University Hospitals Leuven. A total of 429 adolescents ( $M_{age} = 16$  at T1) participated in the present study, comprising four measurement waves spanning approximately three years. Latent class growth analysis was used to identify trajectory classes of parenting and perceived health. Whereas adolescents from democratic households reported the most favorable health outcomes, adolescents from authoritarian, overprotective, and psychologically controlling families (all characterized by relatively high levels of psychological control) showed an increased risk for poor perceived health over time. Hence, the present study found substantial developmental associations between parenting and perceived health in adolescents with CHD. Future research should investigate whether working on the parent-adolescent relationship can foster patients' health.

**Keywords.** Heart defects, congenital; Parenting; Perceived health; Adolescence; Latent class growth analysis

Although adolescents become increasingly involved in peer relationships, the relationship with parents remains important throughout adolescence and emerging adulthood. A recent study in emerging adults found parental support to be associated with decreases in smoking, depressive symptoms, and perceived stress over a 1-year period, even after controlling for the effects of friend support and conflict (Helgeson et al., in press). Furthermore, demographics in Flanders (i.e., the Dutch-speaking part of Belgium, the country where this study was conducted) indicate that less than 5% of individuals tend to leave the parental home before the age of 22 (Kins et al., 2014; Vettenburg et al. 2007). Hence, it is important that research on parenting focuses on the period of late adolescence and emerging adulthood.

Researchers have argued that raising a child with a chronic illness could alter the ability to parent effectively (Uzark & Jones, 2003). Such a tenet is in line with Abidin's (1995) parenting stress model, for instance, which states that parenting-related stressors – including characteristics of the child that are perceived as distressing – shape the behaviors that parents display towards the child which, in turn, could impact on the child's adjustment (Uzark & Jones, 2003). Inspired by such reasoning, the present study examined associations between parenting and perceived health in adolescents with congenital heart disease. Such a focus on perceived health is warranted given that perceived health has been shown to be a powerful predictor of health outcomes – including mortality – above and beyond socio-demographic factors, health behaviors, and objective health status (Benyamini, 2011).

Congenital heart disease (CHD), comprising a wide spectrum of simple, moderate, and complex structural heart lesions, is the most common birth defect (9:1000 births; van der Linde et al., 2011). Unlike several decades ago, 90% of children with CHD now survive into adulthood (Moons et al., 2010). Previous research found parents of children with CHD to report heightened parenting distress during children's first years of life as compared to the parents of healthy children, with distress being unrelated to the complexity of children's heart defect (Pelchat et al.,

1999; Uzark & Jones, 2003). Furthermore, parents of children with CHD perceived their parental situation as more uncontrollable and reported more doubts regarding their parental competency (Uzark & Jones, 2003). According to Abidin (1995), the heightened parental distress during children's first years of life might have shaped these parents' behaviors and attitudes towards their child, potentially affecting their child's adjustment beyond childhood and adolescence. However, a recent meta-analysis that looked at differences in parenting between families with and without chronically ill children has produced inconsistent findings (Pinquart, 2013). Nonetheless, extensive research has linked parental behaviors to quality of life, perceived health, depressed mood, and treatment adherence in adolescents with chronic illnesses (Butler et al., 2007; Luyckx et al., 2011a), emphasizing the need for further detailed study.

### **Parenting dimensions and styles: What is already known?**

Parental behaviors are commonly described in terms of two dimensions: responsiveness and regulation (Barber et al., 2005). *Responsiveness* refers to being emotionally supportive and empathic towards the child. *Regulation* involves setting rules and limits, and monitoring children's behaviors. Recently, researchers have emphasized the need to assess a third dimension called *psychological control*, an intrusive and manipulative form of control expressed through tactics such as guilt induction and contingent love (Soenens et al., 2006). Whereas regulation has been found to protect against externalizing problems, psychological control has mainly been linked to internalizing problems (Barber et al., 2005).

The typological approach to parenting examines the joint effects of these three parenting dimensions and focuses on parenting styles. Four to six parenting styles have typically been identified in community and clinical samples (Luyckx et al., 2011a; Steinberg, 2001). *Democratic* parents (high on responsiveness and regulation, low on psychological control) communicate clear rules in a supportive climate while respecting adolescents' needs for independence (Steinberg, 2001). Adolescents raised in democratic families generally report few internalizing and

externalizing problems and favorable health outcomes (Luyckx et al., 2011a; Steinberg, 2001). In contrast, adolescents living in *psychologically controlling* (low on responsiveness and regulation, high on psychological control) and *uninvolved* households (low to moderate on all three dimensions) generally show the poorest physical and psychosocial adjustment (Butler et al., 2007; Luyckx et al., 2011a; Steinberg, 2001). Adolescents raised in authoritarian, indulgent, and overprotective households tend to fall somewhere in-between. Whereas *indulgent* parenting (low on regulation and psychological control, moderate on responsiveness) has been associated with higher levels of externalizing problems, *authoritarian* parenting (low on responsiveness, high on regulation and psychological control) has mostly been linked to higher levels of internalizing problems (Steinberg, 2001). Finally, *overprotective* parenting (moderately high to high on responsiveness, regulation and psychological control) has been associated with decreased self-efficacy, substance use, and heart-focused anxiety in adolescents with CHD (Holmbeck et al., 2002; Luyckx et al., 2011a; Ong et al., 2011).

### **Parenting dimensions and styles: What is still missing?**

Although these studies have provided important insights, the literature is characterized by significant gaps. First, studies in adolescents with a chronic illness typically focus on responsiveness and some form of parental control. However, these studies generally do not distinguish between behavioral control (or regulation) and psychological control, despite the fact that these two types of control have been differentially related to children's adjustment (Barber et al., 2005; Soenens et al., 2007). Second, few studies have distinguished between maternal and paternal parenting in pediatric populations. Whereas mothers have been found to be more involved in illness management, fathers tend to encourage – more so than mothers do – adolescents' self-reliance and individuation (Seiffge-Krenke, 2001). Hence, maternal and paternal parenting practices should be examined separately (McKinney & Renk, 2008).

Third, few studies have adopted a longitudinal approach to parenting, despite the changes in the parent-child relationship that take place during adolescence. For instance, parental responsiveness and regulation typically decrease over the course of adolescence, being a time when adolescents try to separate themselves from parents and establish their own sense of identity, often resulting in higher levels of parent-child conflict (Loeber et al., 2011; Luyckx, Tildesley, et al., 2011; McNally, Eisenberg, & Harris, 1991). However, these changes might be a function of parenting style, with psychologically controlling parents possibly showing the steepest decreases and democratic parents showing the least decreases in responsiveness and regulation. To address this question, a recent study in adolescents from the general population used a longitudinal trajectory approach to examine the ways in which parenting dimensions combine into styles over time (Luyckx et al., 2011b). Such a trajectory approach not only takes into account levels of parenting, but also rates of change in parenting over time. Four developmental trajectory classes were identified (i.e., democratic, authoritarian, indulgent, and uninvolved parenting) and differentially related to changes in psychosocial outcomes such as internalizing symptoms, health behaviors, and antisocial behaviors (Luyckx et al., 2011b). Unfortunately, studies adopting a longitudinal approach to parenting in adolescents with a chronic illness are scarce. However, the parents of these adolescents may experience more difficulties in adjusting their levels of responsiveness and regulation to adolescents' increasing needs for independence, which may be partially explained by higher perceived child vulnerability (Holmbeck et al., 2002; Hullman et al., 2010). Indeed, parents of children with a chronic illness tend to hold more anxious cognitions about their child's health or their child's susceptibility to illness (Hullman et al., 2010). Such difficulties in applying developmentally appropriate levels of responsiveness and regulation may be particularly pronounced in overprotective parents, whereas democratic parents might be more flexible in this respect. To address these types of questions, a longitudinal trajectory approach to parenting was adopted in the present study.

## **The present study**

This study was part of a larger project called i-DETACH (Information technology Devices and Education program for Transitioning Adolescents with Congenital Heart disease), which is a 4-wave longitudinal study spanning approximately three years. Using data from Wave 1, Luyckx et al. (2011a) examined the relationships between perceived parenting and several psychosocial outcomes such as quality of life and substance use. The present study adds to these findings by: (1) applying a longitudinal approach; (2) including a different set of outcomes; and (3) examining the role of mothers and fathers separately. Identifying parenting styles that are not only based on levels of responsiveness, regulation, and psychological control, but also on rates of change in these dimensions over time, allows for a more sensitive classification into different parenting styles (Twisk & Hoekstra, 2012).

The present study had three main objectives. First, we aimed to identify trajectory classes of maternal and paternal parenting in adolescents with CHD. We expected four to six parenting trajectory classes to emerge: democratic, indulgent, overprotective, authoritarian, psychologically controlling, and/or uninvolved parenting (Luyckx et al., 2011a, b; Steinberg, 2001). No a priori hypotheses about developmental changes within these different parenting classes were forwarded, due to the lack of previous research adopting a longitudinal trajectory approach to parenting. Second, we aimed to identify trajectory classes of generic and illness-specific domains of perceived health. Although we hypothesized that the majority of patients would report favorable health over time (Frederiksen et al., 2009), other trajectory classes were expected to emerge as well, such as patients showing an increase or decrease in perceived health and patients showing persistently poor perceived health over time (van Rijen et al., 2005).

Third, we aimed to investigate how trajectory classes of parenting and perceived health were related to one another. We hypothesized that most patients from democratic families would be classified in the most favorable perceived health class. In contrast, patients from

psychologically controlling and uninvolved families were hypothesized to belong mainly to one of the poor perceived health classes. Finally, patients from the other three parenting classes were expected to fall somewhere in-between (Luyckx et al., 2011a, b; Steinberg, 2001).

## METHOD

### Participants and Procedure

Patients were selected from the database of pediatric and congenital cardiology of the University Hospitals Leuven using the following criteria: confirmed CHD (i.e., structural abnormalities of the heart and great intrathoracic vessels that are actually or potentially of functional significance; Mitchell et al., 1971); aged 14-18 years at the start of the study; last cardiac outpatient visit at the tertiary care center performed  $\leq 5$  years ago; being able to read and write Dutch; and the availability of contact details. Exclusion criteria were: cognitive or physical limitations inhibiting filling out questionnaires; prior heart transplantation; and absence of consent to participate by patients or their parents. Eligible patients ( $N = 498$ ) received a questionnaire, information letter, informed consent form, and pre-stamped return envelope by mail. The primary heart defect was obtained from medical records and categorized using a modified version of the scheme developed by the CONCOR (CONgenital COR Vitia) project (Van der Velde et al., 2005). The complexity of heart defects was determined based on Task Force 1 of the 32<sup>nd</sup> Bethesda conference as simple, moderate, or complex (Warnes et al., 2001). This study was approved by the Institutional Review Board of the University Hospitals Leuven and performed according to the 2002 Declaration of Helsinki.

A total of 429 (86%) adolescents with CHD participated at T1 (46.6% girls). Mean age was 16.3 years ( $SD = 1.15$ ; range 14.1-18.3). Approximately 40% of adolescents had a simple defect, 48% had a moderate defect, and 12% had a complex defect. A total of 425 (99%) adolescents were still living with their parents. Adolescents were invited to participate at four points in time, each of them separated by an interval of nine months. A total of 304 (71%) adolescents



participated in all four measurement waves. Participants with and without complete data were compared using Little's Missing Completely At Random test (MCAR). A non-significant MCAR test statistic [ $\chi^2(4181) = 3780.55; p = 1.000$ ] suggested that missing values could be reliably estimated at T1-4. Accordingly, to deal with missing values, we used the Expectation-Maximization algorithm provided in SPSS 20.0. At the end of the study, 98% of adolescents were still living with their parents.

## Questionnaires

***Perceived parenting.*** The Child Report of Parent Behavior Inventory (Schludermann & Schludermann, 1988) was used to assess responsiveness. A sample item reads: "My father/mother makes me feel better after talking over my worries with him/her". Regulation was assessed using the Parental Monitoring of Behavior subscale from the Parental Regulation Scale – Youth Self-Report (Soenens et al., 2006). A sample item reads: "My mother/father makes efforts to know who my friends are, where I spend my time, etc.". Finally, the Psychological Control Scale – Youth Self-Report (Barber et al., 2005) was used to assess psychological control. A sample item reads "My mother/father is always trying to change how I feel or think about things". Adolescents responded using a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Separate scores were calculated for mothers and fathers. Cronbach's alpha's ranged from 0.91 to 0.93 for responsiveness, from 0.64 to 0.74 for regulation, and from 0.83 to 0.88 for psychological control.

***Perceived health.*** Generic and illness-specific domains of perceived health were measured using the Pediatric Quality of Life Inventory™ 4.0 (PedsQL; Uzark et al., 2003). It should be noted that this instrument was originally developed to measure health-related quality of life. However, researchers often use the term quality of life when they are actually discussing perceived health or functional ability (Moons, 2004). The generic module of the PedsQL comprises four subscales: physical (e.g., "I have low energy"), emotional (e.g., "I feel afraid or

scared”), social (e.g., “I have trouble getting along with other teenagers”), and school-related functioning (e.g., “It is hard to pay attention in class”) (Uzark et al., 2003). The cardiac module of the PedsQL consists of five subscales: cardiac symptoms (e.g., “I get out of breath when I do sports activity or exercise”), perceived physical appearance (e.g., “I don’t like other people to see my scars”), treatment anxiety (e.g., “I get scared when I have to go to the doctor”), cognitive problems (e.g., “It is hard for me to remember what I’ve read”), and communication (e.g., “It is hard for me to tell the doctors and nurses how I feel”). A 5-point scale ranging from 0 (*never*) to 4 (*almost always*) evaluated the degree to which individuals experienced problems during the past month. Items were inversed coded, summed across all items of the respective subscales, and transformed to range between 0 and 100 (with higher scores indicating better adjustment). In line with previous research in other clinical populations (Felder-Puig et al., 2004), we calculated two separate total scores for the generic and illness-specific module. Cronbach’s alphas ranged between 0.89 and 0.90 for generic perceived health, and between 0.88 and 0.90 for illness-specific perceived health. Descriptive statistics on all study variables from Waves 1 to 4 are displayed in Table 1.

**(INSERT TABLE 1)**

**Statistical analysis**

With regard to Objectives 1 and 2, latent class growth analysis (LCGA; Nagin, 2005) using Mplus 5.0 was conducted to identify trajectory classes for both parenting and perceived health. LCGA summarizes longitudinal data by modeling individual-level variability in developmental trajectories through a small number of classes that are defined by unique initial levels (intercepts) and rates of change (slopes). Hence, trajectory classes can be operationalized as collections of individuals who follow approximately the same developmental trajectory. For parenting, LCGA’s were performed on all three parenting dimension simultaneously and separately for mothers and fathers. Two- to seven-class solutions were estimated. For perceived

health, LCGA's were performed on generic and illness-specific indices simultaneously. Two- to four-class solutions were estimated. In all of these models, the path from the slope to the indicator at Time 1 was fixed to zero so that the intercept would represent the initial level. Given the equally spaced measurement intervals, subsequent linear slope pattern coefficients were fixed at 0, 1, 2, and 3 for Times 1, 2, 3, and 4 respectively. Furthermore, maximum likelihood robust (MLR) estimation was used, as MLR has been shown to be the most accurate estimator when the distribution of scores deviates from a normal distribution (Satorra & Bentler, 1994).

Several criteria were used to decide on the number of classes (Nagin, 2005). First, the Bayesian information criterion (BIC) statistic for a solution with  $k$  classes should be lower than for a solution with  $k-1$  classes, suggesting that adding additional classes improves model fit. Second, classification quality was assessed by entropy (E), a standardized summary of classification accuracy based on the posterior classification probabilities. Entropy ranges from 0.00 to 1.00, with values of 0.75 or higher indicating accurate classification. Third, we used the bootstrapped likelihood ratio test (BLRT), which provides a  $p$  value that can be used to determine whether there is a significant improvement in fit through the inclusion of an additional class. As these criteria do not always clearly indicate a single best-fitting model, it is important to balance objective fit with theoretical justification, parsimony, and interpretability to arrive at a meaningful solution (Jung & Wickrama, 2008).

With regard to Objective 3, we performed multinomial logistic regression analyses to investigate whether membership to the parenting trajectory classes predicted membership to the perceived health trajectory classes. The perceived health trajectory classes constituted the different categories of the dependent variable, with optimal perceived health representing the reference category. The parenting trajectory classes constituted the categories of the independent variable, with democratic parenting class representing the reference category. In all analyses, we controlled for the effects of sex, age, and illness complexity.

## RESULTS

### Objective 1: Trajectory classes of parenting

Table 2 provides an overview of the statistical indices used to decide on the number of classes for the one- to seven-class solution. For both maternal and paternal parenting, a six-class solution was favored over a five-class solution, as evidenced by lower BIC-values and an adequate value for entropy. The BLRT also favored a six-class solution over a five-class solution for both maternal and parental parenting. In the seven-class solution, some classes were variations on a single theme. That is, two highly similar uninvolved classes and overprotective classes appeared for fathers and mothers, respectively. Table 3 presents the intercepts and slopes for the six-class solution. No differences in age [Mother:  $F(5,423) = 1.11, p = 0.352$  ; Father:  $F(5,423) = 1.00, p = 0.416$ ], sex [Mother:  $\chi^2(5) = 6.78, p = 0.238$ ; Father:  $\chi^2(5) = 3.21; p = 0.668$ ], or illness complexity [Mother:  $\chi^2(10) = 10.59, p = 0.390$ ; Father:  $\chi^2(10) = 3.52, p = 0.967$ ] were found across these classes.

(INSERT TABLE 2)

(INSERT TABLE 3)

Patients in Class 1 (*Democratic Parenting*; Mother: 26%; Father: 25%) reported the highest levels of responsiveness and regulation, and scored low on psychological control. Over time, an increase in paternal responsiveness and a decrease in paternal psychological control were observed. By the end of the study, however, a slight decrease in paternal responsiveness and increase in psychological control were again evident. Furthermore, from Time 2 onwards, a slight decrease in paternal regulation was observed. Likewise, Class 2 (*Overprotective Parenting*; Mother: 33%; Father: 21%) was characterized by relatively high responsiveness and regulation. However, in contrast to patients in Class 1, these patients also reported high psychological control. Moreover, maternal responsiveness tended to decrease over time. Class 3 (*Indulgent Parenting*; Mother: 13%; Father: 26%) was characterized by high responsiveness but low

regulation and psychological control. Paternal psychological control and regulation tended to further decrease from Times 2 and 3 onwards. Patients in Class 4 (*Authoritarian Parenting*; Mother: 10%; Father: 15%) showed a reversed pattern, reporting high levels of regulation and psychological control but low responsiveness. Paternal responsiveness further decreased during the first part of the study, whereas maternal regulation tended to slightly decrease by the end of the study. Class 5 (*Psychologically Controlling Parenting*; Mother: 9%; Father: 6%) was characterized by the lowest levels of responsiveness, low regulation, and high psychological control. Whereas maternal regulation and both maternal and paternal psychological control initially increased over time, they tended to decrease again by the end of the study. Finally, Class 6 (*Uninvolved Parenting*; Mother: 9%; Father: 7%) consisted of patients showing persistently low scores on all three parenting dimensions.

## **Objective 2: Trajectory Classes of Perceived Health**

Table 2 provides an overview of the statistical indices used to decide on the number of classes for the one- to four-class solution. A three-class solution was favored over a two-class solution, with the BLRT significant at  $p < 0.001$ . In the four-class solution, some classes were variations on a single theme, that is, two highly similar optimal perceived health classes appeared. Table 4 presents all intercepts and slopes for this three-class solution. Class 1 (*Poor Perceived Health*, 10%) consisted of patients scoring low on both generic and illness-specific perceived health, with the latter further decreasing from Time 2 onwards. Patients in Class 2 (*Optimal Perceived Health*, 45%) scored persistently high on both generic and illness-specific perceived health. Finally, Class 3 (*Moderate Perceived Health*, 45%) consisted of patients scoring moderate (but below average) on generic and illness-specific perceived health. Patients in this class tended to show an initial increase in illness-specific perceived health, followed by a slight decrease from Time 2 onwards. Girls and boys were distributed differently among these classes [ $\chi^2(2) = 29.21, p < 0.001$ ]. Specifically, boys were less often classified in the poor

perceived health class, and more often in the optimal perceived health class. For girls, a reversed pattern emerged. No differences in age [ $F(2,426) = 0.39, p = 0.677$ ] or illness complexity [ $\chi^2(4) = 5.22, p = 0.266$ ] were observed across these classes.

**(INSERT TABLE 4)**

### **Objective 3: Relationships Among Parenting and Perceived Health**

*Maternal parenting.* The logistic regression analysis revealed that membership to the perceived health trajectory classes was significantly predicted by membership to the maternal parenting trajectory classes, above and beyond the effects of sex, age, and illness complexity [ $\chi^2(2) = 43.43, p < 0.001$ ]. As shown in Table 5, the odds of being classified in the poor perceived health class as compared to the optimal perceived health class were 6.74 times higher for patients in the authoritarian class, 7.15 times higher for patients in the psychologically controlling class, and 5.89 times higher for patients in the overprotective class as compared to patients in the democratic class. In addition, the odds of being classified in the moderate perceived health class as compared to the optimal perceived health class were 3.97 times higher for patients in the authoritarian class, 3.37 times higher for patients in the psychologically controlling class, and 3.25 times higher for patients in the overprotective class as compared to patients in the democratic class. Ancillary analyses using the other parenting trajectory classes as reference categories demonstrated further differentiation between the indulgent and uninvolved classes on the one hand and the authoritarian, psychologically controlling, and overprotective parenting classes on the other hand.<sup>1</sup>

**(INSERT TABLE 5)**

*Paternal parenting.* The logistic regression analysis displayed in Table 6 revealed that membership to the perceived health trajectory classes was significantly predicted by the paternal parenting trajectory classes, above and beyond the effects of sex, age, and illness complexity [ $\chi^2(10) = 40.65, p < 0.001$ ]. The odds of being classified in the poor perceived health class as

compared to the optimal perceived health class were 4.73 times higher for patients in the indulgent class, 9.39 times higher for patients in the authoritarian class, 67.14 times higher for patients in the psychologically controlling class, and 8.43 times higher for patients in the overprotective class as compared to patients in the democratic class. In addition, the odds of being classified in the moderate perceived health class as compared to the optimal perceived health class were 2.46 times higher for patients in the indulgent class, 2.45 times higher for patients in the authoritarian class, 8.80 times higher for patients in the psychologically controlling class, and 2.11 times higher for patients in the overprotective class as compared to patients in the democratic class. Ancillary analyses using the other parenting trajectory classes as reference categories demonstrated further differentiation between the psychologically controlling class on the one hand and the indulgent, uninvolved, authoritarian, and overprotective classes on the other hand.<sup>2</sup>

**(INSERT TABLE 6)**

## **DISCUSSION**

Previous cross-sectional research has shown parenting to be substantially related to several indicators of adjustment in adolescents with CHD (Luyckx, Goossens, et al., 2011). However, no study to date has adopted a longitudinal trajectory approach to parenting, despite the changing parent-child relationship that characterizes adolescence. The present study identified six parenting styles (i.e., democratic, overprotective, indulgent, authoritarian, psychologically controlling, and uninvolved parenting) in adolescents with CHD and found these styles to be differentially related to trajectories of patients' perceived health.

### **Longitudinal parenting styles: Developmental trends**

Six parenting trajectory classes emerged that were highly similar for mothers and fathers and that corresponded to those typically discussed in the parenting literature (Barber et al., 2005; Luyckx et al., 2011b; Steinberg, 2001). These trajectory classes were unrelated to sex and illness

complexity. Hence, adolescents with a complex heart defect did not seem to perceive their parents differently as compared to adolescents with less complex heart defects (Ong et al., 2011). Although these parenting trajectory classes were mainly differentiated in terms of mean levels, some interesting (albeit small) changes emerged. In line with the increase in parent-child conflict that is typically observed during adolescence, a small decline in maternal responsiveness was observed from middle to late adolescence, followed by a small increase at the end of adolescence (Luyckx et al., 2011b; McNally, Eisenberg, & Harris, 1991). This decline was most evident in the overprotective class. No significant changes in paternal responsiveness were observed throughout adolescence, except for a small initial increase in democratic fathers. Furthermore, a small decline in maternal regulation was observed from middle to late adolescence, given that adolescence is a time when youngsters try to separate themselves from parents and establish their own sense of identity (Loeber et al., 2011; Luyckx et al., 2011b). However, when looking at the different trajectory classes, adolescents in the psychologically controlling class were found to report a small increase in maternal regulation over time. In fathers – and democratic fathers in particular – a small decline in regulation was observed from middle to late adolescence following an initial increase. Finally, with regard to psychological control, increases in the maternal and paternal psychologically controlling classes were observed from middle to late adolescence, followed by small declines at the end of adolescence. In contrast, democratic fathers showed a small decline in psychological control from middle to late adolescence, followed by a small increase. Hence, we can conclude that, during adolescence, changes in parenting seem to depend partially on the parenting style under consideration. However, more pronounced developmental changes can be expected to emerge when examining parenting using a wider temporal window (Luyckx et al., 2011b). As the developmental changes observed in the present study could very well constitute snapshots of long-term developmental trajectories, future



research should follow patients over a longer period of time (e.g., from childhood to emerging adulthood).

### **Longitudinal parenting styles: Mothers versus fathers**

Although similar parenting trajectory classes emerged for both parents, mothers and fathers were distributed somewhat differently across classes. The most striking differences were observed in the overprotective and indulgent parenting classes. Apparently, a great number of mothers tend to combine high levels of responsiveness and regulation (as observed in democratic parenting) with high levels of psychological control. The life-threatening nature of CHD and the illness-related distress often observed in mothers from children with CHD might instigate this controlling attitude in mothers (Uzark & Jones, 2003). Furthermore, fathers were found to be more indulgent as compared to mothers. This finding was rather surprising given that fathers are typically found to take on a more authoritarian role as compared to mothers (McKinney & Renk, 2008). However, in line with our findings, a study by Seiffge-Krenke (2001) showed diabetic adolescents' fathers to assume a less active role in encouraging adolescents' autonomy and individuation and to score relatively low in terms of overall communication and initiative. More research is needed to examine the extent to which parents take on a different role when confronted with chronic illness in their children.

### **Longitudinal parenting styles and perceived health over time**

First, three relatively stable trajectory classes, capturing both generic and illness-specific perceived health, were identified. Up to 90% of adolescents showed moderate to optimal perceived health over time. This pattern corresponds to the findings of Frederiksen et al. (2009) who found that adolescents with CHD typically report relatively few emotional and behavioural problems. However, our findings differ from those of Karsdorp et al. (2007) who found that adolescents with CHD tend to display an increased risk for internalizing and (to a lesser extent) externalizing problems. This discrepancy might be partially explained by the fact that the study

by Karsdorp used parent reports to assess adolescents' adjustment, whereas in the present study adolescent self-reports were used. Nonetheless, a small but substantial subgroup of patients (10%) reported struggling with their illness. These patients constitute a high-risk group in need for prevention and intervention efforts.

Second, strong associations were found between different parenting and perceived health trajectory classes. In general, adolescents from democratic households reported the most favorable health outcomes over time. In contrast, adolescents from authoritarian, overprotective, and psychologically controlling families (all characterized by relatively high levels of psychological control) showed an increased risk for persistently poor perceived health. A non-supportive and intrusive parenting style typically gives rise to a family climate in which children are unable to communicate openly about their feelings and behaviors and in which parents are not aware of their children's whereabouts (Barber et al., 2005; Luyckx et al., 2011a). Such a family climate may lead to a decrease in adolescents' physical and psychological health (Soenens et al., 2006). This decrease in adolescents' health, in turn, may trigger maladaptive parenting behaviors (e.g., overprotection), thereby constituting a negative vicious cycle.

Surprisingly, adolescents from indulgent households reported similar perceived health as adolescents from democratic households. This might be partially explained by the fact that the PedsQL comprises several subscales consisting of items that seem to tap into internalizing symptoms, such as the subscales 'emotional functioning', 'treatment anxiety', and 'perceived physical appearance'. Indeed, previous research has demonstrated that adolescents from indulgent households mainly show an increased risk for externalizing problems (Steinberg et al., 2001). Similarly, adolescents from uninvolved households did not show an increased risk for poor perceived health. This might be partially explained by the fact that, although mothers and fathers in the uninvolved class scored below average on all three parenting dimensions, levels of responsiveness and regulation still were not that low, especially in mothers. Possibly, raising a

child with a life-threatening condition such as CHD automatically triggers some level of care and worries in parents (Ong et al., 2011). Furthermore, patients reporting moderate to optimal health might not require high parental involvement, resulting in more parents being rated as relatively uninvolved in this group.

### **Clinical implications**

In order to be effective in the long run, prevention and intervention efforts should focus on both parenting and perceived health, given that the effects of maladaptive parenting and poor health status may reinforce each other over time by constituting a negative vicious cycle. With regard to perceived health, the present study identified a small but substantial subgroup of patients struggling with their illness. It is of utmost importance that these patients are identified and closely monitored by the medical team, given that their poor perceived health does not seem transitory but rather chronic in nature. Brief self-report questionnaires can be easily implemented in routine clinical care and can help health professionals in gaining more insight in patients' physical and psychological health (Rumsfeld et al., 2013). However, health professionals should bear in mind that perceived health is a broad concept and that the action needed will depend on the particular problem at hand. For instance, feeling burdened by one's symptoms (e.g., lack of energy and breathlessness) requires a different approach than experiencing problems in the peer group (e.g., feeling left out).

Furthermore, it is important that health professionals are sensitive to the attitudes and behaviors that parents display towards their children, given that these can both influence and be influenced by adolescents' health status. Whereas the beneficial effects of supportive parenting and the detrimental effects of psychologically controlling and authoritarian parenting are generally well-known, the idea that overprotective parenting might also have substantial consequences for adolescents' functioning has only recently begun to emerge (Luyckx et al., 2011a; Ong et al., 2011). The present findings indicate that health professionals should not only

stress the importance of a warm and supportive climate at home. They should also encourage parents to foster developmentally appropriate levels of autonomy in their children and avoid so called “miscarried helping” (Holmbeck et al., 2002). The present findings further point to the importance of involving both parents in these coaching efforts, as both maternal and paternal parenting were found to relate to patients’ perceived health.

### **Limitations and Suggestions for Future Research**

The present study was characterized by some limitations. First, data were gathered through self-reports only. Although adolescent self-report is generally considered a valid measure for assessing parenting (Barber et al., 2005), future research would be strengthened by using parent reports as well. Relatedly, future research should include objective measures of physical health in addition to patient-reported outcomes. Second, the specific nature of the study population, the single-center setting, and the fact that our sample consisted primarily of Caucasian European participants might reduce the generalizability of our findings. Third, maternal and paternal parenting were independently related to adolescents’ perceived health. However, some research has suggested that the degree to which both parents are consistent in their parenting is particularly important towards adolescent adjustment (Luyckx et al., 2011a). Hence, future research should also take into account inter-parental consistency. Fourth, the parenting trajectory classes were empirically derived from the data by means of latent class growth analysis. When interpreting these classes (i.e., when determining which scores can be considered high or low), the sample mean always functions as a point of reference. Put differently, a responsiveness score of 3.7 on a 5-point scale can be labeled ‘high’ for fathers but ‘low’ for mothers, given that – on average – mothers’ responsiveness scores tend to be higher than those of fathers. Hence, it is important to bear in mind that the interpretation of these scores is always *relative* to the sample mean, which makes the meaning of the classes observed quite sample-specific. Finally, it is important to note that our findings on the developmental changes in

parenting cannot be directly compared to the findings obtained by Luyckx et al. (2011b) in the general population, due to differences in the age range of participants, the parenting dimensions assessed, the measurements used, and the time span under consideration. Future research aimed at comparing developmental changes in parenting between adolescents with and without a chronic illness should adopt a similar research design in both groups.

Despite these limitations, the present study demonstrated substantial associations between parenting and perceived health in adolescents with CHD using a longitudinal trajectory approach. Hence, we hope that our findings will encourage health professionals to discuss perceived parenting at home in the follow-up of these adolescents.

### **CONFLICTS OF INTEREST AND ETHICS**

None of the authors have any conflict of interest to declare. Funding was provided through grant OT/11/033 from the Research Fund of KU Leuven (Belgium). Rassart J. en Goossens E. are PhD fellows at the Fund for Scientific Research Flanders (FWO). All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

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**Table 1** Descriptive statistics on the study variables from Wave 1 to 4

	Wave 1	Wave 2	Wave 3	Wave 4
	<i>M</i> (SD)	<i>M</i> (SD)	<i>M</i> (SD)	<i>M</i> (SD)
Maternal responsiveness	4.09 (0.78)	4.02 (0.74)	3.99 (0.74)	4.03 (0.74)
Maternal regulation	3.71 (0.61)	3.72 (0.58)	3.66 (0.59)	3.60 (0.60)
Maternal psychological control	2.08 (0.75)	2.11 (0.73)	2.07 (0.80)	2.05 (0.75)
Paternal responsiveness	3.57 (0.90)	3.54 (0.94)	3.54 (0.96)	3.52 (0.98)
Paternal regulation	3.37 (0.66)	3.42 (0.63)	3.35 (0.64)	3.27 (0.67)
Paternal psychological control	2.08 (0.72)	2.14 (0.76)	2.04 (0.76)	2.00 (0.74)
Generic health	81.63 (12.36)	81.55 (11.57)	81.33 (11.51)	80.69 (11.50)
Illness-specific health	78.25 (14.39)	79.67 (13.41)	79.39 (13.34)	79.11 (13.62)

**Table 2** Statistical indices for the different class solutions of parenting and perceived health

	<b>BIC-value</b>	<b>Entropy</b>	<b>BLRT</b>
<b>Parenting</b>			
1 class	10992 / 12053	---	---
2 classes	9827 / 10633	.888 / .911	-5432, $p < .001$ / -5963, $p < .001$
3 classes	9526 / 10066	.864 / .908	-4820, $p < .001$ / -5222, $p < .001$
4 classes	9180 / 9684	.874 / .900	-4639, $p < .001$ / -4909, $p < .001$
5 classes	9001 / 9451	.884 / .908	-4435, $p < .001$ / -4687, $p < .001$
6 classes	8918 / 9265	.879 / .903	-4316, $p < .001$ / -4541, $p < .001$
7 classes	8860 / 9109	.890 / .907	-4244, $p < .001$ / -4417, $p < .001$
<b>Perceived health</b>			
1 class	27246	---	---
2 classes	25661	.907	-13580, $p < .001$
3 classes	24944	.924	-12767, $p < .001$
4 classes	24678	.891	-12387, $p < .001$

*Note.* Coefficients before the slash represent the indices for mothers; coefficients after the slash for fathers.

**Table 3** Final Parameter Estimates of Parenting Trajectory Classes

Parameters	Total sample	Parenting Trajectory Class					
		Democratic	Overprotective	Indulgent	Authoritarian	Psychologically controlling	Uninvolved
<b>Mother</b>	<i>N</i> =429	<i>N</i> =112 (26%)	<i>N</i> = 142 (33%)	<i>N</i> =54 (13%)	<i>N</i> = 43 (10%)	<i>N</i> = 41 (9%)	<i>N</i> = 37 (9%)
RS mean intercept	4.09***	4.64***	4.18***	4.41***	3.55***	2.91***	3.68***
RS mean linear slope	- 0.10**	- 0.04	- 0.15*	0.03	- 0.11	- 0.17	- 0.20
RS mean quadratic slope	0.03*	0.01	0.03	0.00	0.04	0.04	0.04
RG mean intercept	3.71***	4.10***	3.82***	3.35***	3.89***	3.06***	3.30***
RG mean linear slope	0.02	0.01	- 0.01	- 0.07	0.12	0.29*	- 0.17
RG mean quadratic slope	- 0.02*	- 0.01	- 0.01	- 0.01	- 0.04 <sup>†</sup>	- 0.10*	0.03
PC mean intercept	2.09***	1.66***	2.25***	1.52***	3.15***	2.52***	1.94***
PC mean linear slope	0.03	- 0.09	0.06	- 0.06	0.17	0.39*	- 0.21
PC mean quadratic slope	- 0.01	0.02	- 0.02	0.01	- 0.06	- 0.11*	0.05
<b>Father</b>	<i>N</i> =429	<i>N</i> =109 (25%)	<i>N</i> = 88 (21%)	<i>N</i> =111 (26%)	<i>N</i> = 65 (15%)	<i>N</i> = 25 (6%)	<i>N</i> = 31 (7%)
RS mean intercept	3.57***	4.37***	3.77***	3.58***	3.18***	2.03***	2.26***
RS mean linear slope	- 0.03	0.18***	0.05	- 0.09	- 0.21 <sup>†</sup>	- 0.26	- 0.12
RS mean quadratic slope	0.00	- 0.05**	0.00	0.02	0.05	0.06	0.01
RG mean intercept	3.38***	3.76***	3.76***	3.06***	3.43***	2.69***	2.64***
RG mean linear slope	0.06*	0.07	0.05	0.07	- 0.01	0.13	0.04
RG mean quadratic slope	- 0.03***	- 0.04*	- 0.02	- 0.03 <sup>†</sup>	- 0.01	- 0.05	- 0.07
PC mean intercept	2.09***	1.62***	2.44***	1.75***	2.72***	3.20***	1.86***
PC mean linear slope	0.04	- 0.16***	- 0.06	0.07	0.17	0.53***	0.14
PC mean quadratic slope	- 0.02**	0.03**	- 0.01	- 0.04*	- 0.04	- 0.18***	- 0.04

*Note.* **RS** = responsiveness; **RG** = regulation; **PC** = psychological control.

<sup>†</sup>*p* <.10. \**p*<.05. \*\**p*<.01. \*\*\**p*<.001.

**Table 4** Final parameter estimates of the perceived health trajectory classes.

Parameters	Total Sample	Perceived health trajectory class		
		Poor (N=44; 10%)	Optimal (N=193; 45%)	Moderate (N=192; 45%)
GEN mean intercept	81.61***	63.06***	90.29***	77.23***
GEN mean linear slope	0.13	1.54	- 0.04	- 0.03
GEN mean quadratic slope	- 0.14	- 0.68	- 0.06	- 0.11
ILL mean intercept	78.33***	53.35***	88.35***	74.14***
ILL mean linear slope	1.43**	2.59	0.85	1.69 <sup>†</sup>
ILL mean quadratic slope	- 0.40**	- 0.79 <sup>†</sup>	- 0.19	- 0.50 <sup>†</sup>

*Note.* **GEN** = generic perceived health (total); **ILL** = illness-specific perceived health (total).

<sup>†</sup> $p < .10$ . \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Table 5** Logistic regression analysis predicting perceived health trajectory classes from maternal parenting trajectory classes

	B (SE)	95% confidence interval for odds ratio		
		Lower	Odds ratio	Upper
<b>Poor perceived health<sup>a</sup></b>				
<b>Age Time 1</b>	0.19	0.88	1.21	1.67
<b>Sex</b>				
Women <sup>b</sup>	2.23***	4.02	9.28	21.41
Men	---	---	---	---
<b>Illness complexity</b>				
Simple <sup>c</sup>	---	---	---	---
Moderate	0.05	0.48	1.05	2.30
Complex	1.11*	1.04	3.04	8.84
<b>Parenting trajectory class</b>				
Democratic <sup>d</sup>	---	---	---	---
Indulgent	- 0.09	0.21	0.92	4.07
Authoritarian	1.91**	1.80	6.74	25.20
Psychologically controlling	1.97**	1.86	7.15	27.47
Overprotective	1.77***	2.08	5.89	16.70
Uninvolved	0.51	0.35	1.66	7.88
<b>Moderate perceived health<sup>a</sup></b>				
<b>Age Time 1</b>	0.10	0.92	1.11	1.34
<b>Sex</b>				
Women <sup>b</sup>	0.74***	1.35	2.09	3.24
Men	---	---	---	---
<b>Illness complexity</b>				
Simple <sup>c</sup>	---	---	---	---
Moderate	- 0.06	0.79	0.94	1.48
Complex	0.36	0.69	1.44	2.98
<b>Parenting trajectory class</b>				
Democratic <sup>d</sup>	---	---	---	---
Indulgent	- 0.13	0.43	0.88	1.80
Authoritarian	1.38***	1.74	3.97	9.06
Psychologically controlling	1.22**	1.50	3.37	7.57
Overprotective	1.18***	1.87	3.25	5.66
Uninvolved	0.13	0.50	1.14	2.57

Note. R<sup>2</sup>= .17 (Cox & Snell). \**p* <.05; \*\**p*<.01; \*\*\**p*<.001.

<sup>a</sup>For perceived health, ‘optimal perceived health’ is the reference category. <sup>b</sup>For sex, ‘women’ is the reference category. <sup>c</sup>For illness complexity, ‘simple’ is the reference category. <sup>d</sup>For parenting trajectory class, ‘democratic parenting’ is the reference category.

**Table 6** Logistic regression analysis predicting perceived health trajectory classes from paternal parenting trajectory classes

	B (SE)	95% confidence interval for odds ratio		
		Lower	Odds ratio	Upper
<b>Poor perceived health<sup>a</sup></b>				
<b>Age Time 1</b>	0.21	0.89	1.23	1.70
<b>Sex</b>				
Women <sup>b</sup>	2.38***	4.54	10.80	25.66
Men	---	---	---	---
<b>Illness complexity</b>				
Simple <sup>c</sup>	---	---	---	---
Moderate	0.15	0.52	1.17	2.60
Complex	1.31*	1.26	3.72	10.97
<b>Parenting trajectory class</b>				
Democratic <sup>d</sup>	---	---	---	---
Indulgent	1.55*	1.30	4.73	17.18
Authoritarian	2.24***	2.48	9.39	35.63
Psychologically controlling	4.21***	11.64	67.14	387.31
Overprotective	2.13***	2.33	8.43	30.48
Uninvolved	1.49	0.83	4.44	23.77
<b>Moderate perceived health<sup>a</sup></b>				
<b>Age Time 1</b>	0.10	0.92	1.10	1.33
<b>Sex</b>				
Women <sup>b</sup>	0.73***	1.34	2.07	3.17
Men	---	---	---	---
<b>Illness complexity</b>				
Simple <sup>c</sup>	---	---	---	---
Moderate	0.01	0.65	1.01	1.58
Complex	0.42	0.75	1.52	3.11
<b>Parenting trajectory class</b>				
Democratic <sup>d</sup>	---	---	---	---
Indulgent	0.90**	1.39	2.46	4.35
Authoritarian	0.90**	1.24	2.45	4.83
Psychologically controlling	2.18***	2.34	8.80	33.04
Overprotective	0.75*	1.14	2.11	3.92
Uninvolved	0.49	0.69	1.63	3.86

Note. R<sup>2</sup>= .17 (Cox & Snell). \**p* <.05; \*\**p*<.01; \*\*\**p*<.001.

<sup>a</sup>For perceived health, ‘optimal perceived health’ is the reference category. <sup>b</sup>For sex, ‘women’ is the reference category. <sup>c</sup>For illness complexity, ‘simple’ is the reference category. <sup>d</sup>For parenting trajectory class, ‘democratic parenting’ is the reference category.

Footnotes

<sup>1</sup> The odds of being in the poor perceived health class as compared to the optimal perceived health class were 7.36 times higher for patients in authoritarian class, 7.80 times higher for patients in the psychologically controlling class, and 8.43 times higher for patients in the overprotective class as compared to patients in the indulgent class. In addition, the odds of being classified in the moderate perceived health class as compared to the optimal perceived health class were 4.52 times higher for patients in the authoritarian class, 3.84 times higher for patients in the psychologically controlling class, and 3.70 times higher for patients in the overprotective class as compared to patients in the indulgent class. Furthermore, the odds of being classified in the moderate perceived health class as compared to the optimal perceived health class were 2.97 times higher for patients in the psychologically controlling class, 3.49 times higher for patients in the authoritarian class, and 2.86 times higher for patients in the overprotective as compared to patients in the uninvolved class.

<sup>2</sup> The odds of being in the poor perceived health class as compared to the optimal perceived health class were 2.46 times lower for patients in the indulgent class, 15.14 times lower for patients in the uninvolved class, 7.15 times lower for patients in the authoritarian class, and 7.96 times lower for patients in the overprotective class as compared to patients in the psychologically controlling class. Furthermore, the results showed that the odds of being classified in the moderate perceived health class as compared to the optimal perceived health class were 5.39 times lower for patients in the uninvolved class and 4.17 times lower for patients in the overprotective class as compared to patients in the psychologically controlling class.