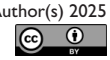
Special Section: Predictors and Outcomes of Peer Victimization

ijbd

International Journal of Behavioral Development
2025, Vol. 49(6) 571–580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Does negative parenting behavior lead to later peer victimization? A longitudinal co-twin control study

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Abstract

Negative parenting behavior is associated with peer victimization. However, we do not know if this association changes across development. It is also unclear whether associations hold after adjusting for genetic factors. Peer victimization and negative parenting behavior were examined using data from TwinLife, a cross-sequential population-based longitudinal study in Germany. The sample comprised 609 reared-together twin pairs from the 5-year-old cohort and 605 twin pairs from the 11-year-old cohort. We used maternal reports of parenting at baseline and child self-reports of peer victimization measured 2 years later. We used a co-twin design among monozygotic twins to control for shared environmental and genetic factors. At the population level, exposure to negative parenting behavior was associated with increased likelihood of peer victimization (5 years old: beta = 0.03, 95% confidence interval [CI] = 0.01 to 0.05; 11 years old: beta = 0.02, 95% CI = 0.01 to 0.03). The strength of the association was similar for participants in both age cohorts. However, the associations between negative parenting behavior and peer victimization did not remain statistically significant after accounting for genetic and shared environmental factors among monozygotic twins (5 years old: beta = −0.01, 95% CI = −0.08 to 0.06; 11 years old: beta = 0.03, 95% CI = −0.04 to 0.09). In exploratory analyses, we found that in early adolescence, monozygotic girls exposed to negative parenting behavior presented higher levels of peer victimization than boys (monozygotic girls: beta = 0.11, 95% CI = 0.03 to 0.19; monozygotic boys: beta = −0.08, 95% CI = −0.19 to 0.02). Our findings suggest that the relationship between negative parenting behavior and children's risk for peer victimization may reflect shared underlying environmental and genetic risks. Our study highlights the importance of using genetically sensitive research designs when considering the role of parenting in the development of children's social relationships.

Keywords

Bullying, peer victimization, parenting, twin research

Introduction

Young people who are victimized by peers are at risk to experience a range of negative social, educational, and mental health outcomes (Arseneault, 2018; Copeland et al., 2013; Kochenderfer-Ladd et al., 2021; Schoeler et al., 2018). Peer victimization is the experience of being the target of peers' aggressive and threatening behaviors done intentionally and repeatedly to cause another person injury or discomfort (Finkelhor et al., 2012). Identifying early risk factors associated with peer victimization can help guide preventive strategies. Negative parenting behavior can increase young people's levels of internalizing and externalizing symptoms (Pinquart, 2017a, 2017b; Thompson et al., 2024) making them vulnerable to peer victimization. Moreover, these experiences of emotional, behavioral maladjustment and peer victimization can, in turn, influence parenting behavior (Kaufman et al., 2020; Thompson et al., 2024). Understanding the role of negative parenting behavior for peer victimization could help develop new and improved preventive interventions.

Social learning theory has long implicated the role of parental modeling in children's developing interpersonal relationships (Bandura, 1969; Ladd & Mize, 1983). This theory emphasizes that children learn behaviors, attitudes, and emotional reactions through observing and imitating their parents, who serve as primary role models. Furthermore, attachment theory also points to the importance of early attachment to parents in an individual's socioemotional development, shaping their internal working models of relationships and influencing their future interactions (Ainsworth & Bell, 1970; Bowlby, 1969). Secure attachments

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formed in early childhood foster a sense of safety and security, which positively affects children's social competence and emotional regulation. Both theories imply a causal role of parenting in the development of children's interpersonal relationships, suggesting that studies of peer victimization would benefit from incorporating measures of family relationships. Indeed, one of the most widely accepted frameworks for peer victimization—the socioecological model includes the family system as an integral component, shaping children's likelihood of being involved in bullying (Espelage & Swearer, 2003). Yet, the predominant focus in peer victimization research has been on the school and peer context, and there is a relative lack of studies investigating the role of parenting (Nocentini et al., 2019).

A body of research has focused on the role of exposure to family violence, with studies consistently finding that children exposed to violence indirectly through domestic abuse, or directly via maltreatment (e.g., severe disciplinary methods that result in physical harm), were more likely to be perpetrators of bullying and to experience victimization by peers (Bowes et al., 2009; Lereya et al., 2013; Nocentini et al., 2019). However, we do not yet know whether more general negative parenting behavior that does not involve physical maltreatment, abuse or neglect would yield similar findings. To date, studies on the association between more general negative parenting behavior (e.g., authoritative parenting or lack of supervision) and peer victimization have shown mixed results (Nocentini et al., 2019).

It is possible that the role of negative parenting on peer victimization may change across development. Previous research was mainly cross-sectional and few of the longitudinal studies focused on negative parenting behavior in early adolescence as a risk factor for later peer victimization (Lereya et al., 2013). As peers become the primary source of influence in adolescence (Ciranka & Van den Bos, 2019; Steinberg & Morris, 2001), it may be that parenting factors become less associated with peer victimization. Although it is often presumed that the influence of parenting reduces over time, there is very little empirical evidence that has tested this hypothesis.

A further possibility for the mixed findings in studies investigating the role of negative parenting behavior and peer victimization may reflect methodological issues, such as a lack of adjustment for key confounding variables. Parents provide both environment and genetic influence to their children, meaning that any observed association between parenting factors and children's peer victimization may be confounded by genetic factors (Kretschmer, 2023). To better understand if observed associations between negative parenting behavior and peer victimization are possibly causal in nature, studies need to employ research which can disentangle genetic and environmental factors. To date, the majority of studies investigating the relationship between negative parenting behavior and peer victimization do not investigate if the correlations observed hold after accounting for genetic confounding. This is particularly important given the finding that victimization shows moderate to high heritability (Johansson et al., 2022). It is possible that genetic factors that influence parenting behaviors might be passed on to children and in turn, influence their likelihood of being victimized by peers. The current study used a co-twin design (McAdams et al., 2021) to investigate whether the relationship between negative parenting behavior and later peer victimization remains after adjusting for shared environmental and genetic factors.

Using data from twins, we can disentangle potential explanations (i.e., genetic confounding, potential causation) for the association of negative parenting behavior with peer victimization by accounting for familial and other factors shared by twins. Twins brought-up together share a major part of their environments (measured and unmeasured). In addition, monozygotic twins (MZ) have the same genotype. The co-twin control design tests whether twins that differ in an exposure (e.g., exposed to different levels of negative parenting behavior) differ in an outcome (e.g., peer victimization). If within-twin pair differences in negative parenting behavior are associated with within-twin pair differences in peer victimization, then we will have evidence that this association is not explained by participants' genetic make-up, nor shared environmental factors, therefore potential causal effect may be at play (McAdams et al., 2021).

Using data from a population-based study of twins reared together, the objectives of the study were (1) to investigate whether negative parenting behavior was associated longitudinally with peer victimization in childhood and early adolescence; (2) to investigate whether any observed association remained after accounting for genetic and shared environmental factors. We hypothesized that the effect of negative parenting behavior on peer victimization might be stronger for children compared to adolescents. Within these objectives, in post hoc/exploratory analyses, we tested whether any associations varied according to sex, given boys and girls may respond differently to parenting behavior (Braza et al., 2015; Endendijk et al., 2016; Pinquart, 2017a) and have different involvement in bullying behaviors especially in early adolescence (Smith et al., 2019).

Methods

Our analyses were preregistered with the Open Science Framework (OSF) (https://osf.io/h8ega/). We have amended the initial preregistered protocol and did not include the association of parenting with bullying perpetration in this study as this measure was not available for the 5-year-old cohort (https://osf.io/8je5z).

Participants

This study is based on TwinLife, a population-based study which tracks the development of 4,000 same-sex twin pairs from 2014 to 2023. Four age cohorts were recruited through a cross-sequential survey design from Germany's resident registries in communities with a population of 5,000 or more. The baseline sample was broadly representative of Germany's population. The TwinLife study covers the full distribution from lower to upper limits of many inequality indicators (e.g., educational status, occupational status, income) in Germany. However, in comparison to the German Microcensus data, TwinLife had a higher share of tertiary-educated households, especially in younger cohorts of TwinLife and lower share of households with no German citizenship (Lang & Kottwitz, 2020; Mönkediek et al., 2019). The current study included participants from Cohort 1 (twins born 2009/2010; aged 5 years at baseline) and Cohort 2 (twins born 2003/2004; aged 11 years at baseline) for whom data on parenting at baseline (2014/2015) and on peer victimization, 2 years later (2016/2017) was available. The sample in this study comprised 609 twin pairs (267 monozygotic (MZ) twin pairs;

Table 1. Outcome and Exposure Measures and Descriptive Statistics.

Characteristics	Cohort (child age at measurement)	*M*, *SD*, Min, Max, range	Cronbach's alpha*	Items and response options	Instrument and references
Peer victimization (self-reported by the twin)	Cohort 1: age 7	*M* (*SD*): 6.90 (1.64) [Min; Max]: [4.00; 12.00] Possible range: 3.00–12.00	0.60	4 items "children yell at you or call you names," "kids deliberately hurt you," "children do not let you play with them," "children say nasty things about you so that the others don't like you anymore"; **Response options:** 1 = never, 2 = occasionally, 3 = very often.	Modified version of the Self-report victimization scale (Ladd & Kochenderfer-Ladd, 2002)
	Cohort 2: age 13	*M* (*SD*): 4.83 (1.54) [Min; Max]: [4.00; 15.00] Possible range: 4.00–16.00	0.71	4 items "anyone teased you or called you names," "threatened physically or actually hurt by another student," "deliberately left out of things," "anyone spread rumors about you"; **Response options:** 1 = never, 2 = less than once a week, 3 = about once a week, 4 = most days.	
Negative parenting behavior (reported by the mother)	Cohort 1: age 5	*M* (*SD*): 18.48 (3.50) [Min; Max]: [7.00; 29.00] Possible range: 7.00–35.00	0.63	Cohort 1 & Cohort 2: 7 items **Negative communication:** "yell at your child because he/she did something wrong," "scold your child because you are angry at him/her"; **Psychological control:** "if your child does something against your will, you punish him/her," "you are disappointed and sad when your child misbehaved," "you make it clear to your child that he/she is not to break the rules or question your decisions." **Inconsistent parenting**: "you threaten your child with a punishment but don't actually follow through," "you find it hard to set and keep consistent rules for your child." **Response options:** 1 = never, 2 = seldom, 3 = sometimes, 4 = often, 5 = very often	Adapted from pairfam (Huinink et al., 2011).
	Cohort 2: age 11	*M* (*SD*): 17.88 (3.94) [Min; Max]: [7.00; 33.00] Possible range: 7.00–35.00	0.74		

**Note*. In Cohort 1, Cronbach's alpha had the following values for the subscales: psychological control subscale—0.61, negative communication subscale—0.61, inconsistent parenting subscale—0.68. In Cohort 2, Cronbach's alpha had the following values for the subscales: psychological control subscale—0.64, negative communication subscale—0.74, inconsistent parenting subscale—0.71.

126 MZ boys and 141 MZ girls) in Cohort 1 and 605 twin pairs (240 MZ twin pairs; 110 MZ boys and 130 MZ) in Cohort 2.

Measures

Table 1 presents the outcome and exposure measures used in this study—including examples of items, reliability measures (i.e., Cronbach's α) and references. A detailed description of the measures used in this study can be found elsewhere (Klatzka et al., 2023; Mönkediek et al., 2019).

Exposure. Negative parenting behavior was assessed as maternal self-reports in face-to-face interviews during wave one using 7 items from Panel Analysis of Intimate Relationships and Family Dynamics (pairfam) (Huinink et al., 2011; Nikstat & Riemann, 2023). Scores for three subscale (i.e., negative communication, psychological control, and inconsistent parenting) were summed to create an overall negative parenting behavior variable ranging from 7 to 35 with higher scores indicating more negative parenting.

Outcome. Peer victimization was measured during face-to-face interviews at Wave 2. Participants were asked four questions about physical, verbal and relational peer victimization (Ladd & Kochenderfer-Ladd, 2002). The sum of the 4 items was calculated and then the score standardized (*Z*-score) for each of the cohorts.

Methodology

Main Analyses. The study of twin pairs reared together is a powerful approach to assess the influence of genetics and environment on human development (Gonggrijp et al., 2023; Vitaro et al., 2009). All twins reared together share 100% of their rearing environment. Furthermore, monozygotic (MZ) twins are genetically identical, so they are matched for sex, age, genetic

and shared environmental influences. In this co-twin control study, using one twin in a pair as the matched control for the co-twin we examined whether negative parenting behavior continues to be associated with peer victimization after accounting for shared environment and genetics.

First, we assessed the association between negative parenting behavior and peer victimization in all participants in the sample, without considering twin status. We used generalized estimating equation (GEE) linear regression with exchangeable correlation structure to correct for familial clustering (i.e., the nonindependence of observations within-twin pairs). We used the robust method for standard error estimation in GEE (Carlin et al., 2005). We obtained an unadjusted population-level estimate that corresponds to the effect of the average level of negative parenting behavior on peer victimization in the entire sample, across families. Second, to estimate the within-pair effect among MZ twins, we used the multiple regression strategy described by Carlin et al. (2005) (see Model 2 in Carlin et al., 2005) which estimates both the "within-twin pair" effect and the "between-twin pair" effect. The "within-twin pair" effect represents the variation in peer victimization accounted for by the level of negative parenting behavior of one twin relative to a co-twin. The "between-pair" effect represents the variation in peer victimization level at the twin-pair average level of negative parenting behavior across families. For the purpose of the current analyses, we were interested only in the "within-twin pair" effect which was obtain by estimating the variation in peer victimization explained by the difference between the parenting score of the first born and the mean of the parenting score of the respective MZ twin pair. In other words, this MZ within-twin pair effect shows whether, in an MZ twin pair discordant for the level of negative parenting behavior, the twin exposed to greater levels of negative parenting behavior reported higher levels of peer victimization. To obtain standardized regression coefficients, we converted the continuous peer victimization variable into standardized *Z*-scores in each cohort. All the GEE analyses were done in R using the code provided on OSF by Baldwin et al. (2021). The code is available on GitHub: https://github.com/SinzianaOncioiu/Negative_parenting_peer_victimization_TwinLife.

Pre-Registered Sensitivity Analyses. We estimated the population-level association between negative parenting behavior and peer victimization adjusting for family-level factors (i.e., sex, income, maternal mental health, parents' cohabiting status and number of people in the household). While the co-twin design adjusted for factors that were shared by the twins, individual characteristics or experiences of each twin may still explain the association between negative parenting behavior and peer victimization. Therefore, the MZ analyses were further controlled for characteristics specific to each twin, i.e., internalizing and externalizing symptoms.

Post Hoc/Exploratory Analyses. We tested for sex differences in the association of negative parenting behavior with peer victimization (interaction between sex and negative parenting behavior). We also investigated the association between the three different sub-styles of parenting which were included in the overall negative parenting behavior, that is, negative communication, psychological control, and inconsistent parenting.

Results

Main Results

As shown in Table 2, negative parenting behavior was associated with later peer victimization at the population level. The associations at population level were similar for children aged 5 years at baseline and 7 years at follow-up (beta = 0.03, 95% confidence interval [CI] = 0.01 to 0.05) and for those aged 11 years at baseline and 13 years at follow-up (beta = 0.02, 95% CI = 0.01 to 0.03). However, for the 5-year-old cohort, the strength of the association reduced to almost null and was not statistically significant in the MZ analyses accounting for genetic and shared environmental factors (beta = −0.01, 95% CI = −0.08 to 0.06). For the 11-year-old cohort, the strength of the association was similar in the population-level and MZ models, but the association was not statistically significant (MZ model: beta = 0.03, 95% CI = −0.04 to 0.09).

Pre-Registered Sensitivity Analyses Results

In sensitivity analyses, the population-level estimates adjusted for family-level factors (sex, income, maternal mental health, parents' cohabiting status, and number of people in the household) were similar to the unadjusted population-level estimates (Table 2). We further adjusted the population-level estimates and the MZ estimates, for child's internalizing and externalizing symptoms measured concurrently with the exposure to explore whether our findings might be explained by child-driven effects. For the younger cohort, following this additional adjustment for internalizing and externalizing symptoms, the population-level and the MZ estimates remained similar to the ones not adjusted. For the older cohort, further adjustment for the child's internalizing and externalizing symptoms explained the association between negative parenting behavior and peer victimization at population level, but left the MZ estimates relatively unchanged (Tables S1 and S2).

Post Hoc/Exploratory analyses Results

We stratified the analyses by sex and found that at population level, for boys, negative parenting behavior was associated with peer victimization during childhood (beta = 0.04, 95% CI = 0.01 to 0.07), but not during early adolescence (beta = 0.01, 95% CI = −0.01 to 0.04) (Table 3). For girls, the pattern looked different: negative parenting behavior was associated with peer victimization during early adolescence (beta = 0.03, 95% CI = 0.01 to 0.04), but the association did not reach statistical significance during childhood (beta = 0.02, 95% CI = −0.01 to 0.04). While for boys the association observed in childhood was explained by shared environmental factors and genetic factors, for adolescent girls we found evidence of negative parenting behavior leading to higher levels of peer victimization (beta = 0.11, 95% CI = 0.03 to 0.19) (Table 3). The association among MZ adolescent girls remained statistically significant and had the same strength even after accounting for internalizing and externalizing symptoms specific to each twin (beta = 0.10, 95% CI = 0.02 to 0.18) (Table S2).

Regarding the subtypes of parenting, in our exploratory analyses (Tables 2 and 3) we found that at population level, psychological control was the subtype associated most consistently with peer victimization among both children and adolescents. However, both for girls and boys, in childhood and early adolescence, the

Table 2. Association of Harsh Parenting and Subtypes of Negative Parenting Behavior With Peer Victimization in Children (Cohort 1, Age 5–7 Years) and Adolescents (Cohort 2, Age 11–13 Years).

	Cohort 1						Cohort 2					
	Phenotypic		Phenotypic adjusted*		MZ		Phenotypic		Phenotypic adjusted*		MZ	
	Beta	95% CI	Beta	95% CI	Beta	95% CI	Beta	95% CI	Beta	95% CI	Beta	95% CI
N **(pairs of twins)**	***n*=609**		***n*=555**		***n*=267**		***n*=605**		***n*=559**		***n*=240**	
Negative parenting behavior	**0.03**	**(0.01, 0.05)**	**0.02**	**(0.01, 0.04)**	−0.01	(−0.08, 0.06)	**0.02**	**(0.01, 0.03)**	**0.02**	**(0.00, 0.03)**	0.03	(−0.04, 0.09)
Negative communication	0.03	(−0.02,0.07)	0.03	(−0.02,0.07)	0.05	(−0.09,0.19)	0.03	(−0.01,0.06)	0.02	(−0.01,0.06)	−0.03	(−0.20,0.14)
Psychological control	**0.05**	**(0.02,0.09)**	**0.05**	**(0.02,0.09)**	0.02	(−0.11,0.15)	**0.05**	**(0.02,0.08)**	**0.05**	**(0.02,0.08)**	0.07	(−0.04,0.17)
Inconsistent parenting	0.03	(−0.02, 0.08)	0.02	(−0.03,0.07)	−0.11	(−0.25,0.03)	0.02	(−0.01,0.05)	0.01	(−0.02,0.04)	0.03	(−0.07,0.13)

Note. In the MZ analyses, twins were ordered according to birth order. We defined the term corresponding to the within-twin pair effect as the difference between the negative parenting behavior score of the first born and the average score for the pair on negative parenting behavior (see Model 2, Carlin et al., 2005). The within-twin pair estimate has been shown to correspond to the relative difference estimate when exposure level is independent of twin order (Madrid-Valero et al., 2024).

*Adjusted for sex (only in the overall model), net household income (modified OECD); maternal mental health, cohabiting, number of people in the household; measured at the same time with the exposure.

Table 3. Association of Harsh Parenting and Subtypes of Negative Parenting Behavior With Peer Victimization in Children (Cohort 1, Age 5–7 Years) and Adolescents (Cohort 2, Age 11–13 Years) by Sex.

	Cohort 1				Cohort 2			
	Phenotypic		MZ		Phenotypic		MZ	
	Beta	95% CI	Beta	95% CI	Beta	95% CI	Beta	95% CI
***N* (pairs of twins)**	***n* = 609**		***n* = 267**		***n* = 605**		***n* = 240**	
Negative parenting behavior								
Boys	0.04	(0.01, 0.07)	−0.06	(−0.18, 0.07)	0.01	(−0.01, 0.04)	−.08	(−0.19, 0.02)
Girls	0.02	(−0.01, 0.04)	0.03	(−0.06, 0.12)	0.03	(0.01, 0.04)	0.11	(0.03, 0.19)
Negative parenting behavior*Sex	0.02	(−0.02; 0.06)	−0.08	(−0.23, 0.06)	−0.02	(−0.05, 0.01)	−0.19	(−0.32, −0.07)
Negative communication								
Boys	0.05	(−0.02,0.11)	−0.06	(−0.30,0.19)	0.03	(−0.03, 0.08)	−0.26	(−0.46, −0.07)
Girls	0.01	(−0.05, 0.07)	0.10	(−0.07,0.27)	0.03	(−0.02, 0.07)	0.13	(−0.08,0.33)
Negative communication*Sex	0.04	(−0.05, 0.13)	−0.16	(−0.45; 0.14)	−0.00	(−0.07, 0.07)	−0.39	(−0.67; −0.11)
Psychological control								
Boys	0.05	(0.01,0.10)	0.01	(−0.19,0.22)	0.02	(−0.03,0.07)	−0.00	(−0.15, 0.14)
Girls	0.05	(0.01,0.10)	0.03	(−0.14,0.19)	0.08	(0.04,0.11)	0.12	(−0.03,0.28)
Psychological control*Sex	0.00	(−0.07; 0.07)	0.01	(−0.26; 0.27)	−0.057	(−0.12, 0.00)	−0.13	(−0.34, 0.08)
Inconsistent parenting								
Boys	0.06	(−0.01,0.13)	−0.15	(−0.35,0.04)	0.01	(−0.04, 0.06)	−0.11	(−0.24, 0.03)
Girls	0.01	(−0.05,0.07)	0.01	(−0.18,0.19)	0.03	(−0.01, 0.08)	0.13	(0.01,0.24)
Inconsistent parenting*Sex	0.05	(−0.04; 0.15)	−0.16	(−0.43; 0.11)	−0.03	(−0.09; 0.04)	−0.23	(−0.41, −0.05)

Note. The results presented for boys and girls come from sex-stratified analyses unadjusted for covariates. These analyses allow for a qualitative comparison of the association of parenting and peer victimization between boys and girls. The parenting-by-sex interaction term was estimated using a linear regression fitted to the entire sample allowing for a statistical comparison of the association parenting-peer victimization between boys and girls. In the MZ analyses, twins were ordered according to birth order. We defined the term corresponding to the within-twin pair effect as the difference between the negative parenting behavior score of the first born and the average score for the pair on negative parenting behavior (see Model 2 Carlin et al., 2005). The within-twin pair estimate has been shown to correspond to the relative difference estimate when exposure level is independent of twin order (Juan J. Madrid-Valero et al., 2024).

association of psychological control with later peer victimization appeared to be accounted for by shared environmental factors and genetic factors in MZ models. Despite no association at the population level, we found that among MZ adolescent girls, inconsistent parenting was associated with more peer victimization and among MZ adolescent boys, parental negative communication was associated with reduced peer victimization (contrary to the hypothesized direction of effect).

Discussion

Exposure to negative parenting behavior was correlated with later peer victimization for both children and adolescents at population level. Contrary to our hypothesis, at population level the strength of the associations between negative parenting behavior and peer victimization 2 years later was similar for participants aged 7 and 13 years at follow-up. However, the associations were no longer remained statistically significant in the most stringent analyses comparing MZ twin pairs. While the population-level findings are in line with previous studies that have found a relationship between harsh and authoritarian parenting and higher levels of victimization (Lereya et al., 2013), our study highlights the importance of taking genetic confounding into consideration.

We did not find any evidence of environmental mediation in our main analyses, suggesting that much of the relationship between negative parenting behavior and bullying victimization may be due to shared environmental and genetic factors. This suggests that estimates of the effects of parenting on children's risk for victimization are likely to be inflated if genetically sensitive designs are not used. Future genetically informed studies need to consider the interplay between genetic factors of parents and their children and environmental factors shared by siblings when investigating the relationship between parenting behavior and peer victimization. We did not find any evidence that the effects of negative parenting behavior on peer victimization

lessen over time. Rather, effects may be similar across childhood and early adolescence. This finding is particularly interesting given that peer influences are reported to be increasingly strong for behavior during adolescence (Steinberg & Morris, 2001) and adolescents report parental power as gradually diminishing over time (De Goede et al., 2009).

In exploratory analyses, we found some indication of sex differences, i.e., for adolescent girls, negative parenting behavior remained associated with peer victimization even in the most stringent analyses among MZ twins (and even when adjusting for their internalizing and externalizing symptoms). While we cannot exclude the possibility of chance finding, this association may give an indication of a potential causal effect of differential parenting on the likelihood of later experiences of peer victimization among MZ adolescent girls. It is important to note, that among MZ twins, the exposure is differential parenting among identical twins (i.e., the difference in the parenting scores between identical twins in the same family). Previous studies have shown that differential parenting is associated with depressive symptoms, and that adolescents are more sensitive to differential treatment (Jensen et al., 2020, 2013; Oliver & Pike, 2018). However, these contrast effects in parenting behavior may be driven by child characteristics and behaviors. Indeed, studies showed that the behaviors and characteristics of children influence their home environment (Agnew-Blais et al., 2022; Collins et al., 2000). This could also support the surprising finding in our study that, for MZ adolescent boys, negative communication was associated with less peer victimization. This unexpected finding may be explained by children's effect on parenting. For example, unmeasured characteristics of children, such as assertiveness, may explain this association, with the more assertive twin being exposed to more negative communication, but also being less likely to be bullied than his less assertive co-twin. Among the other subtypes of parenting investigated (e.g., psychological control, inconsistent parenting), only psychological control was statistically significantly associated with later bullying victimization at population level, but not among MZ twins. However, the results need to be interpreted with caution as these analyses were exploratory and the sample sizes were relatively small. Taken together, they suggest that future studies should investigate if the relationship between negative parenting behavior and peer victimization varies according to sex. Moreover, future studies should investigate if differential negative parenting behavior has a more detrimental impact on peer victimization than similar negative parenting behavior for both siblings and if specific subtypes of negative parenting behavior can play a different role for peer victimization experiences.

A key strength of this research is its co-twin and cross-sequential design. Most of the literature on familial and parental risk factors for child peer victimization uses traditional samples with only one child per family. In these studies, results may be confounded by shared environmental factors that increase the risk for peer victimization and negative parenting behavior, and by genetics. The twin differences design controls for this as both common environmental and genetic factors are shared within a given twin pair. Furthermore, we also investigated the impact of negative parenting behavior on peer victimization across different ages of participants within a similar point in time (i.e., two different age cohorts in a cross-sequential design), thus holding constant macrolevel environmental and sociological factors. There is evidence to suggest that wider contextual factors such as economic stress have an impact on parenting (Masarik & Conger, 2017) and thus may confound potential results. Therefore, in our design, we are controlling for shared genes, shared environment, and broader environmental contextual factors, resulting in a more stringent design. Another strength of this study is that the exposure variable was reported by the mother and the outcome by the child. This reduced the potential for shared method variance.

This study has some methodological limitations. First, the measure used to assess victimization did not follow the literature standard. Solberg and Olweus (2003) recommend a frequency of two or three times a month for bullying victimization. Due to this deviation from the standard used in the literature, our findings should be interpreted as reflecting peer victimization tendencies rather than reflecting habitual victimization. Second, we have also only used self-reports of maternal parenting which are subject to response bias. Multi-informant measures of parenting (including parent-child observation methods) would enhance the robustness of our findings (Dirks et al., 2012). In addition, measurement errors in the parenting and peer victimization variables might have biased the results, particularly in the younger cohort (Cohort 1) where the internal consistency of the parenting and peer victimization measures was relatively low (and lower than in Cohort 2). This is especially important for the within-pair association because errors in measuring the exposure variable can lead to underestimating causal effects or failing to detect significant within-pair associations, even when a causal relationship exists between the exposure and the outcome (Frisell et al., 2012; McGue et al., 2010). Furthermore, the negative parenting scale in this study, included only three items usually included in maltreatment or harsh parenting subscales (e.g., "yell at your child," "scold," and "threaten") (Backhaus et al., 2023). This may explain why the population-level effect sizes in this study are relatively lower than in previous studies (Lereya et al., 2013). Third, even if we included emotional and behavioral problems as a co-variate in our analyses, we did not have measures of these variables prior to the measure of negative parenting behavior. Therefore, adjusting for emotional and behavioral problems concurrent with the negative parenting behavior may represent an over adjustment as they may be mechanisms through which parenting is associated with peer victimization. Fourth, the overrepresentation of tertiary-educated households in TwinLife study (which was more pronounced in the younger cohorts) could potentially weaken generalization of the association between negative parenting behavior and peer victimization. Finally, we note that some of the analyses may have been underpowered (e.g., unstable estimates with large CIs). Therefore, future co-twin studies on the association of parenting behavior with peer victimization will require even larger samples.

Conclusion

Social learning theory, attachment theory, and the socioecological model of bullying all conceptualize parenting as having a causal influence in children's likelihood of experiencing peer victimization. In our study, we found that negative parenting behavior was associated with an increased likelihood of peer victimization in childhood and early adolescence using traditional correlational analysis. However, the association no longer remained when accounting for the influence of genetics and shared environmental factors. Our study highlights the need for genetically sensitive research designs to disentangle nature from

nurture when investigating the role of family factors in children's peer victimization experiences.

Acknowledgements

The authors would like to thank all participants in the TwinLife study for their time and dedication to the study, and the TwinLife research team for collecting and managing the data. The authors are grateful to Maria Ilie-Niculescu for assistance in reviewing and validating the R code for the analyses.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: All phases of this study were supported by the Calleva Foundation. Lucy Bowes was supported by the Calleva Foundation. Sînziana I. Oncioiu was supported by Calleva Foundation. Christoph H. Klatzka was supported by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG).

Ethical Approval and Informed Consent Statements

The TwinLife study was reviewed and approved by the German Psychological Society (Deutsche Gesellschaft für Psychologie; protocol number: RR 11.2009). All participants were informed in writing about the aims of the TwinLife study, the incentives, and that their participation was voluntary and could be withdrawn at any time. In addition, in all face-to-face surveys, participants received a two-page leaflet summarizing the procedures concerning data protection and privacy and their rights to demand the deletion of all data collected in line with German data integrity laws. Written material was sent to participants before all interviews. At the beginning of each interview, informed verbal consent was obtained from participants (and the participants' legal guardians when the participants were underage) and documented. Following the national legislation and the institutional requirements, written informed consent was not required to participate in this study. Nevertheless, for all supplementary online surveys, written informed consent was obtained from all participants.

Role of Funder/Sponsor

The funder (Calleva Foundation) had no role in the design and conduct of the study.

Data Availability Statement

The TwinLife data are archived in the GESIS data catalog: https://search.gesis.org/research_data/ZA6701. Data are released for academic research and teaching after the data depositor's written authorization.

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Supplemental Material

Supplemental material for this article is available online.

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