Parenting and Child Personality as Modifiers of the Psychosocial Development of Youth with Cerebral Palsy

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Abstract

This two-year longitudinal study addressed the joint contribution of parent-rated parenting behaviors and child personality on psychosocial outcomes in 118 families of children with Cerebral Palsy (*M* age Time 1 = 10.9 years, 64.4% boys). Latent change modeling revealed intra-individual changes in children's psychosocial development as internalizing and externalizing behaviors increased from the first to the second assessment and psychosocial strengths increased from the second to the third assessment, whereas externally controlling and autonomy-supportive parenting behavior remained stable over time. Externally controlling parenting related to higher levels of, and increases in behavioral problems, with these associations being most pronounced among children low on Extraversion, Conscientiousness or Imagination. Autonomy-supportive parenting related to higher levels of psychosocial strengths, with this association being most pronounced among children high on Emotional Stability.

Keywords: cerebral palsy; psychosocial functioning; parenting; personality; within-person level

Introduction

Cerebral Palsy (CP) is the most common cause of physical disability in childhood, characterized by difficulties in movement and posture attributed to neuromuscular non-progressive disturbances in the fetus or infant brain [1]. Heterogeneity is an eminent feature of CP, as reflected in the wide variety in motor functioning among children with CP [2], but also in the diversity of behavioral and emotional functioning [3, 4]. Studies addressing the psychosocial development of children with CP show that these children, on average, are at increased risk to develop behavioral or emotional problems compared to their peers without a disability [e.g., 5, 6]. These psychosocial problems not only jeopardize the children's quality of life and participation in life situations, but also their caregivers' well-being [7, 8]. A longitudinal study among children with CP also indicated that these behavioral and psychological problems persist into adolescence [3]. Nevertheless, very little is known about the underlying risk and resilience factors that can explain this developmental variance [4, 9].

To better understand why some youth with CP are more vulnerable or resilient to develop behavioral problems, scholars increasingly argue that it is important to go beyond the examination of "disability-specific sources". Instead, they call for research on "non-syndrome-specific" factors that naturally vary among all children [10, 11]. Indeed, there is growing recognition that developmental outcomes for children with CP essentially depend on children's general psychological characteristics and psychosocial family variables, instead of being determined only by disability-specific medical or physical functioning [12, 13]. In particular, researchers nominated both *parenting behavior* and *child personality* as potential "non-syndrome-specific" factors that may provide a richer understanding of the psychosocial heterogeneity in clinical samples, including youth with CP [10, 14, 15]. Building on this literature, the current study aims to examine the role of parenting and child personality, as well as their interplay, in the prediction of psychosocial functioning among children with CP.

The importance of parenting for the psychosocial functioning of children with CP

Research increasingly points towards the importance of *parenting behavior* in the psychosocial development of children with CP [e.g., 10]. Indeed, a recent meta-analysis showed that both dysfunctional and constructive parenting behaviors were systematically related to the well-being of children with a chronic physical condition [16]. One dimension of parenting with particular relevance to children with CP is parental autonomy-support. As conceptualized in Self-Determination Theory [SDT; 17], a macro-theory on human socialization, *autonomy-supportive* parenting is characteristic of parents who promote their child's volitional functioning by offering choice, supporting exploration, and trying to understand the child's point of view. Such parenting contributes to feelings of authenticity, self-direction, and psychological freedom in the child [18]. Autonomy-supportive parenting can be contrasted with autonomy-thwarting parenting, which involves intrusive and domineering attempts to pressure a child to think, act, and feel in parent-imposed ways (Grolnick, 2003; Grolnick & Pomerantz, 2009). One specific type of autonomy-thwarting parenting is *externally controlling* parenting, which involves punitive and disciplining behaviors such as (corporal) punishment, verbal or physical coercion or threats [19]. Research in the general population has shown that, whereas autonomy-supportive parenting is related to beneficial developmental outcomes such as adaptive social functioning [20] and emotion regulation [21], autonomy-thwarting parenting is systematically related to maladaptive outcomes, such as behavioral and/or emotional problems [22-25].

In the past two decades, research has also begun to examine the role of autonomy-supportive parenting among children with a neurodevelopmental disability. In CP-research, a number of studies demonstrated cross-sectional associations between autonomy-supportive parenting and better psychosocial outcomes, such as better mental health, higher self-esteem, better academic functioning, more psychosocial strengths, and less social and emotional problems [10, 12, 14, 26]. In contrast, autonomy-thwarting parenting was found to relate to maladaptive outcomes. In a recent meta-analysis among children with a chronic physical condition, Crandell et al. (2018) found that parental coercion (which involves forceful and

threatening parenting practices) was related to child depression, poorer quality of life, poorer physical function, and more internalizing problems. Although few studies looked into the role of externally controlling parenting (i.e., punitive and disciplining behavior) specifically, studies did demonstrate the detrimental effects of various other autonomy-thwarting parenting practices. For example, psychologically controlling parenting (which involves manipulative and insidious practices such as guilt-induction and love withdrawal) related to more externalizing problems in children with three types of neurodevelopmental disabilities, including 121 children with CP [14]. Further, overprotective parenting (which conceptually also involves overbearing, autonomy-suppressing behaviors) related to lower self-esteem and more feelings of anxiety among youth with CP [27, 28].

The importance of child personality for the psychosocial functioning of children with CP

Besides parenting, children's unique individuality in how they behave, think and feel, plays an important role in the development of behavioral problems as well as psychosocial strengths. These individual tendencies that surface early in life and that are relatively stable across situations and time are commonly described as *personality* [29]. Research among children without developmental difficulties has consistently shown that personality differences significantly influence children's development [15, 30, 31]. These studies generally relied on the well-validated Five-Factor Model of personality, which in childhood distinguishes among five major personality dimensions: Extraversion, Benevolence, Conscientiousness, Emotional Stability and Openness-to-experience/Imagination [15, 32].

Focusing on specific personality traits, both cross-sectional and longitudinal research in general populations identified robust relations between high Extraversion and low Benevolence, Conscientiousness, and Emotional Stability, on the one hand, and behavioral problems on the other hand [e.g., 30, 33, 34, 35]. In CP-research, however, studies on the relation between personality and child adjustment are more limited and confined to cross-sectional evidence. Vrijmoeth et al. [4] examined maladaptive, pathological personality traits measured by the Dimensional Personality Symptom Item Pool [36] among 101 youth with

motor and intellectual disabilities, including 45 children with CP. Results showed that higher scores on Disagreeableness (a proxy of low Benevolence) and lower scores on Emotional Stability and Compulsivity (a proxy of low Conscientiousness) were related to behavior problems. However, no study to date has evaluated longitudinal associations of personality traits with psychosocial outcomes in CP. Also, associations between personality and more positive behavioral outcomes, such as psychosocial strengths, have not been studied to date.

The interplay between child personality and parenting

In addition to the recognition that both child personality and parenting are implicated in children's psychological functioning, there is increasing attention for the interplay between these two major factors [37]. That is, based upon their personality make-up, children differ in how sensitive they are to their social environment and specifically to parenting practices. Children might have an increased sensitivity to either stressful [diathesis-stress model; 38], supportive [vantage-sensitivity model; 39], or both stressful and supportive environments [differential-susceptibility model; 40, 41] depending on their personality make-up.

Studies among general populations and families of children with behavioral difficulties have provided most support for the diathesis-stress model, indicating that children with more challenging personality traits (i.e., lower Benevolence, Conscientiousness, Emotional Stability) are particularly vulnerable to develop behavioral problems when exposed to autonomy-thwarting parenting [33, 42-44]. Furthermore, a meta-analysis on parenting-by-temperament interactions in general populations showed that children with a more challenging temperament (compared to those with a more easy temperament) were more vulnerable to negative parenting, but also found evidence for the differential susceptibility model, as these same children were also more sensitive to the beneficial effects of positive parenting [45]. To our knowledge, no study to date has evaluated this personality-by-parenting interplay among families of children with CP.

The present study

This longitudinal study with three annual waves aims (1) to map out intra-individual changes in children's psychosocial functioning and parenting behavior across a two-year period and (2) to examine the additive and interactive effects of both parenting and child personality in the psychosocial development of youth with CP. This study contributes to the literature in three innovative ways. First, research in general populations addressing the roles of parenting and personality, as well as parenting-by-personality interactions, has increased our understanding of heterogeneity in children's psychosocial functioning. However, among families of children with motor disabilities, this research avenue is still in its infancy and confined to cross-sectional evidence. To our knowledge, this is the first study to address these processes from a longitudinal perspective in families of children with CP. Second, developmental literature on CP primarily focused on children's behavioral problems and dysfunctional parenting behavior, which provides a limited and one-sided view on children's behavior and parenting quality. This study complements this vulnerability-oriented approach with a strengths-oriented approach by addressing the role of both autonomy-thwarting and -supportive parenting behavior, and their relations with negative as well as positive child outcomes. Doing so, we aim to uncover keys to promote constructive parenting and child behavior. Third, this study uses latent change modeling (LCM) to examine the unique and interactive roles of both parenting and child personality in children's psychosocial development. This technique allows us to model absolute change at the within-person level, which provides insight into processes of change within a family unit, rather than processes of relative change among the sample group as a whole. Studies at the level of a family unit are particularly valuable for the application of parenting research in practice because the examination of processes at this level are most salient and meaningful to individuals with CP and their families. Moreover, the family unit is the place where real changes through interventions and parent support can take place [46].

Method

Participants

Participants were parents of 118 children with CP (64.4% boys). The sample consisted of 104 mothers, 12 fathers, and 2 legal guardians with an average age of 41.4 years old at T1 ($SD =$ 5.4, range = 30.1-65.4). Most participants were married or lived with their partner (78.8% at T1) and were employed (82.9% mothers and 90.4% fathers at T1). At Time 1 (T1) children were on average 10.9 years old ($SD = 2.9$ years, range = 4.6-17.0 years, age range = 7-15 years for 86.4% of the children). At Time 2 (T2), the mean age was 12.1 years ($SD = 2.9$, range = 5.8-18.3 years) and at Time 3 (T3) the children had an average age of 12.9 years (SD = 2.9, range = 6.7-19.3 years). The majority of the children were reported to have spastic CP (72.9%), followed by 11.9% with a mixed type of CP, 7.6% with dyskinetic CP and 1.7% with ataxic CP. For 5.9% of the participants, the type of CP was unknown. Reports on the Gross Motor Function Classification System [GMFCS; 47, 48] indicated that 21.2% of the children functioned at level I (i.e., the child can walk without restrictions but has limitations in more advanced motor skills), 39.0% at level II, 17.8% at level III, 8.5% at level IV and 13.6% of the children functioned at level V (i.e., the child has very limited motor abilities). Table 1 provides additional demographic information of the participants.

Procedure

Primary caregivers of children with CP were recruited through seven service centers for children with physical disabilities in [blinded for peer review]. Primary inclusion criteria for the participants were: being a primary caregiver of a child that (a) had received a formal diagnosis of CP and (b) was aged between 4 and 18 years. At the beginning of the study and during each follow-up, each participant had telephone contact with a researcher from the research team. During this telephone conversation, the researcher not only explained the aim and the course of the study but also discussed the participants' relationship with the child and tried to get a clearer view on whether the participant was aware of the child's daily life experiences and could provide insight into the child's development. From these conversations, it became clear that the participant was a main caregiver for the child. Participants were asked to report on family background information, their perceptions of their

child's behavioral problems, psychosocial strengths, personality, and their own parenting behavior through paper questionnaires that were sent to the family home. All participants who indicated that they wanted to participate in a longitudinal study during the baseline assessment were re-invited in the first and second follow-up study by telephone. To evaluate associations over time, we included the 118 participants (i.e., 104 biological mothers, 12 biological fathers, and 2 legal guardians) who participated three ($n = 92$) or two ($n = 26$) times. ANOVAs and Chi-square tests revealed no significant differences between the participants who participated once ($n = 13$) and the participants who participated two or three times ($n = 118$) in terms of demographic characteristics and study variables (all ps > 0.05). The study received ethical approval from the Institutional Review Board of the host University and informed consent was obtained from all individual participants included in the study at each assessment.

Measures

Child behavior problems. Parents assessed their child's emotional and behavioral problems with the Dutch version of the parent-report Child Behavior Checklist/6-18 [CBCL; 49] on a three-point Likert scale ranging from (0) *not applicable* to (2) *often applicable*. Internalizing problems comprised the subscales for anxious/depressive (13 items) and withdrawn/ depressive behavior (8 items). The subscales for aggressive (18 items) and rule-breaking behavior (17 items) represented externalizing problems. Cronbach α's ranged from .86 (internalizing problems at T2) to .92 (externalizing problems at T3).

Child psychosocial strengths. Parents rated their child's psychosocial strengths on the Behavioral and Emotional Rating Scale [BERS-2; 50] on a 5-point Likert-scale ranging from (1) *completely not true* to (5) *completely true*. The questionnaire comprises three types of strengths: Interpersonal Strengths (15 items, e.g., *"Accepts responsibility for his/her behavior"*), Family Involvement (10 items, e.g., *"Shows a sense of commitment towards the family"*) and Intrapersonal-affective Strengths (18 items, e.g., *"Accepts closeness and*

intimacy from others"). Cronbach α's ranged from .75 (family involvement at T2) to .93 (interpersonal strength at T3).

Externally controlling parenting. Parents' use of coercion and physical punishment was assessed with the negative control scale from the Ghent Parental Behavior Scale [PBS; 51]. This scale taps into punitive parenting (6 items, e.g., *"If my child does something that is not allowed, I give him/her a punishment"*) and harsh punishment (5 items, e.g., *"I spank my child when he/she is disobedient"*) ($r = .32$ at T1, $r = .41$ at T2, $r = .27$ at T3) rated on a 5-point Likert scale, ranging from (1) *never* to (5) *always*. Cronbach's alphas ranged from .83 (T1) to .85 (T2).

Autonomy-supportive parenting. Parents' rated their autonomy-supportive parenting using the Autonomy Support Scale of the Perceptions of Parents Scale [POPS; 52, 53]. The seven items were scored on a five-point scale, ranging from (1) *not applicable* to (5) *fully applicable* (e.g., *"I am usually willing to consider things from my child's point of view"*). Cronbach's alphas ranged from .75 (T1) to .80 (T2).

Child personality. Given that personality factors are characterized by substantial continuity and long-term stability [29], parents assessed their child's personality only during the baseline assessment, at T1, using the Hierarchical Personality Inventory for Children [HiPIC; 54]. In this questionnaire, parents indicated how characteristic 144 statements were for their child's behavior on a five-point Likert scale, ranging from (1) *hardly characteristic* to (5) *very characteristic*. The 144 items represent 18 underlying facets, which can be grouped into five higher-order factors: *Extraversion* is represented by the facets Energy, Expressivity, Optimism and Shyness; *Benevolence* includes the facets Altruism, Dominance, Egocentrism, Compliance and Irritability; *Conscientiousness* is represented by the facets Concentration, Perseverance, Orderliness and Achievement Motivation; *Emotional Stability* encompasses the facets of Anxiety and Self-Confidence; *Imagination* includes the facets Creativity, Intellect and Curiosity. Cronbach α's ranged from .86 (Benevolence) to .96 (Conscientiousness).

These questionnaires were all developed to be broadly applicable and were successfully used in research among children with special needs, including youth with CP [14, 55-57].

Data analysis

Latent change modeling (LCM) was used to model change at the within-person level (i.e., within a family unit) in parenting and psychosocial outcomes across a two-year interval. The LCMs were estimated using Mplus8 [58] with robust maximum likelihood as estimator because missing data were missing completely at random (Little's missing completely at random test: χ^2 (254) = 235.50, p = .79) [59]. To gain acceptable statistical power to analyze the models, we modeled change across the three waves in two separate models: T1-to-T2 (first time period) and T2-to-T3 (second time period). This decision was also informed by latent growth curve analyses [60] performed initially on these data, indicating no significant mean slope nor variance in the slope of the outcome variables when change was modeled across three assessment points simultaneously. However, when change was modeled in a more fine-grained fashion between two one-year intervals using LCM, we did find significant variance in the growth parameters predicting the initial level and change in the outcome variables. Acceptable model fit was evaluated according to: Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) of 0.08 or below, Comparative Fit Index (CFI) of 0.90 or above [61].

The measurement model described the latent level and change factors for each latent variable. Concerning the parenting behaviors, we created two parcels for each parenting construct applying the item-to-construct balance method, where stronger loading items are combined with weaker loading items [62]. As child behavior problems, psychosocial strengths, and personality are considered to be multidimensional in nature, we used their subscales as indicators for their latent factors [cf. the internal-consistency approach; 63]. The measurement model for each study variable showed adequate fit, with the average fit being: RMSEA = 0.05, CFI = 0.99 and SRMR = 0.04.

Next, the measurement models were supplemented with a structural model that specified how these level and change factors were interrelated. Within each of the structural models, the level of, and change in, an outcome variable was predicted simultaneously by one personality domain (measured at baseline) and the level of, and change in, one parenting construct. Given the three outcome variables and five personality domains, this resulted in 15 models regarding externally controlling parenting and 15 models regarding autonomy-supportive parenting (Figure 1). All models showed adequate fit with an average fit of RMSEA = 0.05, CFI = 0.97 and SRMR = 0.06.

Furthermore, we tested the moderating role of child personality by adding interaction terms between a child personality domain and the level of, and change in, parenting behavior to the models. For each personality domain, three interaction terms were created (i.e., between child personality, on the one hand, and the level of, change from T1-to-T2, and change from T2-to-T3 in parenting behavior, on the other hand), which simultaneously predicted the level of, and change in, the outcome variables. This approach resulted in 30 tested interaction terms (i.e., five personality domains, two parenting variables and three outcome variables). For probing interactions, we followed the Johnson-Neyman technique, which allowed to indicate the specific value along the continuum of the personality trait at which the relation between parenting and child behavior was significant [i.e., regions of significance; 64]. Significant interactions were visually illustrated using plots in SPSS 26.0.

Results

Preliminary analyses

Before addressing the main research questions, we examined the associations between several demographic characteristics and the variables of interest. We conducted a MANCOVA with child gender, type of CP, CP symptom severity (i.e., GMFCS-level), and informant's educational level as fixed variables, with the child's and informant's age as covariates, and with all study variables as dependent variables. Within these analyses, yearly-assessed variables were aggregated across the three assessment points. The findings revealed no overall

multivariate effects for the child's age, type of CP, level of physical functioning (i.e., CP symptom severity based on GMFCS-level), and the informant's educational level or age (all ps > .05). An additional MANCOVA including the available information on children's cognitive functioning ($n = 81$), demonstrated that the child's intellectual functioning also did not have a significant effect on the study variables (all ps > .05). However, the multivariate effect of child gender was significant (Wilk's $\lambda = .70$, $F(10,51) = 2.24$, $p = .03$), indicating that parents of girls reported more internalizing problems ($F(1,115) = 4.54$; $p = .04$) and less Emotional Stability ($F(1,116) = 4.62$; $p = .03$) compared to parents of boys. Looking more closely into the effect of child age in each assessment period, correlation analyses indicated that child age was associated with more internalizing problems at T1 ($r = .20$, $p = .03$), more Benevolence ($r = .24$, $p = .01$) and less Extraversion ($r = -.35$, $p < .001$). Therefore, all LCMs controlled for child age and child gender. Means, standard deviations, and correlations between the study variables are presented in Table 2.

Main analyses

Research question 1: Do problem behaviors, psychosocial strengths and parenting change over time in children with CP?

Mean-level changes in children's psychosocial development and parenting behavior were estimated using univariate LCMs. Results indicated a significant mean-level increase in both internalizing and externalizing problems from T1-to-T2 and no significant change thereafter. Psychosocial strengths remained stable in the first time period but increased significantly from T2-to-T3. Both externally controlling parenting as well as autonomy-supportive parenting showed mean-level stability across the two-year period. The models showed significant variances in the slope for all latent variables, suggesting substantial individual differences in how child behavior and parenting behavior changed over time. Parameter estimates and fit indices of the univariate LCMs are provided in Table 3.

Research question 2: What are the additive and interactive effects of parenting and child personality on behavioral outcomes in children with CP?

Main effects of parenting and child personality. First, we examined main effects of parenting and child personality on behavioral outcomes. Concerning parenting behavior, the findings showed that both the level of, and change in, externally controlling parenting related positively to higher levels of, and change in, externalizing child behavior (at both time periods). Moreover, change in externally controlling parenting also related positively to change in internalizing problems (in the first time period). Furthermore, the level of autonomy-supportive parenting related positively to the level of psychosocial strengths. Concerning child personality, less Extraversion, Benevolence and Emotional Stability related to higher levels of internalizing problems, and less Benevolence, Conscientiousness and Emotional Stability were associated with higher levels of externalizing problems. Higher scores on all personality traits related positively to the level of psychosocial strengths. One significant association was observed between child personality and change in the outcome variables, where high Conscientiousness related to an increase in psychosocial strengths in the first time period.

The moderating role of child personality. Second, interaction terms were added, examining whether the nature and/or relation between the level of, or change in, parenting behavior and the level of, or change in, children's psychosocial development varied as a function of child personality. Nine out of 30 tested interactions were significant: six with the level of psychosocial functioning as outcome (Figure 2), and three with change in psychosocial functioning as outcome (Figure 3).

First, concerning the level of internalizing problems as an outcome, the findings indicated that the relation between the level of externally controlling parenting and the level of internalizing problems was only significant for children with lower scores on Extraversion ($t(113) = -2.03$, $p = .04$, $b = -1.33$). The Johnson-Neyman technique indicated that when Extraversion was below 2.44 (6.8% of the children), the relation between the level of

externally controlling parenting and the level of internalizing problems became statistically and positively significant (Figure 2a). Second, three significant interaction effects were found in relation to the level of externalizing problems as outcome. The relation between the level of externally controlling parenting and the level of externalizing problems was only significant among children with lower scores on Extraversion ($t(113) = -2.24$, $p = .03$, $b = -1.43$), Conscientiousness ($t(113) = -2.45$, $p = .02$, $b = -1.38$) or Imagination $t(113) = -2.32$, $p = .02$, $b = -1.15$). The relation became statistically and positively significant when Extraversion was lower than 3.40 (43.2% of the children), when Conscientiousness was lower than 3.02 (45.8% of the children), or when Imagination was lower than 3.09 (44.9% of the children) (Figure 2b). Third, two significant effects were found in relation to the level of psychosocial strengths as outcome. When Extraversion was lower than 2.60 (8.5% of the children) or when Imagination was lower than 2.06 (6.8% of the children), the relation between the level of externally controlling parenting and the level of strengths became statistically and negatively significant ($t(113) = 2.17$, $p = .03$, $b = 0.30$; $t(113) = 2.14$, $p = .03$, $b = 0.25$, respectively) (Figure 2c).

Furthermore, we observed three significant interaction effects concerning change in all outcome factors. First, the association between change in externally controlling parenting and change in internalizing problems in the second time period was significantly negative among children with a score lower than 2.61 on Emotional Stability (31.4% of the children), yet not significant among children with higher scores ($t(113) = 3.72$, $p < .001$, $b = 1.22$) (Figure 3a). Second, the previously reported interaction between Conscientiousness and negative controlling parenting, was replicated when change in externalizing problems in the first time period was modeled as outcome ($t(113) = -2.40$, $p = .02$, $b = -0.80$). More specifically, when children scored lower than 2.89 on Conscientiousness (39.0% of the children), change in externally controlling parenting related positively to change in externalizing problems (Figure 3b). One interaction effect was observed concerning autonomy-supportive parenting. Whereas the relation between change in autonomy-supportive parenting and change in psychosocial

strengths in the first time period was significant among children with a score of 2.90 or higher on Emotional Stability (50.0% of the children), this effect was not significant for children with lower scores ($t(113) = 2.03$, $p = .04$, $b = 0.26$) (Figure 3c). A similar effect was observed when the level of, and change in, psychosocial strengths at the second time period were modeled as outcome factors, but these effects did not reach significance (both p's = .09).

After Bonferroni-correction ($p < .002$ in the structural model), only one interaction effect remained significant, concerning the effect between Emotional Stability and change in externally controlling parenting on change in internalizing problems in the second time period (Figure 3a) ($\beta = .42$, $p < .001$ in the structural model). Since the personality-by-parenting interplay has never been documented among youth with CP and because Bonferroni correction is quite rigorous to uncover interaction effects [65], we described all significant interactions ($p < .05$ in the structural model).

Discussion

Given that children with CP vary widely in their psychosocial adjustment, it is essential to understand the underlying factors that can explain why some children experience many behavioral or emotional problems whereas others report high levels of psychosocial well-being [4, 66]. Researchers advocated to go beyond the inquiry of "disability-specific sources" and encouraged studies examining "non-syndrome-specific" factors. This study aimed to advance the understanding of the psychosocial development of children with CP by examining the joint value of parenting behavior and child personality in relation to behavioral problems and psychosocial strengths, from a two-year longitudinal perspective.

Continuity and change in children's psychosocial functioning and parenting behavior

As a first research aim, we explored continuity and change in psychosocial functioning and parenting behavior over time. Univariate LCMs indicated a significant increase in both internalizing and externalizing problems during the first time period, and a significant increase in psychosocial strengths during the second time period. To our knowledge, no study to date has reported on intra-individual changes in behavioral problems and psychosocial

strengths in youth with CP, assessed with the CBCL [49] and BERS-2 [50]. These findings are generally consistent with the small body of longitudinal research demonstrating that behavior problems persist and social strengths, such as social participation, tend to moderately improve when children with CP develop into young adolescents [3, 9]. The significant increase in both internalizing and externalizing problems may be indicative of the new challenges puberty presents to children with CP and their families. During puberty, demands for more maturity and responsibility increase, peers become more important and youth tend to struggle more often with their self-worth [24]. Among youth with CP these normative challenges can be exacerbated by the child's motor disability. Therefore, puberty can be an especially challenging period for youth with CP as they tend to compare themselves more often with their peers and become more aware and reflective of their own capabilities and limitations [3, 5].

Further, our findings indicated no significant change in parenting behavior across time, suggesting that parents are, on average, quite stable in the way they interact with their child. This finding is consistent with findings obtained in the general population [67]. Importantly, however, we found substantial variation in intra-individual changes in parenting, indicating that parents differ in how their parenting behavior changes across time. In general, the substantial variation in within-person change in each study variable suggested that children and parents differed in the degree to which their psychosocial functioning or use of parenting behaviors changed across time. These findings across a two-year interval complement a recent diary study among children with CP, showing that the degree to which parents are autonomy-supportive and controlling can considerably vary from one day to the other during one week [55].

Effects of parenting and child personality on children's psychosocial functioning

As a second research aim, we investigated additive and interactive effects of parenting behavior and child personality on behavioral problems and psychosocial strengths of youth with CP. Overall, this study showed that parenting as well as child personality act as

important and unique precursors of the psychosocial development of children with CP. More specifically, three important findings illustrated that these "non-syndrome-specific" factors, might act as risk-factors leading to behavioral problems as well as protective factors enhancing psychosocial strengths.

Effects of parenting. First, corroborating previous research, autonomy-relevant parenting behavior related uniquely and substantially to the psychosocial development of youth with CP (Aran et al., 2007). In line with hypotheses derived from SDT, externally controlling parenting consistently related to behavioral problems, whereas autonomy-supportive parenting was associated with beneficial outcomes [17]. Both high levels of, and change in, externally controlling parenting were associated with more externalizing problems in youth with CP. This finding supports previous cross-sectional work among CP-populations [14] and longitudinal work among general populations [23]. Children are more likely to engage in aggressive or rule-breaking behavior when parents rely on harsh disciplining or pressuring behaviors. Previous studies also indicated consistent associations between externally controlling parenting and internalizing problems among general [22] and CP-populations [16]. Although this study did not identify a significant association between the level of externally controlling parenting and the level of internalizing problems, change in both factors during the first time period were significantly associated. This finding meshes with previous findings among general populations, illustrating that changes in controlling parenting are positively tied to changes in children's internalizing problems [22, 68].

Further, the level of autonomy-supportive parenting consistently related to higher levels of psychosocial strengths, a finding consistent with previous studies demonstrating associations between autonomy-supportive parenting and better outcomes in the psychosocial functioning of children with CP [e.g., 16, 26]. Since we found no significant association between autonomy-supportive parenting and behavioral problems, this study supports the idea that positive parenting might play a more prominent role in fostering positive outcomes rather than protecting against maladaptive outcomes [69].

Effects of child personality. Second, this study is one of the first to demonstrate that individual differences in personality relate uniquely to both negative and positive behavioral outcomes in youth with CP. Our findings generally confirmed well-documented associations obtained in the broader developmental literature [30] and prior research among children with CP [4]. Lower levels of Extraversion, Benevolence and Emotional Stability were associated with higher levels of internalizing problems, and lower levels of Benevolence, Conscientiousness and Emotional Stability related to higher levels of externalizing problems. Furthermore, child personality predicted children's psychosocial strengths, indicating that personality can also function as a source of resilience. All personality domains consistently related to the level of parent-reported psychosocial strengths, and Conscientiousness even positively related to increases in psychosocial strengths in the first time period. Higher scores on Benevolence, Conscientiousness and Emotional Stability have been previously related to more adaptive outcomes in general populations [e.g., 70], but the association with Extraversion and Imagination might be more CP-specific. Perhaps, expressions of energy, expressivity, and optimism in children with CP (i.e., more Extraversion) might relate to the child's motor and speech abilities to communicate and express thoughts and feelings towards others, which facilitates the possibility to show affect or involvement towards others. Additionally, children with CP who display more curiosity and creativity (i.e., more Imagination) might immerse themselves more strongly in interpersonal relationships, which may lead to the development of stronger affective and interpersonal skills.

Personality-by-parenting interplay. Third, this study identified nine significant interaction effects out of 30 tested interactions. Since the number of interaction effects is limited and only one interaction effect remained after Bonferroni correction, the role of these interactions should be interpreted with caution and further replication is warranted. Nevertheless, these interactions proved to be significant despite the limited sample size, and suggest a fairly robust moderating effect of child personality in the relation between parenting and child behavior. The findings mainly supported the idea that children with CP with a more

vulnerable personality might have an increased sensitivity to dysfunctional parenting (diathesis-stress model). One interaction was consistent with the notion that adaptive personality increases sensitivity to supportive parenting (vantage-sensitivity model). No evidence was found supporting the differential-susceptibility model in this study.

In line with the diathesis-stress model [38], extensive research on personality-by-parenting interactions in general populations identified strong support for the idea that especially children with low Emotional Stability or low Conscientiousness are at increased risk to develop behavioral problems when exposed to negative parenting practices [42]. Whereas this study showed that the interaction effect concerning Conscientiousness also applies to youth with CP, other significant interactions might be more CP-specific. Consistent with previous studies, low Conscientiousness served as a vulnerability factor, associated with elevated levels of externalizing behavior when parents were more controlling [33, 44]. Similar findings were observed in relation to low Extraversion and Imagination. Children with low scores on Extraversion exhibited higher levels of internalizing and externalizing problems, as well as lower levels of psychosocial strengths when exposed to externally controlling parenting. Although significant interaction effects with the personality domain Extraversion are rare in the extant literature, our finding is consistent with at least one previous study suggesting that Shyness (a facet of Extraversion) plays a role in the development of internalizing problems, but only in the context of high or average levels of overreactive parenting [35]. Furthermore, children with low scores on Imagination exhibited higher levels of externalizing problems, as well as lower levels of psychosocial strengths when exposed to externally controlling parenting. Because interaction effects with Imagination are rarely documented among general populations, Imagination might play a unique role among youth with CP. Furthermore, our findings supported the notion that children low in Emotional Stability are more sensitive to the effects of their environment compared to children high on Emotional Stability [42]. Whereas, change in externally controlling parenting in the second time period was negatively associated with change in internalizing problems among children

with low Emotional Stability, this association was not significant among youth with high Emotional Stability. This interaction could be interpreted as an effect of child behavior on parents. When children go through a period in which they temporarily exhibit more internalizing problems than usual, parents might be less controlling, especially when children are more vulnerable. These parents may have already experienced that in times of internalizing problems, these vulnerable children do not benefit from increasing the pressure, and so they might give their child some breathing space. Aunola et al. [71] observed a similar effect on a daily level in the general population, where parents reduced their use of psychological control when their child showed more depressive symptoms than usual.

One interaction was consistent with the vantage-sensitivity model, which involves that children with a more adaptive or mature personality might have an increased sensitivity to a supportive environment [39]. In this study, the psychosocial strengths of children with higher scores on Emotional Stability increased during the first time period when exposed to more autonomy-supportive parenting, whereas children with lower Emotional Stability did not seem to experience this beneficial effect. This finding might suggest that when a child shows that he/she can handle adversity or is self-confident, it is easier for parents to recognize strengths and be patient and attuned to their child's needs. Similar results have been found in general populations, where children with low levels of fear and distress were positively affected by supportive parenting behavior, such as maternal sensitivity, whereas fearful children were more likely to experience equal or even elevated levels of behavioral problems [72, 73].

The findings indicated no significant interaction effects including Benevolence. This is somewhat surprising as previous research in general populations identified Benevolence as a meaningful moderator in the relation between child behavior and parenting [35, 44]. Overall, future studies on the unique and interactive effects of child personality and parenting behavior on the psychosocial development of youth with CP are needed to further unravel the meaning of these findings.

Practical implications

This study has multiple practical implications. First, the vast majority of studies on CP and interventions for children with CP draw from a medical point of view, focusing primarily on the child's medical and physical functioning related to the disability. However, the current findings support the growing recognition of the importance of psychological characteristics and psychosocial family variables for the well-being of children with CP [e.g., 10]. Therefore, we encourage clinicians and researchers to attend to the psychological and emotional well-being of these children, in addition to their physical development. Moreover, the increase of behavioral problems during the first time period indicated that the beginning of puberty might be a challenging period for both children with CP and their context. During this transition, the relationship with caregivers changes, and growth and puberty interact with the disability [74]. Therefore, we encourage caregivers to be open, alert and responsive towards questions and uncertainties related to this stage of life, involving peer relationships-and acceptance, self-worth, body image, and emerging sexuality.

Second, the longitudinal associations between parenting and child psychosocial functioning highlight that autonomy-thwarting and autonomy-supportive parenting behaviors play important roles in the development of youth with CP. Therefore, family interventions should pay attention to controlling behaviors, but also recognize parents' autonomy-supportive behaviors and reinforce them. Interventions could provide strategies and rationales for their importance, even when the child's motor functioning or behavioral problems challenge parents' coping strategies or opportunities to be autonomy-supportive. Previous intervention studies among general populations indeed supported the beneficial impact of an autonomy-supportive parenting program for children's mental health [75, 76]. Moreover, it might be more stimulating and energizing for both parents and care providers to recognize and acknowledge autonomy-supportive behaviors, rather than focusing on ways to avoid controlling parenting [77].

Third, the findings revealed that certain personality traits rendered children with CP either more vulnerable or resilient to develop behavioral problems, and at the same time increased or decreased their sensitivity towards their environment. To date, interventions are less focused on individual differences among children with CP. Therefore, applying a non-pathologizing language to talk about individual differences as captured by personality traits, might be especially valuable to accommodate interventions and parental strategies to the unique strengths and challenges in each child's personality. Attuning to a child's unique personality can result in better behavioral outcomes and higher quality parent-child relationships [78].

Limitations and directions for future research

When interpreting the findings of the current study, some limitations should be kept in mind. First, the generalizability of the present findings is limited by several factors: the specific choice of instruments and parenting dimensions, the reliance on mothers as the primary source of information (i.e., mono-rater bias), and the specific recruitment strategies. Future research could benefit from applying alternative measures and assessment methods [e.g. observational designs; 79], including multiple informants and more diverse recruitment strategies (e.g., social media, inclusive education). Future research would also do well to examine broader conceptualizations of parenting [80], for instance, by including a measure of parental structure. This can allow to examine combinations of structure and autonomy-support, and to investigate whether the effects of these combinations are also moderated by the personality of the child. Second, we acknowledge that other factors influence the association between parenting behavior and psychosocial functioning in families with CP. Diverse child factors (e.g.., feelings of pain, comorbid diagnosis) or contextual factors (e.g., parents' personality, feelings of stress, motivation to take care of their child, marital relationship, social support) might play a role in the relation between parenting and child behavior [3, 4, 6, 74]. Although this study corroborates previous findings by demonstrating no significant associations between the severity of the child's physical functioning or intellectual

functioning and parenting behaviors [12, 27, 81], future research should assess the role of

symptom severity and other comorbid disorders [e.g., 9] more extensively. A comprehensive

examination could, for instance, include the child's language ability and should also use

measures that are reliable and validated within a CP-population, such as standardized

intelligence tests for children with motor disabilities [82]. Additionally, based on Attachment

Theory, it could be particularly valuable to assess parent-child attachment, parents' resolution

towards their child's diagnosis, and how these factors influence parents' behaviors and

children's psychosocial development. Although the large majority of parents raising a child

with CP seems to have resolved their reactions to their child's diagnosis [83], unresolved

reactions have been associated with less parental sensitivity and emotional availability, and

more disorganized parent-child attachments [84-86]. More generally, future research would

do well to combine insights from SDT and Attachment Theory, in order to gain more

complete insight into the quality of attachment relationships between parents and children

with CP. While Attachment Theory emphasizes the importance of parental warmth and

responsiveness (i.e., sensitivity, which provides children with a sense of a safe haven), SDT

places more emphasis on the importance of autonomy support, where parents encourage

initiative and thus facilitate the function of a secure base. Research among parents of children

without any known disability shows that both parenting dimensions are important in the

development of secure attachment and related developmental outcomes [e.g., 87, 88].

However, these unique effects have not yet been demonstrated in the context of CP, which

could be valuable for future research. Third, the data-analyses did not fully account for

transactional processes between the child (i.e., behavior and personality) and its environment

(i.e., parenting behavior). Several studies among general populations have convincingly

shown that child behavior, child personality and parenting behavior reciprocally affect each

other throughout time [e.g., 37, 89]. Although studies examining these bidirectional effects

are currently lacking in the CP-literature, we assume that similar bidirectional processes

operate in this population. Also, we acknowledge that the sample size was relatively small for

the modeling method used, which might have resulted in a lack of power for some of the analyses. Moreover, the large number of analyses might have resulted in an increased risk for Type I errors. However, an a-priori sample size calculation for structural equation modeling (SEM) demonstrated that our sample size was sufficient to detect effects [90]. Also two approaches for power analysis within SEM, namely a power analysis based on RMSEA by MacCallum et al. [91] and a power analysis using Satorra, Saris [92]'s method based on the Chi-square test indicated sufficient power for the different models (power values ranging from 0.78 to .87, and from 0.85 to 0.93 in the two approaches, respectively). Nevertheless, future prospective longitudinal studies with larger sample sizes, multiple informants, and more assessment moments are needed to replicate the current results and to further disentangle the transactional child-parent interplay among families of youth with CP.

Summary

This study showed that parenting behavior and child personality are important and unique modifiers of the psychosocial development of children with CP. Across two years, children's psychosocial development showed substantial change, whereas parenting behavior remained stable. Both parenting behavior and child personality functioned as risk-factors leading to behavioral problems and as protective factors enhancing psychosocial strengths. Externally controlling parenting related to more maladaptive outcomes, with increased vulnerability among children with low Extraversion, Conscientiousness or Imagination. Autonomy-supportive parenting related to more adaptive outcomes, with more beneficial effects among children with high Emotional Stability. Therefore, this study provides empirical support for the theoretical claim that examining the personality-by-parenting interplay is vital for the psychosocial development of *all* children, including those with CP.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Table 1 Descriptive data on the participating children and their parents (N = 118)

	N	%
Child characteristics		
GMFCS[a]		
I	25	21.2
II	46	39.0
III	21	17.8
IV	10	8.5
V	16	13.6
CFCS[b]		
I	51	43.2
II	22	18.6
III	24	20.3
IV	7	5.9
V	1	0.8
Unknown	13	11.0
Intellectual functioning[c]		
Intellectual disability (IQ < 70)	31	26.3
No intellectual disability (IQ > 69)	50	42.4
Unknown	37	31.4
Comorbid diagnose[d]		
Epilepsy	38	32.2
Autism spectrum disorder	26	22.0
Cerebral visual impairment	32	27.1
Other[e]	45	38.1
Type of education		
Special kindergarten	3	2.5
Regular primary education	17	14.4
Special primary education	66	55.9
Regular secondary education	10	8.5
Special secondary education	14	11.9
Unknown	8	7.0
Living situation		
At home with parents	92	78.0
Part-time at home, part-time at school	13	11.0
During the week at school, in the weekend at home	7	5.9
Unknown	6	5.1
Parent characteristics		
Marital status		
Married or living with partner	93	78.8
Living without partner (single, divorced, widow)	10	8.5
Unknown	15	12.7
Degree of education		
Primary school	2	1.7
Secondary school	49	41.5
Higher education	64	54.2
Unknown	3	2.5

[a] Scores on the Gross Motor Function Classification System [47] retrieved from the medical file at T1. If the GMFCS scores were not found at T1, scores were based on parent-report at T2 or T3. [b] At T2 and T3 parents were asked to rate their child's ability to communicate on the Communication Function Classification System [93]. Scores are based on parent-reports at T2 and, if needed, supplemented with parent-report at T3. [c] Retrieved from the medical file at T1. [d] Based on information from the medical file and parent-report at T2 and T3. Parents could indicate several comorbid diagnoses. [e] Specific learning disorder, AD(H)D and behavioral disorder were most prevalent.

Table 2 Means, standard deviations and correlations between the study variables (N = 118)

	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
GMFCS[a]	-	-	-.16	-.04	.07	-.11	.21	.16	.06	.10	.18	.19	-.18	-.02	-.01	-.15	.01	-.10	.00	-.05	-.14	-.07
T1																						
1. Internalizing	6.47	5.88																				
2. Externalizing	8.14	7.36	.63***																			
3. Strengths	3.64	0.52	-.39***	-.54***																		
4. Ext. control	3.90	1.10	.06	.14	-.03																	
5. Aut.-support	3.86	0.56	-.05	-.07	.34***	.12																
6. Extraversion	3.44	0.61	-.43***	-.08	.49***	.03	.33***															
7. Benevolence	3.26	0.60	-.36***	-.74***	.64***	.00	.00	.03														
8. Conscient.	2.99	0.59	-.11	-.39***	.46***	.04	.24**	.08	.50***													
9. Emo. Stability	2.91	0.66	-.64***	-.43***	.23*	-.10	-.07	.34***	.27**	-.08												
10. Imagination	3.20	0.73	-.17	-.12	.41***	.05	.45***	.61***	.08	.38***	.11											
T2																						
11. Internalizing	7.32	5.94	.70***	.46***	-.29**	-.12	.03	-.38***	-.27**	-.01	-.57***	-.06										
12. Externalizing	8.59	7.78	.53***	.80***	-.43***	.03	.01	-.01	-.69***	-.31***	-.40***	.01	.57***									
13. Strengths	3.68	0.54	-.31***	-.48***	.70***	.07	.31***	.45***	.55***	.29**	.27**	.34***	-.38***	-.51***								
14. Ext. control	3.92	1.11	.01	.17	-.16	.66***	-.09	-.05	-.08	-.12	-.06	-.04	.02	.17	.03							
15. Aut.-support	3.90	0.58	-.14	-.08	.26**	.08	.50***	.23*	.07	.31***	-.02	.27**	-.01	-.11	.34***	.05						
T3																						
16. Internalizing	7.44	6.61	.71***	.54***	-.32**	-.01	-.14	-.35***	-.32**	-.05	-.57***	-.03	.80***	.64***	.43***	.07	-.19					
17. Externalizing	8.85	8.01	.55***	.81***	-.37***	.08	-.04	-.01	-.66***	-.20	-.45***	.08	.52***	.88***	.47***	.15	-.11	.66***				
18. Strengths	3.68	0.51	-.38***	-.52***	.73***	.03	.44***	.41***	.52***	.29**	.33**	.41***	-.39***	-.53***	.79***	.16	.39***	-.47***	-.57***			
19. Ext. control	3.85	1.08	.16	.11	-.10	.75***	-.06	-.13	.05	-.04	-.20	-.02	.06	.01	.09	.72***	.10	.02	.08	.08		
20. Aut.-support	3.82	0.55	-.07	.01	.43***	.03	.55***	.30**	.01	.24*	-.03	.34**	-.06	-.03	.46***	.18	.56***	-.16	-.01	.50***	.07	

SD Standard deviation, *Ext. control* Externally controlling parenting, *Aut.-support* Autonomy-supportive parenting, *Conscient.* Conscientiousness, *Emo. Stability* Emotional stability

[a] Scores on the Gross Motor Function Classification System [47], *Mode* = 2.00, range = 1.00 to 5.00

*p < .05, **p < .01, ***p < .001

Table 3 Parameter estimates and fit indices of the univariate latent change model, controlling for child age and gender (N = 118)

	Level		Change T1-to-T2		Change T2-to-T3		Correlation (level, Change12)		Correlation (level, Change23)		Correlation (Cha12, Change23)		Fit indices		
	M	s^2	M	s^2	M	s^2	Est	SE	Est	SE	Est	SE	RMSEA	CFI	SRMR
Internalizing problems	1.09*	2.80**	0.27*	0.95*	0.22	0.98***	-0.38	0.13**	-0.09	0.16	-0.15	0.38	0.07	0.96	0.08
Externalizing problems	1.75***	3.22***	0.42*	1.08***	0.47	0.70**	-0.11	0.14	0.00	0.15	-0.51	0.21*	0.07	0.98	0.06
Psychosocial strengths	3.40***	0.19***	-0.09	0.11***	0.12**	0.06***	-0.36	0.01***	0.05	0.15	-0.65	0.12***	0.08	0.97	0.11
Externally controlling	2.34***	0.27***	0.12	0.19**	-0.12	0.13**	-0.30	0.13*	0.19	0.22	-0.68	0.15***	0.07	0.98	0.04
Autonomy-support	3.83***	0.24***	0.04	0.22***	-0.10	0.19***	-0.40	0.11***	0.16	0.14	-0.70	0.12***	0.05	0.99	0.08

The table reports unstandardized means and variances of the level and change in the study variables and standardized correlations between the level and change in the study variables

RMSEA Root Mean Square Error of Approximation, *CFI* Comparative Fit Index, *SRMR* Standardized Root Mean Square Residual

*p < .05, **p <.01, ***p <.001

Fig. 1 Latent change model on the relation between child personality and parenting behavior (**a** externally controlling parenting, **b** autonomy-supportive parenting) on children's internalizing problems, externalizing problems, and psychosocial strengths
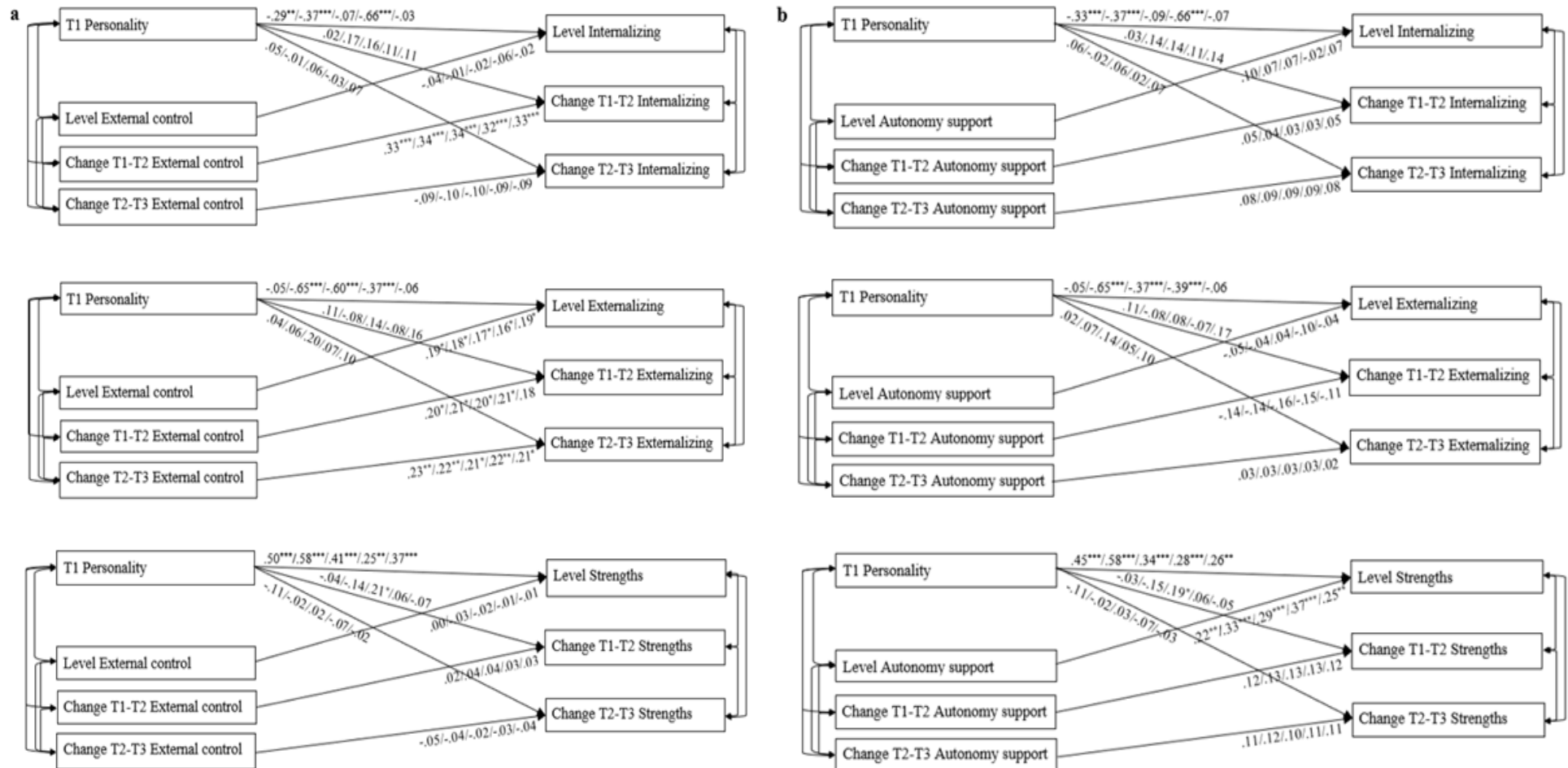
Path coefficients refer to the models including the following personality traits: Extraversion/ Benevolence/ Conscientiousness/ Emotional Stability/ Imagination
*p < .05, **p <.01, ***p <.001

Fig. 2 Interaction between child personality and parenting on the level of psychosocial functioning (**a** internalizing problems, **b** externalizing problems, **c** psychosocial strengths)
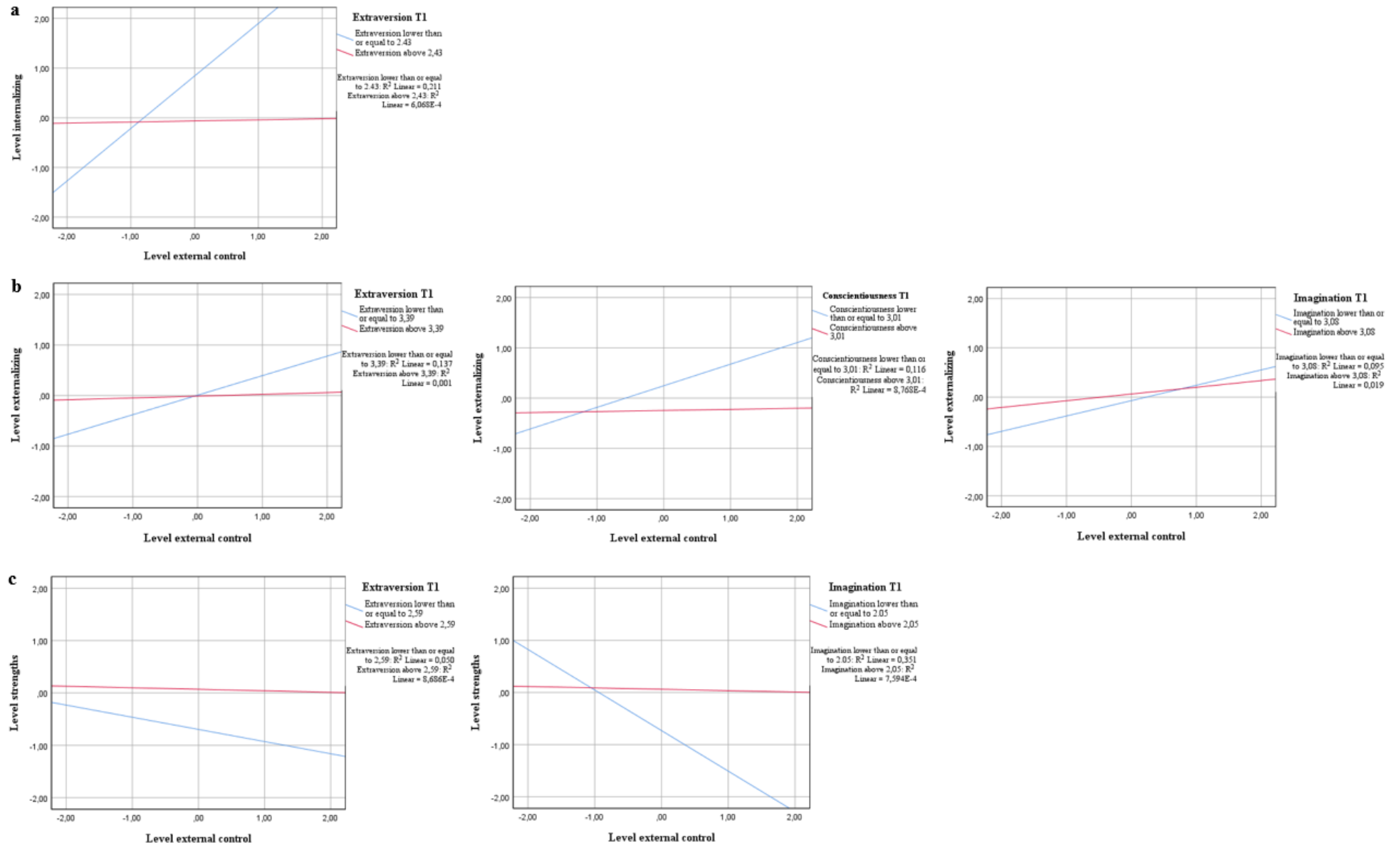
Fig. 3 Interaction between child personality and parenting on change in psychosocial functioning (**a** internalizing problems, **b** externalizing problems, **c** psychosocial strengths)