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Beyond parenthood: Parenting practices, not parental status, predict parental well-being

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Abstract

Parenthood has long been associated with both higher and lower well-being, giving rise to the so-called parenthood paradox. We argue that this apparent inconsistency stems from treating parenthood as a binary status rather than distinguishing parental status from the everyday practices through which parenting is enacted. Using longitudinal data from the German TwinLife Study and a co-twin control design, we disentangle the associations of becoming a parent from those of parenting behavior while accounting for shared genetic and family background. Across conventional mixed-effects models, parents report higher global life satisfaction than non-parents. However, this association is substantially attenuated and becomes statistically indistinguishable from zero in within-twin analyses, indicating that the apparent well-being advantage of parenthood is largely explained by selection into parenthood. By contrast, parenting practices exhibit robust within-family associations with parental well-being. Greater emotional warmth and consistency are associated with higher life satisfaction and lower parenting-related stress, whereas inconsistent and controlling parenting predict poorer well-being outcomes. These findings suggest that parental well-being depends less on parental status itself than on the quality of everyday parent–child interactions. More broadly, they indicate that much of the literature has conflated the consequences of becoming a parent with the consequences of how parents engage with their children. By separating status from behavior, our study offers a new perspective on the parenthood–well-being relationship and identifies parenting practices as a potentially modifiable pathway for improving parental well-being.

Keywords: Parenthood; Parenting Practices; Engagement; Life Satisfaction; Stress; Twin Study.

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1 Introduction

Parenthood is often portrayed as one of the most meaningful yet demanding experiences in adult life. Parenting has the potential to shape adults' emotional lives in lasting ways, functioning simultaneously as a source of strain and fulfillment (Rotondi et al., 2024). Yet empirical evidence on the relationship between parenthood and well-being remains strikingly inconsistent. While some studies document positive associations between parenthood and subjective well-being across both affective and cognitive dimensions (e.g., Aassve et al., 2012), others report null or even negative relationships (e.g., Clark and Oswald, 2002; Stanca, 2012; Myrskylä and Margolis, 2014; Deaton and Stone, 2014). This lack of consensus has given rise to the so-called parenthood–well-being paradox (Nomaguchi and Milkie, 2020; Nelson et al., 2013). This inconsistency has persisted despite increasingly sophisticated data and methods, suggesting that the paradox may stem less from disagreement about effects than from how parenthood itself is conceptualized and measured. We argue that this inconsistency reflects a broader conceptual issue in the study of social roles. Across economics, sociology, and public health, roles such as parenthood, marriage, or employment are typically operationalized as binary states, implicitly treating role occupancy as the relevant exposure. Yet social roles do not directly generate well-being (Biddle, 1986; Turner, 2001). Rather, they create opportunities and constraints for repeated behaviours through which individuals allocate time, emotional resources, and attention in everyday life. From this perspective, the consequences of parenthood are unlikely to arise simply from becoming a parent, but from the caregiving practices through which the parental role is enacted (Giddens, 1984; Emirbayer and Mische, 1998).

This distinction is particularly important from the perspective of household production. Parenthood is often treated empirically as a demographic characteristic, yet economically it represents entry into a production process rather than an outcome in itself. From the perspective of household production, parenthood does not constitute the treatment itself. Rather, it grants access to a production technology through which households transform time, attention, emotional effort, and material resources into multiple forms of family welfare (Becker, 1965, 1993; Grossman, 1972; Cunha and Heckman, 2007). Parenting practices, therefore, constitute productive behavioural inputs, whereas parental status merely identifies participation in this production process. Treating parenthood as a binary exposure risks conflating fundamentally different patterns of caregiving, thereby obscuring the mechanisms through which family life shapes well-being (Cunha and Heckman, 2007). This framework predicts that estimates based solely on parental status should systematically understate the contribution of caregiving behaviour and generate heterogeneous findings across studies whenever behavioural investments vary substantially across parents.

This conceptual distinction also offers a potential explanation for the long-standing parenthood–well-being paradox. If behavioural investments rather than parental status constitute the relevant exposure, empirical estimates based solely on parenthood inevitably aggregate individuals experiencing very different caregiving environments. Two parents may occupy the same social role while differing substantially in emotional warmth, consistency, involvement, communication, and the intensity of daily caregiving. Heterogeneity in these productive

behaviours is therefore expected to attenuate and destabilize estimates based exclusively on parental status. Evidence from time-diary studies is consistent with this view: parents report higher subjective well-being during activities with children than during other daily activities, yet mothers experience greater stress and fatigue than fathers, differences largely explained by activity composition, the presence of other adults, and constraints on sleep and leisure (Musick et al., 2016). These patterns suggest that the consequences of parenthood for well-being may depend critically on the behavioral content of parenting, especially for stress and burden related to caregiving, while effects on broader life satisfaction may be more contingent and heterogeneous.

A growing empirical literature supports this behavioral interpretation. Greater parental involvement has been linked to lower depressive symptoms among resident fathers, although the direction of the association varies across contexts, highlighting the contingent nature of engagement (Kotila and Dush, 2013). Neurobiological evidence further shows that caregiving experiences are associated with changes in brain regions implicated in parenting and emotional regulation (Abraham et al., 2014; Gordon et al., 2010; Kim et al., 2014). In clinical samples, parenting self-efficacy is positively associated with constructive practices and inversely related to inconsistent discipline, with clear links to caregiver depression (Hamovitch et al., 2019). Taken together, these findings suggest that parenting behaviors and parental psychological states are closely intertwined, making it difficult to infer whether observed associations reflect the emotional consequences of parenting practices or the behavioral manifestation of parents' pre-existing well-being.

At the same time, identifying the direction of these relationships remains challenging. Parents' mental health can shape how they parent, generating bidirectional dynamics. Longitudinal evidence indicates, for example, that higher maternal depressive symptoms predict subsequent increases in overreactivity and laxness and declines in warmth (Errázuriz Arellano et al., 2012). More broadly, observational estimates may be biased by stable family background characteristics and genetic confounding (Hagenbeek et al., 2023). Genetically informed frameworks conceptualize parenting as a phenotype jointly shaped by parental traits, child-evoked responses, and broader family environments (Patterson et al., 2017). Through gene–environment correlations, children actively co-construct their environments, further complicating causal inference (Burt et al., 2021).

These challenges point to the need for designs that can separate selection into parenthood from environmentally malleable behavioral processes. In this paper, we argue that resolving the parenthood–well-being paradox requires shifting the analytical focus from parental status to the behavioral content of parenting. Rather than treating well-being as a unitary outcome, we distinguish between global life evaluations and parenting-specific stress, and examine how each relates to both parental status and parenting practices. Leveraging data from the German TwinLife Study and a genetically informed co-twin control design, we decompose the association between parenthood and well-being into two components: selection on shared family and genetic factors, and differences in parenting practices within families.

Guided by this conceptual framework, we test three related predictions. First, if parental status is primarily a proxy for selection into family roles rather than the relevant behavioural exposure, the apparent well-being advantage of parents should attenuate under co-twin

comparisons that account for shared genetic and family background. Second, if parenting practices constitute the productive behavioural inputs through which parenthood shapes family welfare, parenting engagement and parenting style should exhibit stronger and more robust associations with parental well-being than parental status itself. Third, because parenting is a joint production process, the same behavioural dimensions associated with parents' well-being should also predict children's cognitive and social development.

Our contribution is therefore conceptual as much as empirical. We shift the unit of analysis from role occupancy to role enactment, arguing that the consequences of parenthood are generated less by parental status than by the behaviours through which the parental role is enacted. To test this proposition, we examine two complementary dimensions of parental well-being: global life satisfaction and a parenthood-specific burden/stress index, the latter capturing aspects of well-being most directly linked to everyday caregiving. We further extend the analysis to children's developmental outcomes, allowing us to assess whether the parenting practices associated with parents' own well-being also constitute productive inputs into child development. By jointly considering parental and child outcomes, our framework conceptualises parenting as a behavioural production process through which family welfare is generated, providing a more precise account of the parenthood–well-being relationship and clearer implications for interventions targeting parenting practices.

To our knowledge, no prior twin-based study has directly estimated the association between parenting engagement or parenting style and parents' own well-being using a co-twin control design. Existing twin-based evidence on parental mental health has focused on three adjacent areas: studies of parents of multiples documenting elevated stress and depressive symptoms (Wenze et al., 2015; De Roose et al., 2018; Bonanni et al., 2024); Children-of-Twins and twin-family designs disentangling genetic and environmental transmission of parental depression and parenting practices (Silberg et al., 2010; Natsuaki et al., 2014; Jami et al., 2021); and co-twin control approaches in the subjective well-being literature, which establish the identification strategy we exploit but have not been applied to parenting practices.

Methodologically, we estimate linear mixed-effects models with family random intercepts alongside within-twin (pair fixed-effects) models that absorb all stable shared genetic and environmental confounds. In supplementary analyses, we exploit Children-of-Twins linkages to compare cousins in monozygotic families, assessing whether between-family differences in parenting correspond to differences in children's outcomes when genetic relatedness is held constant. We further report variance components and both marginal and conditional R^2 to evaluate whether parenting operates primarily through between-family differences or through nonshared, individual-specific pathways—a distinction that speaks directly to the potential scope for policy-relevant interventions.

The remainder of this paper is organized as follows. Section 2 describes the TwinLife data, measures, and empirical strategy. Section 3 presents the results, beginning with the association between parental status and well-being, before examining parenting practices and extending the analysis to children's developmental outcomes. Section 4 discusses the implications of our findings for understanding the behavioural mechanisms linking parenthood to family welfare.

2 Data and Methods

We use data from the German TwinLife Study, drawing on the F2F4 survey wave, which contains detailed information on the children of twins, including measures of parenting style and parental engagement. Our primary outcomes are global life satisfaction (GLS) and a parenthood-specific burden/stress index (EBI). Global life satisfaction was measured using the 5-item Satisfaction with Life Scale (Diener et al., 1985), while parenthood-specific burden/stress was assessed using six items of the Parental Stress Inventory (Tröster, 2011). Both outcomes were calculated as mean scores of the items contributing to each scale. All items were answered on a 5-point Likert-type scale, with mean scores computed only for individuals with complete responses. Consistent with our conceptual framework, these measures capture the behavioural enactment of the parental role rather than parental status itself. They therefore operationalise the productive caregiving behaviours through which family welfare is hypothesised to be generated.

The main predictors included parental engagement and parenting style, and were also calculated as the mean scores of the items contributing to each scale. Parenting engagement items were parent-reported and defined as parental behavior supporting the child's school progress. The scale was inspired by previous work (Spinath and Wolf, 2006) and includes four sub-scales: structure (3 items), emotional support (3 items), autonomy (3 items) and control (3 items). Parenting style refers to the constellation of attitudes and patterns of parental authority toward a child that sets the emotional context of parental behaviour (Leung and Tsang, 2014). It was assessed using five subscales: warmth (four items), control (three items), negative communication (two items), inconsistent parenting (two items), and monitoring (two items). Due to substantial missing data, the monitoring subscale was excluded from selected analyses.

The main child outcomes were cognitive development, social development, and a combined index of global development using items adapted from the National Educational Panel Study in Germany. Cognitive development was measured using four items: endurance and concentration, language skills (for example, vocabulary and sentence structure), knowledge of plants, animals, and the environment, and mathematical skills. Social development was measured using two items: social skills, such as conflict resolution, and communication skills, such as responding appropriately in conversation. For all items, the responding parent rated the child's abilities relative to those of other children of the same age outside the family.

Covariates include age, sex, federal state (East/West), community size, household size, education (CASMIN), income, and zygosity. The analysis sample consists of twins participating in the TwinLife Children of Twins (CoT) subsample (i.e., twins who are parents), along with their corresponding co-twins identified and linked from the main TwinLife dataset. The main analyses are conducted on this linked sample, with additional sensitivity analyses restricted to twin pairs with matched (1:1) family identifiers. The step-by-step data cleaning process, sample exclusion criteria, and the final sample sizes available for each specific statistical model are outlined in Figure 1.

We begin by estimating linear mixed-effects models of the form:

$$y_{if} = \alpha + \beta X_{if} + \gamma C_{if} + u_f + \varepsilon_{if}, \tag{1}$$

where y_{if} denotes GLS or EBI for individual i in family f; X_{if} captures parental engagement, parenting style dimensions, or parental status (depending on the specification); C_{if} is a vector of covariates; u_f is a family-level random intercept; and ε_{if} is an idiosyncratic error term. Standard errors are clustered at the twin-pair level.

To more tightly address selection on shared family background and genetic factors, we estimate within-twin fixed-effects (pair FE) models. These specifications absorb all time-invariant characteristics shared by twins—including shared genes and early family environment—such that identification comes from within-pair differences in parenting engagement, parenting style, and parental status. We estimate separate within-pair models for each parenting construct. Although these models provide stronger control for unobserved confounding, statistical power is more limited because identification relies exclusively on within-pair discordance.

To examine dynamic changes in well-being around the transition to first birth, we estimate individual fixed-effects panel models in an event-study framework. Event time is defined relative to the year preceding the first birth (reference category), with leads and lags grouped at the tails to stabilize estimates. Calendar year fixed effects are included to account for common time shocks, and standard errors are clustered at the twin-pair level. These models capture within-person changes in GLS over time and complement the cross-sectional and co-twin analyses.

To assess cross-generational associations, we estimate mixed-effects models of children's global, cognitive, and social development. These models include nested random intercepts at the twin-pair (family) and child levels to account for the hierarchical structure of the data. Parenting style dimensions are the main predictors, controlling for child sex (44% female, 56% male) and child age, with the latter measured at Wave 7 when the CoT dataset was collected ($M = 5.61$, $SD = 1.98$, range: 4–11 years in the final analytical sample).

To assess where explanatory power arises, we report the between-family variance component (σ_u^2) and the within-family (idiosyncratic) variance (σ_ε^2), alongside marginal R^2 (variance explained by fixed effects) and conditional R^2 (variance explained by both fixed and random effects). This decomposition allows us to evaluate whether parenting operates primarily through between-family differences or through individual-specific pathways. If parenting quality is behaviorally salient, the inclusion of engagement and parenting style should primarily reduce within-family variance and increase marginal R^2, particularly for the burden/stress outcome, while leaving part of the between-family heterogeneity intact.

3 Results

Guided by our conceptual framework, we first examine whether the association between parental status and well-being survives comparisons that account for shared genetic and family background. We then test whether parenting practices—the behavioural enactment of

the parental role—are more strongly associated with parental well-being than parental status itself. Finally, we examine whether these same behavioural dimensions predict children's developmental outcomes, consistent with a household production framework.

3.1 Parenthood status and well-being.

Figure 2 contrasts adjusted cross-sectional estimates with within-twin fixed-effects estimates for parenthood status. In cross-sectional models, being a parent is positively associated with GLS (Table S1). However, this association attenuates substantially and becomes statistically indistinguishable from zero under within-twin comparisons (Table S2), suggesting that the cross-sectional parenthood premium likely reflects selection on shared family background or genetic factors rather than a causal effect of becoming a parent. Consistent with this interpretation, the variance decomposition indicates that parental status explains only a small share of the overall variation in well-being (Table S3).

To probe dynamic patterns around the transition to parenthood, we estimate individual fixed-effects event-study models of GLS relative to the year before first birth (Table S4). We find no evidence of significant anticipatory changes in life satisfaction prior to childbirth. The year of birth shows a small and statistically insignificant increase. Beginning one year after birth, GLS rises significantly relative to the pre-birth baseline ($b = 0.39$, $p = 0.002$), with positive effects persisting for up to six years before attenuating thereafter.

Gender-stratified trajectories are shown in Figure 3. Among women, life satisfaction increases modestly in the first two years after birth but fades over time. Among men, GLS is significantly lower several years prior to birth and rises sharply at the transition to parenthood, with gains that remain larger and more persistent than those observed for women. Because the estimates account for calendar-year effects, the observed increases are net of common temporal shocks affecting individuals observed in event time. In the male sample, where GLS exhibits a declining trend over time within this group, fatherhood is associated with higher GLS relative to this trajectory. Overall, short-run improvements in life satisfaction appear for both sexes, whereas longer-run gains are primarily experienced by men.

As a robustness check, we re-estimated the event-study models using within-twin fixed-effects specifications (Table S5). These estimates are underpowered because identification at each event-time level relies on a limited number of twin pairs contributing within-pair variation (on average, approximately 54 pairs in the full sample, 19 among males, and 35 among females). Nevertheless, the direction of the coefficients aligns with the main results.

3.2 Parental engagement and well-being.

Figure 2 summarizes the associations between parenting practices and parental well-being. Higher parental engagement is associated with higher GLS and lower perceived burden in baseline models (Tables S6, S7–S8). After adjusting for covariates, the association with GLS attenuates and becomes statistically insignificant, whereas the protective association with

EBI remains robust. Variance component analyses indicate that adding engagement reduces residual variance and improves model fit (Table S3).

Within-twin estimates provide little evidence of meaningful within-pair differences in GLS. In contrast, coefficients for EBI suggest that higher engagement may buffer parenting-related stress within families, although estimates are imprecise (Table S9). Taken together, these results indicate that parental engagement is more strongly linked to stress processes than to global life satisfaction.

3.3 Parenting style.

Parenting style exhibits the strongest and most consistent associations with parental well-being (Figure 2). Emotional warmth is robustly linked to higher GLS and lower EBI, whereas inconsistent parenting is associated with elevated stress (Tables S10, S11, S12). Psychological control and negative communication display weaker and less stable patterns. A composite index contrasting positive and negative parenting yields similar results (Table S13).

Variance decomposition confirms that parenting style meaningfully improves explanatory power (Table S14). Figure 4 visualizes how the inclusion of parenting constructs primarily compresses within-family heterogeneity. Within-twin models indicate that psychological control is negatively associated with GLS and that inconsistent parenting predicts higher EBI, although confidence intervals remain wide (Table S15). Overall, these findings suggest that the quality of parenting—more than parental status—constitutes the most behaviorally salient correlate of parental well-being.

3.4 Parenting style and children's cognitive and social development.

We next examine whether parenting style is associated with children's developmental outcomes using several mixed-effects models with nested random intercepts at the twin-pair and child levels. Across specifications, parental monitoring is consistently associated with more favorable developmental outcomes, whereas negative parenting dimensions are associated with worse outcomes.

For global development, parental monitoring is positively associated with children's scores (B = 0.34, p = 0.004), whereas inconsistent parenting (B = -0.20, p = 0.036), and negative communication (B = -0.30, p = 0.004) are negatively associated (Table S16). The composite index of positive parenting positively predicts global development (B = 0.49, p = 0.009), whereas negative parenting predicts lower levels of development in children (B = -0.32, p = 0.013).

For cognitive development, monitoring remains positively associated (B = 0.34, p = 0.010), as well as positive parenting (B = 0.55, p = 0.009), while negative communication (B = -0.35, p = 0.007) and negative parenting (B = -0.37, p = 0.019) predict lower scores (Table S17). For social development, parental monitoring is again positively associated (B = 0.33, p =

0.016), while negative communication is marginally negatively related (Table S18).

As a robustness check, we re-estimated these models using within-twin fixed-effects specifications (Tables S19, S20, S21). Although statistically underpowered due to the limited number of twin pairs (9) with children, the direction of the estimates mirrors the main results.

4 Conclusions

Our findings suggest that differences in caregiving behaviours provide a useful framework for understanding heterogeneity in the association between parenthood and parental well-being, beyond parental status alone. Across analyses, the apparent association between parenthood and well-being weakens substantially once shared family background is accounted for, whereas parenting practices remain consistently associated with parenting-specific well-being and children's development.

In contrast, parenting practices—and particularly parenting style—emerge as more behaviorally salient correlates of parental well-being. These findings are consistent with the interpretation that parenting quality represents an important behavioural input associated with both parental well-being and children's development. Emotional warmth and consistency are robustly associated with lower parenting-related stress, while inconsistent and psychologically controlling practices predict greater perceived burden. Associations with global life satisfaction are more modest and less stable under within-twin comparisons, indicating that parenting practices are more closely linked to stress processes proximal to caregiving than to broader life evaluations.

Several limitations should be acknowledged. First, although the co-twin control design substantially reduces confounding arising from shared genetic and family background, the analyses remain observational and cannot completely exclude residual confounding from non-shared environmental factors or reverse causation. Second, parenting practices and parental well-being were measured contemporaneously, limiting conclusions about the temporal ordering of these associations. Third, several within-twin analyses, particularly those involving parenting practices and children's outcomes, relied on relatively small numbers of discordant twin pairs and should therefore be interpreted cautiously. Finally, because the study is based on German families, replication in other institutional and cultural contexts will be important to assess the generalizability of these findings.

Variance decomposition analyses further show that parenting style explains a nontrivial share of individual-specific variation in well-being beyond stable family-level traits. The fact that explanatory power arises primarily through within-family, nonshared pathways suggests that parenting practices operate at the level of individual experiences rather than reflecting fixed family environments alone. Importantly, this implies that policies aimed at supporting parents need not operate exclusively at the level of families or inherited social conditions, but can effectively target individual parents' practices and caregiving contexts. This pattern reinforces the interpretation of parenting quality as a potentially malleable margin, shaped by situational factors and day-to-day interactions rather than predetermined by background

characteristics.

From a policy perspective, these findings shift attention away from parenthood status per se toward interventions that support positive parenting practices. Programs and environments that foster emotional warmth, consistency, and constructive communication may reduce parenting-related stress and improve parents' psychological functioning, even if they do not substantially alter overall life satisfaction. Our cross-generational analyses are consistent with this interpretation, showing that more supportive parenting profiles are also associated with more favorable child developmental outcomes, although these associations should be interpreted cautiously given limited within-family power.

By moving beyond parental status to the behavioral content of parenting, this study offers a more precise and actionable framework for understanding the parenthood–well-being relationship. Rather than focusing exclusively on whether parenthood itself is associated with greater well-being, our findings suggest that variation in how parents engage with their children may explain an important share of the heterogeneity reported in the literature, particularly for parenting-related stress. These findings are consistent with the view that parenting constitutes the behavioural mechanism through which parenthood shapes family welfare.

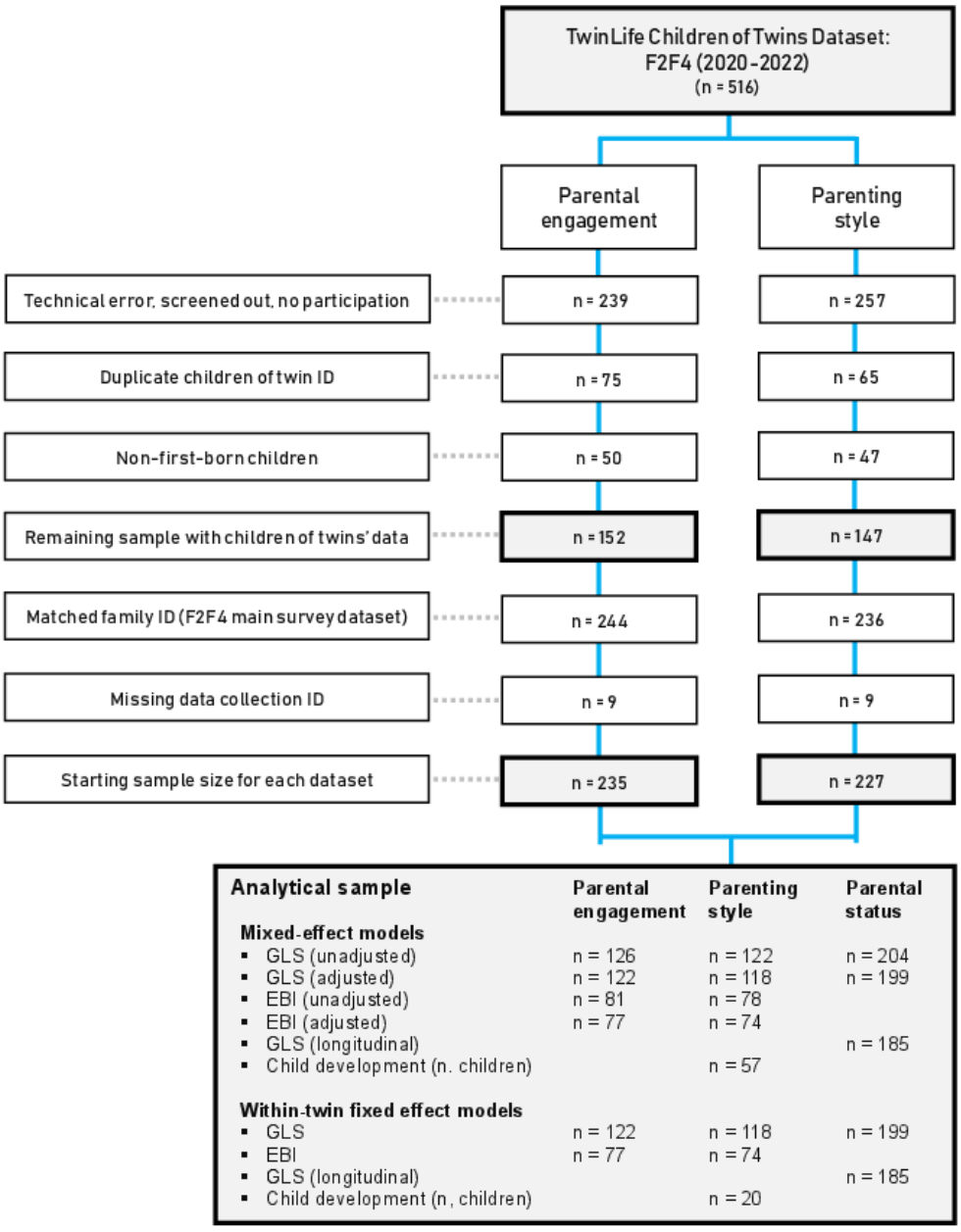


Figure 1: Data processing and analytical samples Flowchart of data cleaning, sample selection, and final analytical sample sizes. The top panel details the stepwise exclusion criteria (e.g., technical errors, duplicates, and birth-order restrictions) applied to the initial dataset to establish the baseline samples for parental engagement and parenting style. The bottom panel specifies the final sample sizes (n) utilized across the various mixed-effect and within-twin fixed-effect models. Sample sizes vary across analyses depending on data availability and the independent variable of interest; analyses focusing on parental status incorporate counterpart twins when available, resulting in larger sample sizes than those restricted strictly to parenting behaviors. The sample size for the analyses on child development refers to the number of children included in the models.

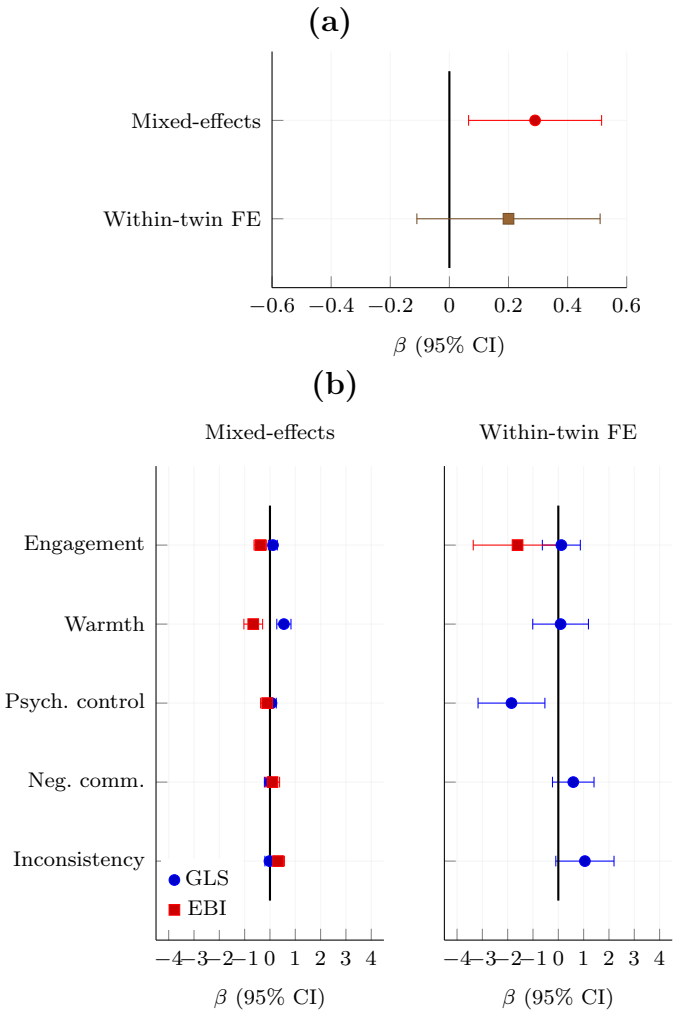


Figure 2: Parenthood, parenting practices, and parental well-being. Points are β coefficients; horizontal bars indicate 95% confidence intervals. Within-twin FE estimates for EBI are not shown for parenting style subscales because there was no within-pair variation.

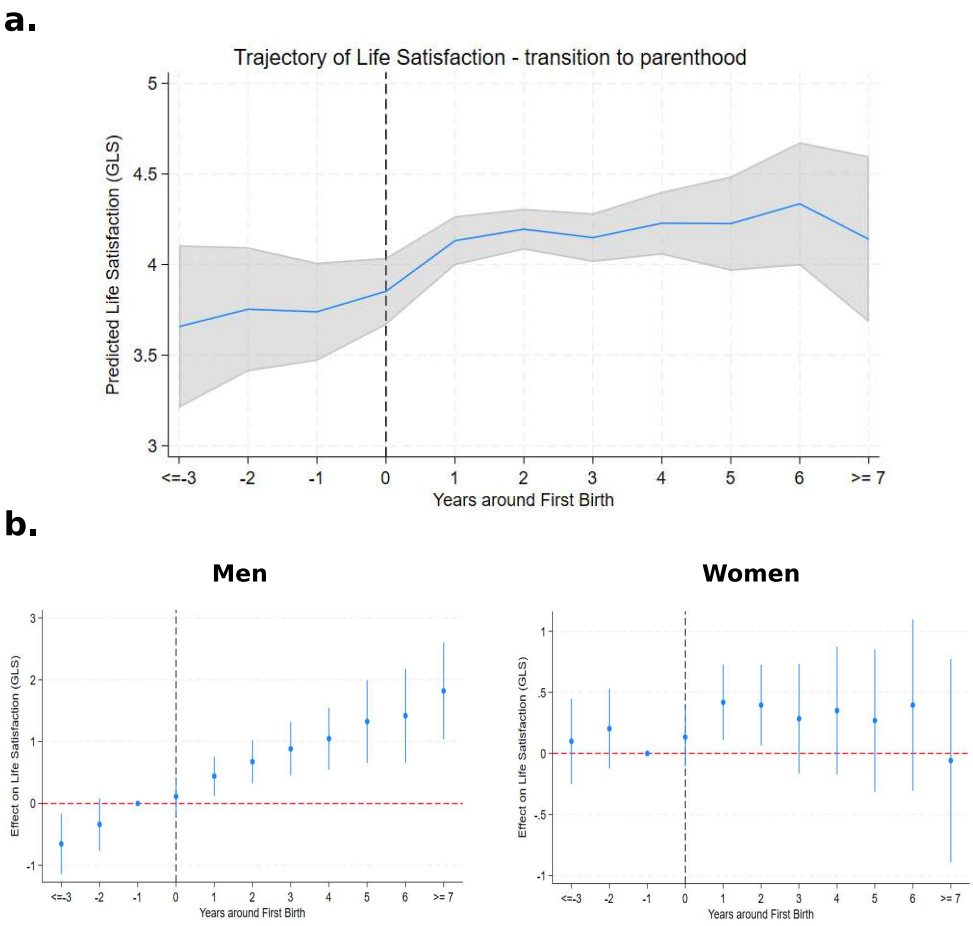


Figure 3: Changes in global life satisfaction (GLS) around the transition to parenthood. a). Estimated trajectory of GLS before and after the first child birth after controlling for baseline temporal effects. The gray area represents 95% CI. b) Separate effects of transition to parenthood (beta coefficients, one year before birth as reference level) for men and women separately. Vertical lines indicate 95% CI.

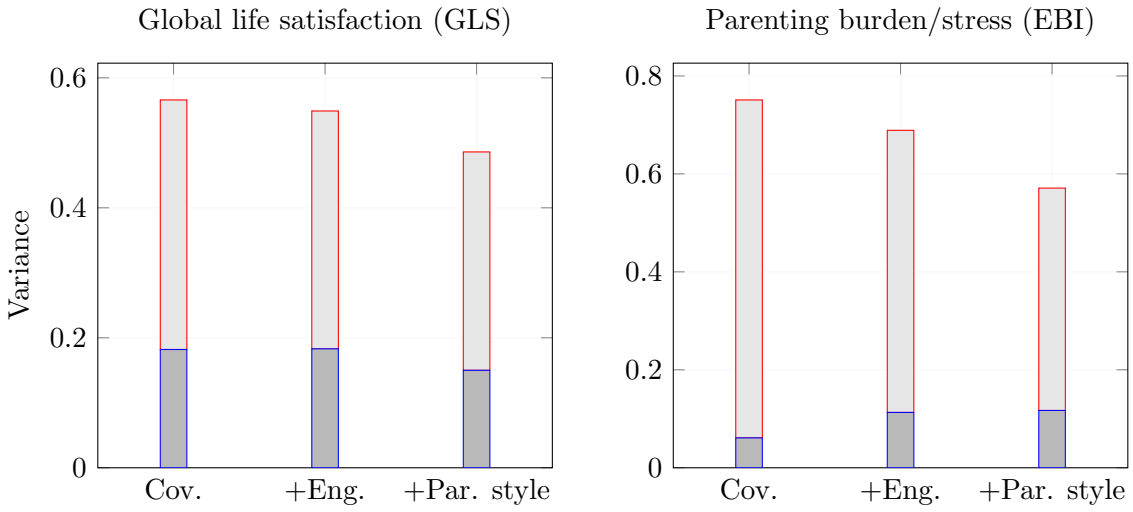


Figure 4: Variance decomposition of parental well-being models (Tables S4–S5). Stacked bars report between-family variance ($Var(u_f)$, blu) and within-family variance ($Var(\varepsilon)$, orange). Adding parenting constructs primarily reduces within-family heterogeneity, especially for parenting-related stress (EBI), indicating that parenting quality operates mainly through individual-specific pathways rather than shared family background.

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Ethics approval

This study is a secondary analysis of data from the German TwinLife Study and did not involve the collection of new data from human participants. The TwinLife Study received ethical approval from the Ethics Committee of the German Psychological Association (protocol numbers RR 11.2009 and RR 09.2013). All participants, and parents or legal guardians of participating children where applicable, provided informed consent prior to participation. All procedures in the original study were conducted in accordance with the relevant ethical guidelines and regulations. The analyses presented here were conducted using pseudonymised data obtained through the TwinLife data access procedures.

Data availability

The data analysed during the current study are available from the TwinLife Study (https://www.twin-life.de) under a data use agreement. The data are not publicly available because access is restricted by the TwinLife consortium but are available to qualified researchers upon reasonable request and subject to the TwinLife data access procedures.

Use of generative artificial intelligence

Generative artificial intelligence tools were used during the preparation of this manuscript to support language editing, improve clarity and flow, and assist with the organization of the argument. These tools were not used to generate the empirical analyses, derive the results, or make substantive decisions regarding the study design, data construction, model specification, or interpretation of findings. All AI-assisted text was reviewed, edited, and approved by the authors, who take full responsibility for the content of the manuscript.

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Supplementary Materials

Table S1: Relationship between being a parent and global life satisfaction

	Global life satisfaction	
	Unadjusted	Adjusted
Being a parent, β (95% CI), p	0.37 (0.17 to 0.58), <0.001	0.29 (0.06 to 0.51), 0.014
Covariates (Adjusted model)		
Female (vs. male), β (95% CI), p		-0.08 (-0.31 to 0.16), 0.538
Age (years)		0.03 (-0.03 to 0.09), 0.304
Western federal state (vs. Eastern)		0.06 (-0.24 to 0.36), 0.707
Community: 20,000–99,999 (vs. 1–19,999)		-0.10 (-0.41 to 0.20), 0.506
Community: 100,000–499,999		0.14 (-0.16 to 0.43), 0.363
Community: 500,000+		0.01 (-0.28 to 0.31), 0.921
Household size		0.10 (-0.02 to 0.23), 0.100
Education: Intermediate (vs. Elementary)		0.35 (-0.24 to 0.94), 0.243
Education: Maturity		0.20 (-0.38 to 0.77), 0.509
Education: Tertiary		0.60 (0.01 to 1.18), 0.047
Net equiv. income		0.00 (0.00 to 0.00), <0.001
Dizygotic (vs. monozygotic)		-0.15 (-0.38 to 0.08), 0.203

Table S2: Relationship between being a parent and global life satisfaction (within-twin fixed effects)

	Global life satisfaction β (95% CI), p
Being a parent	0.20 (-0.11 to 0.51), 0.205
Federal state	
Western federal state	0.36 (-0.87 to 1.60), 0.561
Community size	
20,000 to 99,999	-0.27 (-0.94 to 0.39), 0.415
100,000 to 499,999	-0.05 (-0.54 to 0.45), 0.848
500,000 or more	0.02 (-0.61 to 0.65), 0.953
Household size	0.17 (-0.04 to 0.38), 0.108
Education	
Intermediate	0.07 (-1.15 to 1.30), 0.904
Maturity	-0.34 (-1.73 to 1.04), 0.622
Tertiary	-0.02 (-1.41 to 1.38), 0.982
Income (net eq.)	0.00 (-0.00 to 0.00), 0.188

Table S3: Variance components (parental engagement and being a parent as predictors)

	GLS ∼ covariates / + engagement		EBI ∼ covariates / + engagement		GLS ∼ covariates / + being a parent	
	Model 1A	Model 1B	Model 2A	Model 2B	Model 3A	Model 3B
Var(u)	0.182	0.183	0.061	0.113	0.072	0.065
Var(e)	0.384	0.366	0.690	0.576	0.461	0.452
Proportion change in variance (%)	—	4.860	—	16.575	—	2.006
R^2 (conditional)	0.436	0.463	0.238	0.371	0.318	0.330
R^2 (marginal)	0.170	0.195	0.171	0.249	0.212	0.234

Model 1A/1B: GLS with/without parental engagement.
Model 2A/2B: EBI with/without parental engagement.
Model 3A/3B: GLS with/without being a parent.

Table S4: Changes in global life satisfaction around the transition to parenthood. Reference level for years to first child birth: -1. Reference level for calendar year: 2015.

	GLS β (95% CI), p		
	All	Males	Females
Years to first child birth			
Years $\leq$ -3 (pre-birth)	-0.08 (-0.38 to 0.22), 0.589	-0.65 (-1.14 to -0.16), 0.010	0.10 (-0.25 to 0.45), 0.572
-2 years	0.01 (-0.25 to 0.28), 0.916	-0.34 (-0.76 to 0.08), 0.114	0.20 (-0.12 to 0.53), 0.220
0 (year of birth)	0.11 (-0.08 to 0.31), 0.253	0.11 (-0.20 to 0.43), 0.480	0.13 (-0.11 to 0.37), 0.272
+1 year	0.39 (0.15 to 0.63), 0.002	0.44 (0.12 to 0.76), 0.007	0.42 (0.11 to 0.73), 0.008
+2 years	0.46 (0.18 to 0.73), 0.001	0.68 (0.33 to 1.02), <0.001	0.40 (0.07 to 0.73), 0.019
+3 years	0.41 (0.06 to 0.76), 0.024	0.88 (0.45 to 1.31), <0.001	0.28 (-0.16 to 0.73), 0.210
+4 years	0.49 (0.08 to 0.90), 0.019	1.05 (0.55 to 1.55), <0.001	0.35 (-0.17 to 0.87), 0.185
+5 years	0.49 (0.00 to 0.97), 0.043	1.32 (0.66 to 1.99), <0.001	0.27 (-0.31 to 0.85), 0.362
+6 years	0.60 (0.02 to 1.17), 0.043	1.42 (0.66 to 2.18), <0.001	0.40 (-0.31 to 1.10), 0.265
Years $\geq$ +7	0.40 (-0.29 to 1.10), 0.257	1.82 (1-04 to 2.60),<0.001	-0.06 (-0.89 to 0.77), 0.889
Calendar year			
2016	0.15 (-0.12 to 0.41), 0.274	0.02 (-0.38 to 0.41), 0.934	0.25 (-0.12 to 0.62), 0.185
2017	0.30 (-0.03 to 0.63), 0.076	-0.19 (-0.64 to 0.25), 0.389	0.53 (-0.12 to 0.95), 0.012
2018	-0.08 (-0.50 to 0.33), 0.692	-0.46 (-0.98 to 0.06), 0.082	NA
2019	-0.01 (-0.37 to 0.35), 0.952	-0.76 (-1.21 to -0.30), 0.002	0.29 (-0.18 to 0.76), 0.228
2020	-0.19 (-0.61 to 0.24), 0.388	-0.98 (-1.50 to -0.46), <0.001	0.12 (-0.43 to 0.67), 0.665
2021	-0.17 (-0.65 to 0.30), 0.470	-1.07 (-1.56 to -0.57), <0.001	0.16 (-0.44 to 0.76), 0.599
2022	-0.27 (-0.80 to 0.27), 0.332	-1.19 (-1.78 to -0.61), <0.001	0.05 (-0.63 to 0.74), 0.877
2023	-0.39 (-0.99 to 0.22), 0.209	-1.71 (-2.45 to -0.98), <0.001	0.06 (-0.71 to 0.84), 0.869
2024	-0.43 (-1.15 to 0.28), 0.232	-1.90 (-2.63 to -1.17), <0.001	0.12 (-0.77 to 1.01), 0.787

Table S5: Changes in global life satisfaction around the transition to parenthood - within-twin FE. Reference level for years to first child birth: -1. Reference level for calendar year: 2015.

	GLS β (95% CI), p		
	All	Males	Females
Years to first child birth			
Years $\leq$ -3 (pre-birth)	0.15 (-0.19 to 0.49), 0.386	-0.21 (-0.87 to 0.46), 0.536	0.24 (-0.14 to 0.62), 0.217
-2 years	0.07 (-0.22 to 0.36), 0.638	-0.22 (-0.75 to 0.31), 0.414	0.20 (-0.13 to 0.53), 0.233
0 (year of birth)	0.08 (-0.12 to 0.28), 0.440	-0.04 (-0.41 to 0.32), 0.814	0.12 (-0.15 to 0.39), 0.375
+1 year	0.32 (0.09 to 0.55), 0.008	0.20 (-0.17 to 0.57), 0.287	0.38 (0.07 to 0.69), 0.017
+2 years	0.28 (-0.00 to 0.56), 0.051	0.20 (-0.33 to 0.72), 0.454	0.31 (-0.04 to 0.66), 0.078
+3 years	0.17 (-0.18 to 0.52), 0.345	0.31 (-0.22 to 0.85), 0.241	0.14 (-0.33 to 0.61), 0.548
+4 years	0.19 (-0.22 to 0.60), 0.351	0.33 (-0.29 to 0.96), 0.290	0.19 (-0.36 to 0.74), 0.500
+5 years	0.15 (-0.36 to 0.66), 0.557	0.48 (-0.36 to 1.32), 0.255	0.10 (-0.56 to 0.75), 0.765
+6 years	0.15 (-0.47 to 0.77), 0.628	0.44 (-0.41 to 1.30), 0.303	0.12 (-0.71 to 0.95), 0.769
Years $\geq$ +7	-0.08 (-0.87 to 0.70), 0.834	0.56 (-0.42 to 1.54), 0.259	-0.24 (-1.26 to 0.77), 0.636
Calendar year			
2016	0.20 (-0.09 to 0.48), 0.181	0.11 (-0.33 to 0.55), 0.615	0.29 (-0.10 to 0.68), 0.149
2017	0.42 (0.07 to 0.77), 0.019	0.09 (-0.52 to 0.60), 0.778	0.59 (0.17 to 1.01), 0.007
2018	NA	NA	NA
2019	0.23 (-0.16 to 0.62), 0.241	-0.18 (-0.86 to 0.49), 0.589	0.41 (-0.07 to 0.88), 0.090
2020	0.11 (-0.34 to 0.56), 0.630	-0.27 (-1.07 to 0.52), 0.493	0.28 (-0.27 to 0.83), 0.320
2021	0.18 (-0.29 to 0.66), 0.446	-0.19 (-1.01 to 0.62), 0.636	0.34 (-0.24 to 0.92), 0.250
2022	0.15 (-0.41 to 0.71), 0.605	-0.23 (-1.22 to 0.75), 0.638	0.27 (-0.40 to 0.94), 0.432
2023	-0.08 (-0.58 to 0.74), 0.814	-0.60 (-1.71 to 0.52), <0.001	0.30 (-0.51 to 1.10), 0.464
2024	0.08 (-0.63 to 0.78), 0.830	-0.65 (-1.86 to -0.56), 0.288	0.35 (-0.49 to 1.20), 0.411

Table S6: Relationship between parental engagement and subjective perception of quality of life

	Global life satisfaction				Burden and stress related to parenthood			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Parental engagement	0.23 (0.06 to 0.39)	0.008	0.12 (-0.05 to 0.30)	0.173	-0.31 (-0.54 to -0.08)	0.007	-0.38 (-0.63 to -0.13)	0.003
Covariates (Adjusted models)								
Female (vs. male)			-0.02 (-0.31 to 0.28)	0.912			0.48 (0.01 to 0.96)	0.045
Age (years)			0.06 (-0.01 to 0.14)	0.095			0.04 (-0.13 to 0.20)	0.665
Western federal state (vs. Eastern)			0.01 (-0.35 to 0.37)	0.942			0.11 (-0.36 to 0.58)	0.651
Community: 20,000–99,999 (vs. 1–19,999)			0.08 (-0.28 to 0.45)	0.660			-0.72 (-1.25 to -0.20)	0.007
Community: 100,000–499,999			0.07 (-0.28 to 0.41)	0.712			-0.29 (-0.78 to 0.20)	0.240
Community: 500,000+			-0.05 (-0.40 to 0.31)	0.789			-0.63 (-1.19 to -0.06)	0.029
Household size			-0.00 (-0.16 to 0.16)	0.997			-0.16 (-0.39 to 0.07)	0.184
Education: Intermediate (vs. Elementary)			0.45 (-0.35 to 1.25)	0.273			-0.13 (-1.25 to 0.98)	0.814
Education: Maturity			0.43 (-0.38 to 1.24)	0.296			0.60 (-0.55 to 1.75)	0.304
Education: Tertiary			0.80 (-0.01 to 1.62)	0.052			0.19 (-0.95 to 1.32)	0.745
Net equiv. income			0.00 (-0.00 to 0.00)	0.157			-0.00 (-0.00 to 0.00)	0.083
Dizygotic (vs. monozygotic)			-0.18 (-0.46 to 0.10)	0.215			0.38 (-0.03 to 0.78)	0.067

Table S7: Relationship between parental engagement and global life satisfaction

	Model 1		Model 2		Model 3		Model 4		Model 5	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
PE	0.23 (0.06 to 0.40)	0.009	0.12 (-0.06 to 0.31)	0.196	0.12 (-0.21 to 0.44)	0.480	0.55 (-0.25 to 1.36)	0.176	0.08 (-0.29 to 0.46)	0.666
Sex										
Female			-0.02 (-0.33 to 0.30)	0.919	-0.05 (-1.46 to 1.37)	0.950	-0.01 (-0.32 to 0.31)	0.974	-0.04 (-0.36 to 0.27)	0.782
Age			0.06 (-0.02 to 0.14)	0.116	0.06 (-0.02 to 0.14)	0.122	0.05 (-0.03 to 0.13)	0.225	0.08 (-0.00 to 0.16)	0.061
Federal state										
Western federal state			0.01 (-0.37 to 0.40)	0.940	0.01 (-0.37 to 0.40)	0.945	0.01 (-0.37 to 0.39)	0.945	0.01 (-0.38 to 0.39)	0.967
Community size										
20,000 to 99,999			0.08 (-0.31 to 0.47)	0.686	0.08 (-0.31 to 0.47)	0.688	0.11 (-0.27 to 0.50)	0.572	0.05 (-2.01 to 2.10)	0.965
100,000 to 499,999			0.06 (-0.31 to 0.43)	0.740	0.06 (-0.31 to 0.43)	0.742	0.06 (-0.31 to 0.42)	0.765	-1.44 (-3.63 to 0.74)	0.195
500,000 or more			-0.05 (-0.43 to 0.33)	0.797	-0.05 (-0.43 to 0.33)	0.800	-0.05 (-0.43 to 0.33)	0.810	0.11 (-1.63 to 1.84)	0.903
Household size			-0.00 (-0.17 to 0.17)	0.997	0.00 (-0.18 to 0.18)	0.996	0.00 (-0.17 to 0.17)	0.991	-0.03 (-0.21 to 0.15)	0.717
Education										
Intermediate			0.45 (-0.41 to 1.31)	0.305	0.45 (-0.41 to 1.31)	0.308	2.34 (-0.42 to 5.10)	0.097	0.44 (-0.43 to 1.30)	0.322
Maturity			0.43 (-0.43 to 1.29)	0.329	0.43 (-0.44 to 1.30)	0.331	0.71 (-2.15 to 3.58)	0.626	0.40 (-0.47 to 1.27)	0.368
Tertiary			0.80 (-0.07 to 1.66)	0.070	0.80 (-0.07 to 1.67)	0.072	2.47 (-0.30 to 5.25)	0.081	0.79 (-0.08 to 1.66)	0.076
Income (net eq.)			0.00 (-0.00 to 0.00)	0.183	0.00 (-0.00 to 0.00)	0.188	0.00 (-0.00 to 0.00)	0.145	0.00 (-0.00 to 0.00)	0.234
Zygosity										
Dizygotic			-0.18 (-0.48 to 0.12)	0.242	-0.18 (-0.48 to 0.12)	0.244	-0.20 (-0.50 to 0.10)	0.189	-0.17 (-0.47 to 0.14)	0.280
Interactions										
Female × PE					0.01 (-0.38 to 0.39)	0.967				
Intermediate × PE							-0.61 (-1.47 to 0.26)	0.170		
Maturity × PE							-0.16 (-1.04 to 0.72)	0.721		
Tertiary × PE							-0.53 (-1.38 to 0.33)	0.228		
20,000–99,999 × PE									0.01 (-0.53 to 0.54)	0.983
100,000–499,999 × PE									0.41 (-0.17 to 0.99)	0.162
500,000+ × PE									-0.05 (-0.50 to 0.40)	0.831

Model 1: Unadjusted; Model 2: Adjusted; Model 3: Adjusted + Sex×Engagement; Model 4: Adjusted + Education×Engagement;
Model 5: Adjusted + Community size×Engagement. Reference categories: Male; Eastern federal state; Community size 1–19,999; Elementary education; Monozygotic twins.

Table S8: Relationship between parental engagement and burden and stress related to parenthood

	Model 1		Model 2		Model 3		Model 4		Model 5	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Parental engagement	-0.31 (-0.55 to -0.08)	0.008	-0.38 (-0.66 to -0.11)	0.006	-0.00 (-0.52 to 0.51)	0.985	-0.42 (-1.51 to 0.66)	0.447	-0.60 (-1.12 to -0.09)	0.021
Sex										
Female			0.48 (-0.05 to 1.00)	0.073	2.19 (0.13 to 4.25)	0.037	0.48 (-0.06 to 1.02)	0.082	0.47 (-0.06 to 0.99)	0.083
Age			0.04 (-0.14 to 0.22)	0.689	0.06 (-0.12 to 0.24)	0.520	0.04 (-0.15 to 0.22)	0.696	0.06 (-0.12 to 0.25)	0.490
Federal state										
Western federal state			0.12 (-0.41 to 0.64)	0.662	0.20 (-0.33 to 0.72)	0.461	0.10 (-0.44 to 0.64)	0.714	0.17 (-0.35 to 0.69)	0.526
Community size										
20,000 to 99,999			-0.72 (-1.30 to -0.13)	0.016	-0.72 (-1.30 to -0.15)	0.014	-0.72 (-1.31 to -0.12)	0.018	-0.90 (-3.76 to 1.96)	0.537
100,000 to 499,999			-0.29 (-0.83 to 0.25)	0.287	-0.29 (-0.83 to 0.24)	0.279	-0.31 (-0.87 to 0.25)	0.272	-2.71 (-5.63 to 0.21)	0.069
500,000 or more			-0.63 (-1.26 to -0.01)	0.047	-0.66 (-1.27 to -0.04)	0.036	-0.65 (-1.30 to -0.01)	0.048	-1.78 (-4.08 to 0.53)	0.131
Household size			-0.15 (-0.41 to 0.11)	0.251	-0.24 (-0.51 to 0.03)	0.085	-0.15 (-0.41 to 0.12)	0.276	-0.19 (-0.45 to 0.07)	0.158
Education										
Intermediate			-0.13 (-1.38 to 1.12)	0.840	-0.07 (-1.29 to 1.15)	0.911	-0.01 (-3.75 to 3.73)	0.996	-0.05 (-1.31 to 1.21)	0.935
Maturity			0.61 (-0.68 to 1.89)	0.355	0.66 (-0.59 to 1.92)	0.301	0.00 (-4.11 to 4.11)	1.000	0.57 (-0.74 to 1.88)	0.391
Tertiary			0.21 (-1.06 to 1.48)	0.750	0.28 (-0.96 to 1.53)	0.654	0.00 (-3.83 to 3.84)	0.999	0.24 (-1.04 to 1.53)	0.713
Income (net eq.)			-0.00 (-0.00 to 0.00)	0.125	-0.00 (-0.00 to 0.00)	0.144	-0.00 (-0.00 to 0.00)	0.140	-0.00 (-0.00 to 0.00)	0.092
Zygosity										
Dizygotic			0.37 (-0.08 to 0.82)	0.104	0.36 (-0.08 to 0.80)	0.110	0.38 (-0.08 to 0.83)	0.107	0.43 (-0.02 to 0.89)	0.059
Interactions										
Female × Parental engagement					-0.49 (-1.07 to 0.08)	0.093				
Intermediate × Parental engagement							-0.04 (-1.21 to 1.13)	0.948		
Maturity × Parental engagement							0.17 (-1.05 to 1.39)	0.790		
Tertiary × Parental engagement							0.06 (-1.12 to 1.23)	0.924		
20,000–99,999 × Parental engagement									0.04 (-0.70 to 0.79)	0.908
100,000–499,999 × Parental engagement									0.66 (-0.12 to 1.45)	0.098
500,000+ × Parental engagement									0.32 (-0.30 to 0.94)	0.315

Model 1: Unadjusted; Model 2: Adjusted; Model 3: Adjusted + Sex×Engagement; Model 4: Adjusted + Education×Engagement;
Model 5: Adjusted + Community size×Engagement. Reference categories as in Table S7.

Table S9: Relationship between parental engagement and subjective perception of quality of life (within-twin fixed effects)

	Global life satisfaction β (95% CI), p	Burden & stress related to parenthood β (95% CI), p
Parental engagement	0.12 (-0.63 to 0.87), 0.716	-1.61 (-3.36 to 0.13), 0.058
Federal state		
Western federal state	0.08 (-3.16 to 3.31), 0.958	—
Community size		
20,000 to 99,999	-0.12 (-2.15 to 1.91), 0.896	-10.02 (-22.61 to 2.56), 0.076
100,000 to 499,999	0.20 (-1.49 to 1.90), 0.790	-3.37 (-9.20 to 2.45), 0.130
500,000 or more	0.52 (-2.11 to 3.16), 0.658	-19.82 (-44.75 to 5.10), 0.076
Household size	0.22 (-0.74 to 1.19), 0.608	2.58 (-0.64 to 5.79), 0.075
Education		
Intermediate	0.02 (-1.29 to 1.32), 0.975	-2.53 (-6.64 to 1.57), 0.117
Maturity	0.64 (-1.70 to 2.99), 0.545	-7.35 (-18.46 to 3.77), 0.105
Income (net eq.)	-0.00 (-0.00 to 0.00), 0.978	0.00 (-0.00 to 0.01), 0.547

Table S10: Relationship between parenting style and subjective perception of quality of life

	Global life satisfaction				Burden and stress related to parenthood			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Emotional warmth	0.51 (0.22 to 0.80)	0.001	0.55 (0.27 to 0.83)	¡0.001	-0.65 (-1.02 to -0.27)	0.001	-0.66 (-1.03 to -0.29)	¡0.001
Psychological control	0.10 (-0.10 to 0.29)	0.326	0.06 (-0.13 to 0.25)	0.539	-0.21 (-0.48 to 0.06)	0.128	-0.11 (-0.37 to 0.15)	0.410
Negative communication	0.05 (-0.17 to 0.28)	0.657	-0.00 (-0.22 to 0.22)	0.997	0.08 (-0.20 to 0.36)	0.584	0.10 (-0.18 to 0.38)	0.471
Inconsistent parenting	-0.13 (-0.32 to 0.06)	0.193	-0.02 (-0.20 to 0.17)	0.863	0.36 (0.11 to 0.61)	0.004	0.32 (0.08 to 0.57)	0.009
Covariates (Adjusted models)								
Female (vs. male)			-0.12 (-0.41 to 0.18)	0.434			0.42 (-0.04 to 0.88)	0.076
Age (years)			0.08 (0.01 to 0.15)	0.022			-0.04 (-0.18 to 0.11)	0.606
Western federal state (vs. Eastern)			-0.03 (-0.37 to 0.31)	0.862			0.20 (-0.23 to 0.62)	0.358
Community: 20,000–99,999 (vs. 1–19,999)			-0.01 (-0.35 to 0.34)	0.965			-0.55 (-1.04 to -0.06)	0.027
Community: 100,000–499,999			0.05 (-0.28 to 0.38)	0.776			0.03 (-0.41 to 0.48)	0.889
Community: 500,000+			-0.11 (-0.45 to 0.22)	0.505			-0.26 (-0.75 to 0.23)	0.299
Household size			-0.04 (-0.21 to 0.13)	0.633			-0.23 (-0.47 to 0.01)	0.058
Education: Intermediate (vs. Elementary)			0.55 (-0.22 to 1.32)	0.161			0.23 (-0.83 to 1.29)	0.670
Education: Maturity			0.45 (-0.33 to 1.22)	0.258			0.80 (-0.26 to 1.87)	0.139
Education: Tertiary			0.86 (0.09 to 1.63)	0.029			0.53 (-0.55 to 1.61)	0.335
Net equiv. income			0.00 (-0.00 to 0.00)	0.213			-0.00 (-0.00 to 0.00)	0.078
Dizygotic (vs. monozygotic)			-0.08 (-0.35 to 0.18)	0.549			0.11 (-0.26 to 0.49)	0.551

Table S11: Relationship between parenting style and global life satisfaction

	Model 1		Model 2		Model 3		Model 4		Model 5	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Emotional warmth	0.51 (0.21 to 0.81)	0.001	0.55 (0.24 to 0.86)	¡0.001	0.86 (0.24 to 1.47)	0.006	1.08 (-1.73 to 3.89)	0.451	0.49 (-0.11 to 1.09)	0.111
Psychological control	0.10 (-0.10 to 0.29)	0.335	0.06 (-0.15 to 0.26)	0.588	0.49 (0.09 to 0.89)	0.017	-1.59 (-9.30 to 6.12)	0.685	-0.02 (-0.38 to 0.33)	0.904
Negative communication	0.05 (-0.18 to 0.28)	0.664	0.00 (-0.23 to 0.24)	0.995	-0.25 (-0.81 to 0.30)	0.371	2.62 (-6.12 to 11.35)	0.557	-0.13 (-0.56 to 0.31)	0.568
Inconsistent parenting	-0.13 (-0.32 to 0.07)	0.202	-0.02 (-0.22 to 0.19)	0.869	-0.16 (-0.48 to 0.17)	0.340	0.05 (-0.31 to 0.42)	0.785	0.09 (-0.38 to 0.57)	0.701
Sex										
Female			-0.12 (-0.44 to 0.20)	0.466	2.20 (-1.64 to 6.04)	0.262	-0.10 (-0.43 to 0.23)	0.562	-0.18 (-0.52 to 0.16)	0.302
Age			0.08 (0.01 to 0.16)	0.034	0.08 (0.01 to 0.16)	0.028	0.11 (0.03 to 0.20)	0.007	0.08 (-0.00 to 0.16)	0.057
Federal state										
Western federal state			-0.03 (-0.39 to 0.34)	0.879	-0.01 (-0.37 to 0.35)	0.956	-0.03 (-0.39 to 0.32)	0.855	-0.03 (-0.41 to 0.35)	0.874
Community size										
20,000 to 99,999			-0.01 (-0.38 to 0.36)	0.959	-0.06 (-0.43 to 0.31)	0.745	0.05 (-0.34 to 0.43)	0.817	-3.52 (-8.04 to 0.99)	0.126
100,000 to 499,999			0.04 (-0.31 to 0.40)	0.810	0.09 (-0.26 to 0.45)	0.600	-0.04 (-0.40 to 0.31)	0.817	-0.06 (-4.26 to 4.14)	0.978
500,000 or more			-0.12 (-0.48 to 0.25)	0.526	-0.16 (-0.53 to 0.20)	0.383	-0.18 (-0.55 to 0.19)	0.336	0.17 (-4.27 to 4.61)	0.941
Household size			-0.04 (-0.22 to 0.14)	0.660	-0.02 (-0.21 to 0.16)	0.789	-0.09 (-0.27 to 0.10)	0.362	-0.05 (-0.23 to 0.14)	0.630
Education										
Intermediate			0.55 (-0.29 to 1.38)	0.197	0.51 (-0.33 to 1.36)	0.234	5.04 (-2.92 to 13.01)	0.215	0.41 (-0.45 to 1.26)	0.350
Maturity			0.44 (-0.39 to 1.28)	0.300	0.46 (-0.38 to 1.30)	0.282	-0.80 (-8.52 to 6.91)	0.838	0.35 (-0.51 to 1.20)	0.427
Tertiary			0.85 (0.02 to 1.68)	0.045	0.85 (-0.00 to 1.71)	0.051	5.04 (-2.52 to 12.60)	0.192	0.65 (-0.20 to 1.50)	0.136
Income (net eq.)			0.00 (-0.00 to 0.00)	0.248	0.00 (-0.00 to 0.00)	0.223	0.00 (-0.00 to 0.00)	0.500	0.00 (-0.00 to 0.00)	0.125
Zygosity										
Dizygotic			-0.08 (-0.37 to 0.20)	0.571	-0.08 (-0.37 to 0.20)	0.561	-0.03 (-0.32 to 0.27)	0.856	-0.13 (-0.43 to 0.17)	0.388
Interactions: Sex × style										
Female × Emotional warmth					-0.41 (-1.13 to 0.32)	0.270				
Female × Psychological control					-0.55 (-1.00 to -0.09)	0.018				
Female × Negative communication					0.31 (-0.31 to 0.93)	0.327				
Female × Inconsistent parenting					0.20 (-0.22 to 0.62)	0.360				
Interactions: Education × style										
Intermediate × Emotional warmth							-0.87 (-3.78 to 2.04)	0.559		
Maturity × Emotional warmth							0.27 (-2.63 to 3.18)	0.854		
Tertiary × Emotional warmth							-0.80 (-3.66 to 2.07)	0.586		
Intermediate × Psychological control							1.38 (-6.38 to 9.14)	0.728		
Maturity × Psychological control							1.70 (-6.01 to 9.41)	0.666		
Tertiary × Psychological control							1.70 (-6.01 to 9.42)	0.665		
Intermediate × Negative communication							-2.67 (-11.47 to 6.13)	0.552		
Maturity × Negative communication							-2.28 (-11.00 to 6.43)	0.608		
Tertiary × Negative communication							-2.87 (-11.58 to 5.84)	0.519		
Intermediate × Inconsistent parenting							0.23 (-0.36 to 0.82)	0.447		
Maturity × Inconsistent parenting							-0.20 (-0.68 to 0.27)	0.402		
Tertiary × Inconsistent parenting							—	—		
Interactions: Community size × style										
20,000–99,999 × Emotional warmth									0.62 (-0.28 to 1.51)	0.178
100,000–499,999 × Emotional warmth									0.17 (-0.68 to 1.01)	0.701
500,000+ × Emotional warmth									-0.15 (-1.00 to 0.70)	0.735
20,000–99,999 × Psychological control									0.47 (-0.06 to 1.00)	0.084
100,000–499,999 × Psychological control									0.02 (-0.57 to 0.61)	0.943
500,000+ × Psychological control									-0.16 (-0.71 to 0.39)	0.570
20,000–99,999 × Negative communication									-0.13 (-0.71 to 0.45)	0.660
100,000–499,999 × Negative communication									-0.00 (-0.89 to 0.89)	0.992
500,000+ × Negative communication									0.50 (-0.14 to 1.15)	0.127
20,000–99,999 × Inconsistent parenting									-0.19 (-0.81 to 0.43)	0.540
100,000–499,999 × Inconsistent parenting									-0.35 (-1.05 to 0.35)	0.328
500,000+ × Inconsistent parenting									-0.02 (-0.61 to 0.57)	0.944

Model notes as in Table S7. Reference categories as in Table S7.

Table S12: Relationship between parenting style and burden and stress related to parenthood

	Model 1		Model 2		Model 3		Model 4		Model 5	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Emotional warmth	-0.65 (-1.04 to -0.26)	0.001	-0.67 (-1.09 to -0.25)	0.002	-0.71 (-1.62 to 0.20)	0.127	-0.48 (-2.34 to 1.38)	0.612	-0.91 (-1.52 to -0.31)	0.003
Psychological control	-0.21 (-0.48 to 0.07)	0.142	-0.10 (-0.39 to 0.20)	0.511	-0.39 (-0.99 to 0.22)	0.212	-0.10 (-2.24 to 2.04)	0.926	0.06 (-0.34 to 0.47)	0.754
Negative communication	0.08 (-0.21 to 0.37)	0.597	0.09 (-0.22 to 0.41)	0.568	-0.11 (-0.91 to 0.69)	0.787	0.08 (-0.44 to 0.61)	0.752	0.15 (-0.31 to 0.61)	0.534
Inconsistent parenting	0.36 (0.11 to 0.62)	0.006	0.33 (0.05 to 0.61)	0.019	0.28 (-0.23 to 0.79)	0.279	0.12 (-0.40 to 0.65)	0.643	0.81 (0.27 to 1.36)	0.003
Sex										
Female			0.43 (-0.10 to 0.96)	0.108	-1.41 (-6.91 to 4.09)	0.615	0.63 (0.02 to 1.24)	0.041	0.36 (-0.27 to 1.00)	0.262
Age			-0.04 (-0.20 to 0.13)	0.662	-0.02 (-0.20 to 0.15)	0.777	-0.05 (-0.27 to 0.17)	0.663	0.03 (-0.17 to 0.23)	0.779
Federal state										
Western federal state			0.20 (-0.28 to 0.69)	0.417	0.20 (-0.30 to 0.69)	0.440	0.12 (-0.41 to 0.64)	0.667	0.26 (-0.27 to 0.80)	0.336
Community size										
20,000 to 99,999			-0.56 (-1.11 to 0.00)	0.052	-0.59 (-1.16 to -0.02)	0.042	-0.38 (-1.00 to 0.24)	0.228	-0.15 (-6.98 to 6.68)	0.965
100,000 to 499,999			0.03 (-0.48 to 0.53)	0.911	0.01 (-0.50 to 0.52)	0.977	0.06 (-0.49 to 0.61)	0.841	0.78 (-4.22 to 5.79)	0.759
500,000 or more			-0.26 (-0.82 to 0.31)	0.375	-0.22 (-0.80 to 0.36)	0.459	-0.27 (-0.87 to 0.32)	0.367	4.38 (-0.56 to 9.31)	0.082
Household size			-0.22 (-0.49 to 0.05)	0.114	-0.27 (-0.57 to 0.03)	0.075	-0.25 (-0.56 to 0.05)	0.098	-0.15 (-0.49 to 0.19)	0.380
Education										
Intermediate			0.21 (-1.00 to 1.43)	0.730	0.31 (-0.96 to 1.58)	0.631	-4.37 (-13.73 to 4.99)	0.360	0.18 (-1.26 to 1.62)	0.808
Maturity			0.80 (-0.43 to 2.03)	0.204	0.94 (-0.34 to 2.22)	0.151	2.07 (-7.42 to 11.56)	0.669	0.82 (-0.69 to 2.32)	0.288
Tertiary			0.53 (-0.71 to 1.77)	0.401	0.64 (-0.67 to 1.96)	0.335	2.26 (-6.26 to 10.79)	0.603	0.58 (-0.91 to 2.06)	0.445
Income (net eq.)			-0.00 (-0.00 to 0.00)	0.123	-0.00 (-0.00 to 0.00)	0.348	-0.00 (-0.00 to 0.00)	0.194	-0.00 (-0.00 to 0.00)	0.155
Zygosity										
Dizygotic			0.12 (-0.31 to 0.55)	0.580	0.16 (-0.28 to 0.61)	0.467	0.13 (-0.35 to 0.61)	0.586	0.04 (-0.47 to 0.55)	0.870
Interactions: Sex × style										
Female × Emotional warmth					-0.00 (-1.06 to 1.06)	1.000				
Female × Psychological control					0.45 (-0.23 to 1.13)	0.196				
Female × Negative communication					0.14 (-0.74 to 1.01)	0.760				
Female × Inconsistent parenting					0.16 (-0.46 to 0.78)	0.609				
Interactions: Education × style										
Intermediate × Emotional warmth							0.88 (-1.26 to 3.02)	0.419		
Maturity × Emotional warmth							-0.44 (-2.62 to 1.74)	0.693		
Tertiary × Emotional warmth							-0.47 (-2.49 to 1.56)	0.651		
Intermediate × Psychological control							-0.43 (-2.72 to 1.85)	0.709		
Maturity × Psychological control							-0.06 (-2.24 to 2.11)	0.955		
Tertiary × Psychological control							0.07 (-2.07 to 2.21)	0.948		
Intermediate × Negative communication							0.53 (-0.37 to 1.43)	0.251		
Maturity × Negative communication							0.08 (-0.87 to 1.04)	0.862		
Tertiary × Negative communication							—	—		
Intermediate × Inconsistent parenting							0.28 (-0.55 to 1.11)	0.509		
Maturity × Inconsistent parenting							0.25 (-0.44 to 0.95)	0.474		
Tertiary × Inconsistent parenting							—	—		
Interactions: Community size × style										
20,000–99,999 × Emotional warmth									0.38 (-0.85 to 1.61)	0.544
100,000–499,999 × Emotional warmth									0.32 (-0.68 to 1.32)	0.531
500,000+ × Emotional warmth									-0.47 (-1.35 to 0.41)	0.296
20,000–99,999 × Psychological control									-0.50 (-1.34 to 0.35)	0.247
100,000–499,999 × Psychological control									-0.14 (-1.08 to 0.81)	0.778
500,000+ × Psychological control									0.25 (-0.49 to 0.99)	0.511
20,000–99,999 × Negative communication									0.11 (-0.61 to 0.83)	0.767
100,000–499,999 × Negative communication									-0.26 (-1.37 to 0.86)	0.653
500,000+ × Negative communication									-0.94 (-1.74 to -0.13)	0.022
20,000–99,999 × Inconsistent parenting									-0.35 (-1.09 to 0.38)	0.346
100,000–499,999 × Inconsistent parenting									-0.62 (-1.68 to 0.44)	0.255
500,000+ × Inconsistent parenting									-0.61 (-1.45 to 0.23)	0.152

Model notes as in Table S7. Reference categories as in Table S7.

Table S13: Relationship between parenting style and subjective perception of quality of life (Sensitivity)

	Global life satisfaction				Burden and stress related to parenthood			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Positive parenting	0.53 (0.24 to 0.82)	¡0.001	0.56 (0.26 to 0.86)	¡0.001	-0.73 (-1.13 to -0.34)	¡0.001	-0.73 (-1.15 to -0.31)	0.001
Negative parenting	0.03 (-0.18 to 0.23)	0.801	0.04 (-0.17 to 0.26)	0.691	0.22 (-0.07 to 0.51)	0.136	0.32 (0.02 to 0.63)	0.036
Covariates (Adjusted models)								
Female (vs. male)			-0.12 (-0.43 to 0.19)	0.439			0.51 (-0.02 to 1.04)	0.059
Age (years)			0.08 (0.01 to 0.16)	0.028			-0.02 (-0.19 to 0.16)	0.859
Western federal state (vs. Eastern)			-0.03 (-0.39 to 0.33)	0.887			0.17 (-0.32 to 0.67)	0.491
Community: 20,000–99,999 (vs. 1–19,999)			-0.01 (-0.38 to 0.36)	0.971			-0.56 (-1.13 to 0.01)	0.054
Community: 100,000–499,999			0.04 (-0.31 to 0.39)	0.830			0.07 (-0.44 to 0.59)	0.780
Community: 500,000+			-0.12 (-0.48 to 0.23)	0.500			-0.26 (-0.83 to 0.32)	0.380
Household size			-0.04 (-0.22 to 0.14)	0.668			-0.24 (-0.51 to 0.02)	0.075
Education: Intermediate (vs. Elementary)			0.55 (-0.27 to 1.38)	0.189			0.05 (-1.19 to 1.30)	0.933
Education: Maturity			0.45 (-0.38 to 1.28)	0.286			0.65 (-0.61 to 1.91)	0.311
Education: Tertiary			0.86 (0.04 to 1.68)	0.041			0.33 (-0.93 to 1.59)	0.609
Net equiv. income			0.00 (-0.00 to 0.00)	0.242			-0.00 (-0.00 to 0.00)	0.147
Dizygotic (vs. monozygotic)			-0.09 (-0.37 to 0.19)	0.513			0.18 (-0.26 to 0.61)	0.422

Positive parenting was calculated using the warmth scale (monitoring was not included due to substantial missing data), while negative parenting was calculated using the control, negative communication, and inconsistent parenting scales.

Table S14: Variance components (parenting style as predictor)

	Model 1A	Model 1B	Model 2A	Model 2B
Var(u)	0.158	0.150	0.045	0.117
Var(e)	0.387	0.336	0.717	0.454
Proportion change in variance (%)	—	13.074	—	36.747
R^2 (conditional)	0.408	0.490	0.217	0.512
R^2 (marginal)	0.166	0.263	0.167	0.385
Model 1A: GLS ∼ covariates; Model 1B: GLS ∼ covariates + parenting style. Model 2A: EBI ∼ covariates; Model 2B: EBI ∼ covariates + parenting style.				

Table S15: Relationship between parenting style and global life satisfaction (within-twin fixed effects)

	Global life satisfaction β (95% CI), p
Emotional warmth	0.09 (-1.01 to 1.19), 0.828
Psychological control	-1.85 (-3.17 to -0.52), 0.018
Negative communication	0.59 (-0.23 to 1.42), 0.117
Inconsistent parenting	1.05 (-0.10 to 2.21), 0.065
Federal state	
Western federal state	-3.05 (-6.33 to 0.23), 0.061
Community size	
20,000 to 99,999	-0.40 (-1.80 to 1.00), 0.472
100,000 to 499,999	-2.26 (-4.67 to 0.15), 0.060
500,000 or more	-2.82 (-5.89 to 0.26), 0.064
Household size	2.20 (0.52 to 3.87), 0.022
Education	
Intermediate	-0.22 (-1.22 to 0.78), 0.575
Maturity	-2.08 (-5.22 to 1.07), 0.141
Income (net eq.)	0.00 (-0.00 to 0.00), 0.276

Table S16: Relationship between parenting style and child global development

	Child global development β (95% CI), p	
	Unadjusted	Adjusted
Warmth	0.30 (-0.09 to 0.68), 0.134	0.32 (-0.10 to 0.73), 0.132
Monitoring	0.34 (0.11 to 0.57), 0.004	0.32 (0.09 to 0.55), 0.006
Inconsistent parenting	-0.20 (-0.39 to -0.01), 0.036	-0.19 (-0.38 to -0.00), 0.049
Control	-0.18 (-0.43 to 0.06), 0.140	-0.19 (-0.43 to 0.06), 0.133
Negative communication	-0.30 (-0.51 to -0.09), 0.005	-0.29 (-0.50 to -0.08), 0.007
Positive parenting	0.49 (0.12 to 0.86), 0.009	0.49 (0.10 to 0.87), 0.013
Negative parenting	-0.32 (-0.57 to -0.07), 0.013	-0.31 (-0.56 to -0.06), 0.016

Positive parenting was calculated using the warmth and monitoring scales, while negative parenting was calculated using the control, negative communication, and inconsistent parenting scales.

Table S17: Relationship between parenting style and child cognitive development

	Child cognitive development β (95% CI), p	
	Unadjusted	Adjusted
Warmth	0.40 (-0.04 to 0.84), 0.073	0.40 (-0.07 to 0.87), 0.097
Monitoring	0.34 (0.08 to 0.60), 0.010	0.33 (0.06 to 0.59), 0.015
Inconsistent parenting	-0.19 (-0.42 to 0.03), 0.097	-0.18 (-0.41 to 0.04), 0.113
Control	-0.23 (-0.52 to 0.06), 0.121	-0.22 (-0.52 to 0.07), 0.133
Negative communication	-0.35 (-0.60 to -0.10), 0.007	-0.34 (-0.59 to -0.08), 0.010
Positive parenting	0.55 (0.14 to 0.97), 0.009	0.54 (0.10 to 0.97), 0.016
Negative parenting	-0.37 (-0.67 to -0.06), 0.019	-0.36 (-0.67 to -0.05), 0.024

Positive parenting was calculated using the warmth and monitoring scales, while negative parenting was calculated using the control, negative communication, and inconsistent parenting scales.

Table S18: Relationship between parenting style and child social development

	Child social development β (95% CI), p	
	Unadjusted	Adjusted
Warmth	0.09 (-0.38 to 0.55), 0.717	0.11 (-0.37 to 0.58), 0.664
Monitoring	0.33 (0.06 to 0.60), 0.016	0.31 (0.05 to 0.57), 0.022
Inconsistent parenting	-0.17 (-0.39 to 0.06), 0.148	-0.15 (-0.36 to 0.07), 0.191
Control	-0.10 (-0.38 to 0.17), 0.473	-0.12 (-0.38 to 0.15), 0.397
Negative communication	-0.23 (-0.47 to 0.02), 0.076	-0.21 (-0.45 to 0.04), 0.098
Positive parenting	0.35 (-0.11 to 0.80), 0.134	0.35 (-0.10 to 0.79), 0.131
Negative parenting	-0.23 (-0.52 to 0.07), 0.132	-0.22 (-0.51 to 0.07), 0.139

Positive parenting was calculated using the warmth and monitoring scales, while negative parenting was calculated using the control, negative communication, and inconsistent parenting scales.

Table S19: Relationship between parenting style and child global development - within twin FE

	Child global development β (95% CI), p	
	Unadjusted	Adjusted
Warmth	0.57 (-0.25 to 1.38), 0.148	0.82 (-0.08 to 1.72), 0.069
Monitoring	0.50 (-0.13 to 1.14), 0.105	0.57 (-0.23 to 1.36), 0.138
Inconsistent parenting	0.54 (-0.32 to 1.40), 0.182	0.72 (-0.30 to 1.74), 0.143
Control	-0.22 (-1.08 to 0.64), 0.574	-0.17 (-0.95 to 0.62), 0.640
Negative communication	-0.63 (-1.80 to 0.53), 0.246	-0.58 (-1.81 to -.66), 0.314
Positive parenting	0.80 (0.09 to 1.51), 0.031	0.92 (-0.04 to 1.88), 0.057
Negative parenting	-0.02 (-1.50 to 1.47), 0.981	0.34 (-1.03 to 1.71), 0.585

Positive parenting was calculated using the warmth and monitoring scales, while negative parenting was calculated using the control, negative communication, and inconsistent parenting scales.

Table S20: Relationship between parenting style and child cognitive development - within-twin FE

	Child cognitive development β (95% CI), p	
	Unadjusted	Adjusted
Warmth	0.68 (-0.46 to 1.81), 0.206	0.96 (-0.32 to 2.24), 0.121
Monitoring	0.45 (-0.26 to 1.15), 0.181	0.61 (-0.33 to 1.55), 0.175
Inconsistent parenting	0.75 (-0.32 to 1.82), 0.147	0.88 (-0.36 to 2.12), 0.42
Control	-0.28 (-1.11 to 0.55), 0.453	-0.28 (-1.16 to 0.60), 0.486
Negative communication	-0.76 (-2.06 to 0.54), 0.214	-0.82 (-2.23 to 0.60), 0.219
Positive parenting	0.83 (-0.14 to 1.80), 0.085	1.04 (-0.27 to 2.35), 0.105
Negative parenting	0.11 (-1.37 to 1.59), 0.871	0.24 (-1.37 to 1.85), 0.739

Positive parenting was calculated using the warmth and monitoring scales, while negative parenting was calculated using the control, negative communication, and inconsistent parenting scales.

Table S21: Relationship between parenting style and child social development - within-twin FE

	Child social development β (95% CI), p	
	Unadjusted	Adjusted
Warmth	0.34 (-0.55 to 1.24), 0.402	0.53 (-0.03 to 1.10), 0.061
Monitoring	0.61 (0.08 to 1.14), 0.028	0.49 (-0.11 to 1.09), 0.096
Inconsistent parenting	0.13 (-0.49 to 0.75), 0.638	0.41 (-0.33 to 1.15), 0.238
Control	-0.09 (-1.17 to 1.00), 0.856	0.06 (-0.70 to 0.82), 0.860
Negative communication	-0.38 (-1.52 to 0.75), 0.457	-0.09 (-1.08 to 0.90), 0.834
Positive parenting	0.75 (0.02 to 1.48), 0.045	0.69 (0.15 to 1.23), 0.018
Negative parenting	-0.26 (-2.31 to 1.79), 0.775	0.53 (-0.85 to 1.92), 0.018

Positive parenting was calculated using the warmth and monitoring scales, while negative parenting was calculated using the control, negative communication, and inconsistent parenting scales.