



Parental aggression and adolescent physical health status 10 years later[☆]

Heather M. Foran^{a,*}, Elena Jansen^a, Lucia Kuhn^a, Laura Restle^a, Kurt Hahlweg^b

^a Institute of Psychology, Klagenfurt University, Universitaetsstr. 65-67, 9020 Klagenfurt, Austria

^b Technical University of Braunschweig, Institute for Psychology, Department of Clinical Psychology, 33 Humboldtstr., 38106 Braunschweig, Germany



ARTICLE INFO

Key words:

Parental aggression
Physical health status
Family environment
Internalizing symptoms

ABSTRACT

Background: Biopsychosocial models have proposed mechanisms through which parental aggression may effect children's emotional development and health. The aim of this study was to examine the relationship between parental physical and psychological aggression and adolescent health status ten years later and determine if this relationship can be explained through children's mental health symptoms.

Methods: The sample consisted of 242 families from Germany. Parental aggression was assessed at baseline from parents of preschool aged children. Assessment of child internalizing and externalizing symptoms included in the present study were collected over a four-year period and physical health status of the adolescent was assessed ten years after baseline assessment. Structural equation modeling was used to examine direct and indirect relationships.

Results: Using latent variable modelling, maternal report of children's internalizing and externalizing symptoms were related to adolescent physical health status at the ten-year follow-up. Significant indirect effects were found such that psychological aggression at baseline predicted children's internalizing and externalizing symptoms over four years, which in turn related to adolescent physical health at the ten-year follow up, although results varied by parental gender.

Conclusion: The current longitudinal study supports the potential long-term effects of early parental aggression on children's mental health and their subsequent physical health status in adolescence consistent with biopsychosocial family models.

1. Introduction

Parental physical punishment, also referred to as corporal punishment and a form of parental aggression, can be defined as an infliction of physical pain through physical force for correction or control of misbehavior, e.g., spanking or slapping (Straus, 1994). Although parental physical punishment is prohibited by German law since 2000, it is still being used. In a study by Hahlweg, Heinrichs, Bertram, Kuschel, and Widdecke (2008), seventy-three percent of the mothers used physical punishment on their children. A survey from 2011 with parents of children under 14 years of age found that 40% of the parents spanked and 10% slapped their children as a disciplinary method (Forsa, 2011). Other forms of parental aggression tend to be underestimated due to the large number of unreported cases (Ziegenhain, Künster, & Besier, 2017).

Since the formal definition of child physical abuse requires a significant impact (Slep, Heyman, & Foran, 2015), physical punishment does not always equal child abuse. However, research shows that the

use of physical punishment increases the odds of child physical abuse (e.g., Afifi, Mota, Sareen, & MacMillan, 2017; Graziano, 1994; Knox, 2010; Straus, 2000; Zolotor, Theodore, Chang, Berkoff, & Runyan, 2008). Moreover, some physical punishment and physical abuse may be viewed on a continuum instead of as distinct categories (e.g., Afifi, Mota, Dasiewicz, MacMillan, & Sareen, 2012; Fergusson & Lynskey, 1997; Rodriguez & Richardson, 2007; Salzinger, Feldman, Hammer, & Rosario, 1991; Whipple & Richey, 1997).

1.1. Parental aggression and health

There is extensive evidence showing the lifelong detrimental effects of child abuse (e.g., Norman et al., 2012). Child abuse puts victims at continued psychological and physical health risks through both direct pathways, such as neurological alterations and inflammation, and indirect pathways, such as engaging in smoking and heavy drinking (e.g., Anda et al., 2006; Fergusson, Boden, & Horwood, 2008; Fuller-Thomson, Brennenstuhl, & Frank, 2010; Mills et al., 2013; Teisl &

[☆] The paper was supported by grants from the German Research Foundation (FO 788/1-2 & HA 1400/14-1-3; 4-5).

* Corresponding author.

E-mail address: heather.foran@aau.at (H.M. Foran).

Cicchetti, 2008; Thomas, Hypponen, & Power, 2008; Wegman & Stetler, 2009). Further research has documented negative effects of parental punishment on children's behavioral and emotional adjustment as well as on their self-esteem (Aucoin, Frick, & Bodin, 2006). An extensive meta-analysis from Gershoff (2002) supported the link between physical punishment and impaired mental health, increased aggression, and lower moral internalization in children.

Parental physical punishment is not only positively associated with concurrent problems, but is also associated with more health risks in adulthood. A study by Afifi, Brownridge, Cox, and Sareen (2006) found physical punishment during childhood was associated with adulthood psychopathology, putting the victims at increased risk for major depression, alcohol abuse/dependence, and other externalizing symptoms. Further, former victims of physical punishment have a higher probability of developing mood disorders, anxiety disorders, substance abuse/dependence, and personality disorders (Afifi et al., 2012). One two-year longitudinal study by Lansford et al. (2014) with over a thousand children across eight countries found increased aggression and anxiety in children who were being physically punished over the two-year period. Brody et al. (2015) found unsupportive parenting resulted in more anger, which was associated with poorer overall health, based on a combined measure of inflammation, self-reported physical health, and depressive symptoms. Increased difficulties with emotion regulation may lead to the release of cortisol and catecholamines and affect telomere length, which may lead to a heightened risk for several diseases such as diabetes and strokes later in life (Beach, Yu, Beach, & Philibert, 2015; Price, Kao, Burgers, Carpenter, & Tyrka, 2013).

Not only parental physical aggression but also parental psychological/verbal aggression is associated with health risks. Parental psychological aggression is associated with psychopathology later in life including depression, somatization, and anxiety (e.g., Choi, Jeong, Rohan, Polcari, & Teicher, 2009; Morimoto & Sharma, 2004; Polcari, Rabi, Bolger, & Teicher, 2014). Parental psychological aggression may lead to neurodevelopmental changes and self-criticism that place a child at risk for internalizing disorders (Choi et al., 2009; Sachs-Ericsson, Verona, Joiner, & Preacher, 2006). Longitudinal studies on parental psychological aggression have found a higher risk for personality disorders among former sufferers (Johnson et al., 2001), as well as an elevated risk for conduct problems and depressive symptoms (Wang & Kenny, 2014).

1.2. Current study

Although there are a growing number of studies which have examined parental aggression and its health effects, few studies have examined these relationships over a longer period of time from childhood to adolescence. In addition, most studies have only included mother-report or child retrospective reports, and physical and psychological aggression are often not considered in the same study. To address these gaps, the current study will test a biopsychosocial family model to determine the effect of early parental aggression on child physical health status during adolescence. This model is in line with theoretical frameworks such as the risky families model (Repetti, Taylor, & Seeman, 2002) and the biobehavioral family model (Wood et al., 2008). First, we hypothesize that more parental psychological and physical aggression at baseline as well as higher levels of children's internalizing and externalizing symptoms will be related to impaired physical health status of adolescents ten years later. Second, we hypothesize an indirect effects model such that parental aggression at baseline will predict children's internalizing and externalizing symptoms over four years, which in turn, will predict adolescent health status. We will test these hypotheses using a prospective sample of German families followed over ten years.

2. Method

2.1. Participants and procedure

Participants were recruited from preschools in Braunschweig, Germany (see Heinrichs, Bertram, Kuschel, & Hahlweg, 2005 for more details on the recruitment process) to participate in a randomized control trial of a universal primary parenting prevention program (i.e., the Triple-P positive parenting program; see Sanders, 2012 for a full description of the program). Preschools were used for recruitment of a representative sample since most children in Germany attend preschool due to their widespread availability and low cost for children. Briefly, 17 preschools were selected to yield a sample representative of a range of social-economic statuses using the social index of their catchment area via the objective Kita Social Index. Parents, fluent in German, were eligible to participate if they had a child 2 ½ to 6 years old attending preschool. The population response rate was 31% ($N = 280$) of those invited to participate (Heinrichs et al., 2005), similar to other international prevention trials (Sanders, 1999). Only parents who were cohabiting or married at pre-assessment were eligible for the current study so that both fathers and mothers could be included in the analyses ($N = 242$).

Participants were assessed seven times over the course of the ten-year study (baseline, approximately 6 months following the initial assessment, four additional times every 12 months after the pre-assessment, and ten years later). Participant retention was excellent across the ten years; 91.3% of families provided data over the ten-year period ($n = 221$ of the initial 242 parents). Participants were given 50 Euros for participating in the first assessment. They were provided with 20 Euros for all subsequent assessments. This study was approved by the ethics committee and informed consent of participants was obtained.

The mean age of the sample was 38.7 (6.0) years for men and 35.4 (4.7) years for women. The study child was 4.5 years old on average ($SD = 0.98$), 46.7% of them being female. The majority of the sample reported receiving a middle income (54%, 1500–3000 Euros per month after taxes); 34% reported an income greater than 3000 Euros per month; 11% of the sample reported an income of less than 1500 Euros per month and 3% did not report any income information. Seventy-nine percent of men and ten percent of women reported working full-time; two percent of men and 46% of women reported working part-time; and eight percent of men and 43% of women were unemployed.

In Germany, there are three levels of secondary education (high, middle, and low). Over half of men and women (57% and 58%, respectively) had completed the high level (typically indicative of individuals who attend college); 20% of men and 33% of women completed the middle level (typically indicative of individuals who obtain some specialized training other than a bachelor's degree such as to become an electrician, cook, or medical assistant or other trade profession) and 14% of men and 9.5% of women reported the low level (typically indicative of individuals who do not complete high school). Regarding post-secondary education, half of the men (48%) and 37% of women had completed some type of university degree; 11% of men and 25% of women had completed a specialized training or community college degree and 32% of men and 38% women had completed an apprenticeship or had no post-secondary education. The median number of children living in the household was one ($IRQ = 1$).

2.2. Measures

2.2.1. Independent variable – Parental physical aggression

Parental aggression towards the child was assessed at baseline (child age 2.5–6.0 years) with mother and father report. Parental physical aggression was assessed with the following item: "Lots of parents report that they had to punish their child due to misconduct, e.g. spanking them or grabbing them firmly or shaking them. How often did you

have to punish your child?" (Kliem, Foran, & Hahlweg, 2014). The relevant time range was defined as within the last year; the item was rated on a response scale ranging from 0 = *never*; 1 = *< 1x/month*; 2 = *1x/month*; 3 = *1x/week*; to 4 = *2-3x/week*.

2.2.2. Independent variable – Parental psychological aggression

A two item measure from the German expanded version (Naumann et al., 2010) of the Parenting Scale (Arnold, O'Leary, Wolff, & Acker, 1993) was used to assess parental psychological aggression. These items included: "When my child does something I don't like, I insult my child, say mean things, or call my child names" and "When my child misbehaves, I don't speak with my child for a long time". The relevant time range was defined as within the past two months. Parents respond to these items on a seven-point scale, choosing between an effective and ineffective (i.e. more aggressive) strategy, with higher scores indicating more psychological aggression. The average score of the items was used in analyses (correlation for mothers $r = 0.38$, $p < .001$ and fathers $r = 0.51$, $p < .001$).

2.2.3. Mediator – Child internalizing and externalizing symptoms

The commonly used Child Behavior Checklist was used to assess maternal- and parental-reported child internalizing and externalizing symptoms in five 12 months intervals starting at baseline (Achenbach & Rescorla, 2000). This widely used measure asks parents to report the presence and frequency of child behavioral problems and emotional problems and has high internal consistency in this sample (internalizing symptoms, $\alpha_{\text{Mother}} = 0.90$, $\alpha_{\text{Father}} = 0.92$; externalizing symptoms, $\alpha_{\text{Mother}} = 0.90$, $\alpha_{\text{Father}} = 0.92$ at baseline). The age-appropriate German versions of the Child Behavior Checklist (CBCL 1 1/2–5 and CBCL 4–18) for children aged 1.5–5 years and 4–18 years were used. Since the two age-dependent versions cannot be directly compared, scores were converted to Z scores. Latent variables for internalizing and externalizing symptoms were created based on maternal and paternal reports at the five assessment time points, respectively.

Internalizing symptoms in the borderline to clinical range at baseline assessment were reported by mothers for 18% of children (father report 17%). Internalizing symptoms at the four-year follow-up were reported by mothers for 20% of children (10% father report). Externalizing symptoms in the borderline to clinical range at baseline assessment were reported by mothers for 13% of children (father report 12%). Externalizing symptoms at the four-year follow-up were reported by mothers for 23% of children (18% father report).

2.2.4. Outcome variable - KINDL physical health status

The KINDL scale on health-related well-being for children and adolescents is available in two versions, one for children and one for parents. It includes five scales: physical and psychological well-being, self-worth, family, friends and school. Only the scale on physical health was of interest in this study. This scale incorporates four items (e.g. "In the last week, my child felt ill") that can be answered on a 5-point Likert scale (1 = *never*; 5 = *always*). After reverse scoring three of the four items, higher scores indicate better physical well-being. The instrument has shown to have good psychometric properties (Ravens-Sieberer, Görtler, & Bullinger, 2000). Internal consistency for this scale in this sample was good ($\alpha_{\text{Mother}} = 0.79$, $\alpha_{\text{Father}} = 0.80$ and $\alpha_{\text{Child}} = 0.79$).

2.2.5. Control variables

Six variables were included in the model to control for their relationship with child physical health status. These variables included child gender and age, group allocation to the Triple-P positive parenting program ($n = 133$) or control condition ($n = 109$), physical health impairment status at baseline (scored from 0 = *not at all* to 4 = *very strongly*), APGAR score (i.e. assessment of appearance, pulse, grimace activity and respiration) at birth (mean of APGAR Index 1 and 2), and inflammation status at baseline (mean of presence = 1 or

Table 1
Descriptive statistics.

	N	Min	Max	Mean	SD
Age of the child (months)	242	30.00	79.00	53.78	11.77
Impairment due to health problems	241	0.00	4.00	0.36	0.72
Inflammation status	242	0.00	1.00	0.07	0.17
APGAR score	231	4.50	10.00	9.75	0.63
Parental use of physical aggression					
Mother report	242	1.00	5.00	1.86	0.67
Father report	218	1.00	4.00	1.60	0.65
Parental use of psychological aggression					
Mother report	240	1.00	7.00	2.19	1.14
Father report	201	1.00	6.50	2.23	1.13
Physical health status at the ten year follow-up					
Mother report	219	6.67	20.00	16.29	3.00
Father report	184	8.00	20.00	16.82	2.45
Child report	223	5.00	20.00	14.91	2.92

Abbreviation. APGAR = combined score assessing appearance, pulse, grimace activity and respiration.

absence = 0 of allergy, asthma and neurodermatitis). Parental age was also examined as a potential confounding variable, but as reported in Table 1, it was not correlated with any study variables, and thus, not included as a control variable.

2.3. Analytical strategy

Descriptive statistics of the sample ($N = 242$) are presented in Table 1. Correlations among the study variables are presented in Table 2. Longitudinal relationships were examined using maximum likelihood estimation with bias-corrected bootstrapping with 1000 resamples in Mplus v.6.12 (Muthén & Muthén, 1998-2010). Tests of indirect effects between baseline parental aggression (psychological and physical) and adolescent physical health status at the ten-year follow-up were conducted with child internalizing and externalizing symptoms considered as proximal predictors (see Fig. 1). Models were run separately for internalizing and externalizing symptoms based on maternal and paternal reports. A variety of the baseline variables were included in the model as controls including group allocation, child age and gender, inflammation status, physical impairment status and APGAR score. To determine model fit, the following indices were used: Root Mean-Square Error of Approximation (RMSEA < 0.08), Comparative Fit Index (CFI > 0.90), and Tucker-Lewis Index (TLI > 0.90) (Hu & Bentler, 1999). Bias-corrected bootstrapped 95% confidence intervals were examined to determine statistical significance of the indirect effects (MacKinnon, Lockwood, & Williams, 2004; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

3. Results

Descriptive statistics are reported in Table 1. Correlations among study variables are reported in Table 2. Psychological and physical aggression were significantly correlated for mothers ($r = 0.23$, $p < .001$) but not fathers ($r = 0.13$, $p = .07$). Group differences among all study variables based on gender or group allocation were tested with independent t -tests. Participants who received the program had lower baseline levels of paternal-reported psychological aggression and higher maternal-reported CBCL scores ($p < .05$). Significant gender differences in physical aggression, adolescent physical health status, baseline paternal-reported externalizing symptoms, and four-year follow-up maternal-reported externalizing symptoms were also found ($p < .05$), such that all scores were higher for boys (i.e., more aggression). No other study variable differed significantly based on group allocation or gender. Based on the results of the t -tests and correlations, six variables were kept in the models as covariates.

Table 3 presents the model fit indices and results of the indirect

Table 2
Kendall's tau correlations among study variables assessed at baseline unless indicated.

	Physical health status at the ten year follow-up			CBCL at baseline		Paternal report		CBCL at the four year follow-up			
	Maternal report	Paternal report	Child report	Maternal report IS	ES	IS	ES	Maternal report IS	ES	Paternal report IS	ES
Impairment due to health problems	-0.11*	-0.09	-0.10	0.06	0.02	0.11	0.07	0.17**	0.03	0.11	-0.01
Inflammation status	-0.12*	-0.17**	-0.15**	0.07	0.04	-0.01	0	0.18**	0.02	0.15*	0.03
APGAR	0.13*	0.03	0.01	-0.10	-0.09	-0.01	-0.03	-0.12*	0.03	-0.05	0.05
Age of the participants											
Mother (years)	0.01	0.04	0.01	-0.12**	-0.10*	-0.13*	-0.11*	-0.02	-0.07*	-0.06	-0.06
Father (years)	0.09	0.04	-0.01	-0.12*	-0.08	-0.17**	-0.15**	-0.09	-0.10*	-0.09	-0.07
Child (months)	-0.02	-0.01	-0.12*	0.04	-0.06	-0.01	-0.01	0.10*	-0.01	.04	-0.02
Physical aggression											
Maternal report	-0.03	-0.19**	0.09	0.02	0.15**	0.12*	0.20**	0.01	0.11*	0.13*	0.15*
Paternal report	-0.02	-0.07	0.03	0.03	0.17**	0.01	0.14*	-0.01	0.20**	0.01	0.12
Psychological aggression											
Maternal report	-0.04	-0.06	-0.10	0.07	0.15**	0.10	0.13**	0.16**	0.10*	0.12*	0.18**
Paternal report	-0.05	-0.04	-0.18**	0	0.16**	0.08	0.17**	0.04	0.12*	0.09	0.14*
CBCL at baseline											
Maternal report											
IS	-0.15**	-0.11*	-0.09	1	0.48**	0.41**	0.25**	0.38**	0.26**	0.21**	0.15**
ES	-0.10*	-0.18**	-0.08		1	0.32**	0.52**	0.31**	0.43**	0.23**	0.38**
Paternal report											
IS	-0.02	-0.20**	-0.04			1	0.51**	0.21**	0.10	0.32**	0.21**
ES	-0.01	-0.21**	-0.08				1	0.20**	0.34**	0.30**	0.41**
CBCL - 4 year follow-up											
Maternal report											
IS	-0.22**	-0.14*	-0.14**					1	0.39**	0.33**	0.19**
ES	-0.08	-0.13*	-0.009						1	0.18**	0.51**
Paternal report											
IS	-0.08	-0.25**	-0.10							1	0.36**
ES	-0.03	-0.22**	-0.11*								1

Abbreviations. IS = internalizing symptoms; ES = externalizing symptoms; CBCL = Child Behavior Checklist; APGAR = combined score regarding appearance, pulse, grimace activity and respiration.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

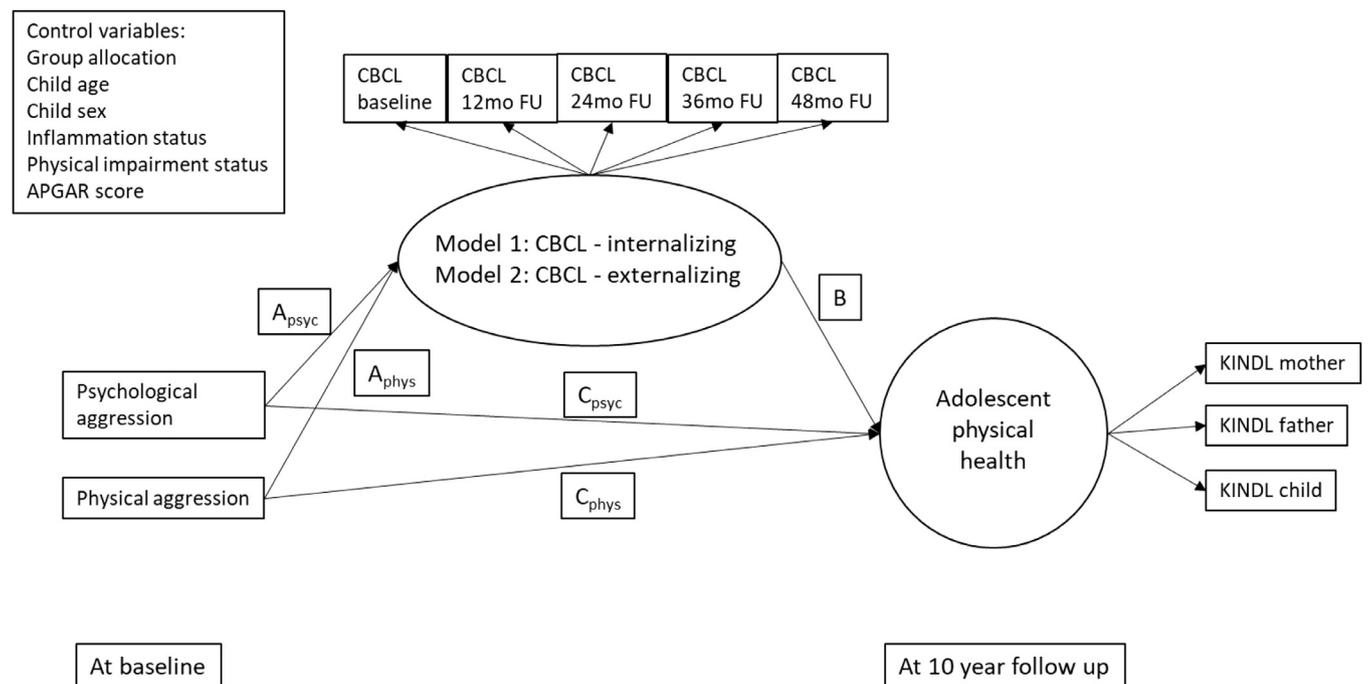


Figure 1. Mediation model including two types of parental aggression (i.e., psychological and physical), internalizing and externalizing symptoms (these were tested in two separate models) and adolescent physical health status. Models were tested separately based on maternal and paternal reports on the CBCL. Control variables are regressed on the mediator and the outcome variable.

Table 3
Model fit indices and indirect effects.

	χ^2 (df)*	RMSEA [90%CI]	CFI	TLI	SRMR	Path B β (p)	Path A _{psy} β (p)	Path A _{phy} β (p)	Path C _{psy} β (p)	Path C _{phy} β (p)	Indirect effect _{psy} β [95%CI]	Indirect effect _{phy} β [95%CI]	Explained variance (%) in M (Y)
<i>Mother</i>													
Internalizing	110.4 (66)	0.054 (0.036,0.072)	0.954	0.936	0.038	-0.345 (0.003)	0.194 (0.009)	-0.069 (0.332)	-0.023 (0.829)	-0.136 (0.172)	-0.067[-0.141,-0.018]	0.024[0.016,0.086]	10.5 (23.1)
Externalizing	111.4 (66)	0.055 (0.037,0.072)	0.957	0.941	0.044	-0.226 (0.046)	0.197 (0.009)	0.093 (0.218)	-0.051 (0.613)	-0.087 (0.405)	-0.045[-0.121,-0.003]	-0.021[-0.079,0.004]	11.2 (17.5)
<i>Father</i>													
Internalizing	106.1 (66)	0.056 (0.035,0.076)	0.934	0.908	0.048	-0.282 (0.055)	0.145 (0.112)	-0.037 (0.649)	-0.113 (0.290)	-0.115 (0.305)	-0.041[-0.143,0.001]	0.010[-0.028,0.083]	3.9 (21.7)
Externalizing	106.2 (66)	0.056 (0.035,0.076)	0.951	0.932	0.042	-0.242 (0.051)	0.207 (0.021)	0.149 (0.082)	-0.099 (0.350)	-0.074 (0.502)	-0.050[-0.131,-0.003]	-0.036[-0.106,0.001]	7.9 (19.8)

Note: Paths refer to those in Fig. 1. Path B – child symptoms→adolescent physical health status, Path A_{psy} – psychological aggression→child symptoms, Path C_{psy} – psychological aggression→adolescent physical health, Path C_{phy} – physical aggression→adolescent physical health. Mother models = Maternal report on children's internalizing or externalizing symptoms (n = 229). Father models = paternal report on children's internalizing or externalizing symptoms (n = 192). RMSEA = root mean-square error of approximation, CI = confidence interval, CFI = comparative fit index, TLI = Tucker-Lewis index, SRMR = standardized root mean square residual, M = mediator, Y = outcome variable. Included control variables: child gender and age, group allocation, child health impairment status, APGAR, inflammation status. Models were tested without covariates and remained largely the same, although more paths were statistically significant in the covariate free model. These results are available from the first author upon request.

* All normed chi-squares (χ^2/df) were in the desirable range of 1.0–2.0 with values between 1.61 and 1.69.

effect models for both mothers and fathers. The longitudinal models were good fits to the data. In the context of the multivariable longitudinal model, psychological aggression was associated with increased internalizing and externalizing symptoms based on maternal reports and with increased externalizing symptoms based on paternal reports. Higher levels of internalizing and externalizing symptoms reported by mothers, predicted worse adolescent physical health status and approached statistical significance for fathers ($p < .06$). Testing of indirect effects showed significant findings for three of the four models tests, partially supporting the hypotheses.

4. Discussion

The aim of this study was to investigate the relationships between parental aggression, child mental health, and adolescent physical health status ten years later. Consistent with biopsychosocial family models, we hypothesized that parental aggression impacts children's mental health symptoms, which in turn places children at risk for poorer physical health status in adolescence. This hypothesis was partially supported. Maternal psychological aggression at baseline predicted increased maternal-reported internalizing and externalizing symptoms and increased paternal-reported externalizing symptoms over a four-year period. In the context of the latent variable models, the indirect effect models for parental aggression, child's mental health, and adolescent physical health status were supported for all models expect the model with paternal-reported internalizing symptoms (see Fig. 1 and Table 3).

These findings highlight the importance of maternal psychological aggression, and partially paternal psychological aggression, in understanding links with children's mental and physical health over time. Taken together, our results provide further tentative support for theoretical biopsychosocial family models that have described the role of poor family environments, such as parental psychological aggression, on developmental health outcomes in children (e.g., emotional security theory; Davies & Cummings, 1994; risky families model; Repetti et al., 2002; biobehavioral family model; Wood et al., 2008).

From a methodological perspective, the use of multiple time points and a multi-informant approach highlights some important considerations for developmental health research. Based on the correlational results, it is clear that results vary based on informant and time period. Past research has shown moderate inter-rater agreement among parents in reporting children's internalizing symptoms and high inter-rater agreement among parents in reporting children's externalizing symptoms (e.g., Duhig, Renk, Epstein, & Phares, 2000; van der Veen-Mulders, Nauta, Timmerman, van den Hoofdakker, & Hoekstra, 2017). The discrepancies have been attributed to sociodemographic differences, time spent with the child, and parenting stress. Further, discrepancies in awareness of the symptoms may relate to differences in the relationship with each parent and what behavior the child displays or discloses.

Given the complexity of this topic, more research is clearly needed to understand how these discrepancies may impact the reliability and validity of the results. Our finding that maternal, but not paternal, report of children's internalizing symptoms related to adolescent physical health status in the latent variable models could be explained by differences in parental awareness of the problems, different parent-child relationships, or be due to the larger sample of mothers who participated. These open questions represent important further areas for research.

4.1. Strengths and limitations

There are several strengths of this study worthy of mention. In particular, the use of the prospective design across such a long time period of ten years and the excellent retention across time are significant strengths. Other strengths include the use of the latent variables

for children's mental health and physical health status and the use of repeated measures. Further, the study included data from both mothers and fathers across time as well as adolescent self-report at the last time point when children were old enough to report on their own symptoms. Few studies exist testing biopsychosocial models of family aggression and health over such a long time frame and with both mothers and fathers included.

There are also several limitations. The sample size was too small to further expand the structural models to include additional variables of interest or to test a fully dyadic model with both father and mother latent variables for CBCL reports examined in the same model. In addition, the sample consisted of parents who participated in a RCT of a brief group parenting intervention ten years earlier. Participation in the study program was controlled for in all analyses and was not a statistically significant predictor of the outcomes examined in the current sample. Further, although prospective, the study cannot confirm causal relationships between variables. Variables were self-reported by mothers, fathers, and children. However, where possible responses of multiple informants were used to counteract reporting bias and common method variance across measures. In addition, the measures of parental aggression were brief and future studies should use more established measures. The explained variance ranged from 4% to 23% and the clinical significance of the associations at different developmental timeframes and based on different reporters needs more consideration in the literature. Lastly, although efforts were made to recruit a sample representative of the region sampled, only a third of eligible parents contacted through preschools agreed to participate in this study. This participation rate is similar to rates found in the existing literature, but nonetheless, the current sample may differ from the population of parents in ways which are unknown.

4.2. Clinical implications and future directions

The results highlight the need for further testing of biopsychosocial family models using longitudinal data to better understand how early parental aggression, particularly psychological aggression, may impact mental health and physical health of children. Future studies should explore the pathways between parental aggression, including more severe child maltreatment, and the impact on children's development to identify risk and protective factors and to test biological mechanisms. Moreover, continued research on the discrepancies between informants and at different time points is needed.

Given the findings in the current manuscript in which higher levels of parental psychological aggression predicted higher levels of mental health symptoms, and in turn, impaired physical health status in adolescence, more attention in prevention of psychological aggression, in particular, is warranted. Data from a recent representative sample in Germany indicate that similar to many other countries, prevalence rates of psychological aggression as well as physical aggression are high and represent a public health challenge (publication in preparation, masked for review). Children in families at risk for parental aggression may also benefit from prevention programs targeting internalizing and externalizing symptoms such as school-based interventions or parent training programs (Sanders, 2012).

Conflict of interest

None.

References

Achenbach, T. M., & Rescorla, L. A. (2000). *Manual for the ASEBA preschool forms & profiles: An integrated system of multi-informant assessment (child behavior checklist for ages 1½–5; language development survey; caregiver–Teacher report form)*. Burlington, VT: University of Vermont.

Affii, T. O., Brownridge, D. A., Cox, B. J., & Sareen, J. (2006). Physical punishment, childhood abuse and psychiatric disorders. *Child Abuse & Neglect*, 30(10), 1093–1103.

<https://doi.org/10.1016/j.chiabu.2006.04.006>.

Affii, T. O., Mota, N. P., Dasiewicz, P., MacMillan, H. L., & Sareen, J. (2012). Physical punishment and mental disorders: Results from a nationally representative US sample. *Pediatrics*, 130(2), 184–192. <https://doi.org/10.1542/peds.2011-2947>.

Affii, T. O., Mota, N., Sareen, J., & MacMillan, H. L. (2017). The relationships between harsh physical punishment and child maltreatment in childhood and intimate partner violence in adulthood. *BMC Public Health*, 17, 1–10. doi:10.1186/s12889-017-4359-8.

Anda, R. F., Felitti, V. J., Bremner, J. D., Walker, J. D., Whitfield, C., Perry, B. D., et al. (2006). The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. *European Archives of Psychiatry and Clinical Neuroscience*, 256(3), 174–186. doi:10.1007/s00406-005-0624-4.

Arnold, D. S., O'Leary, S. G., Wolff, L. S., & Acker, M. M. (1993). The Parenting Scale: A measure of dysfunctional parenting in discipline situations. *Psychological Assessment*, 5(2), 137–144. <https://doi.org/10.1037/1040-3590.5.2.137>.

Aucoin, K. J., Frick, P. J., & Bodin, S. D. (2006). Corporal punishment and child adjustment. *Journal of Applied Developmental Psychology*, 27(6), 527–541. <https://doi.org/10.1016/j.appdev.2006.08.001>.

Brody, G. H., Yu, T., Beach, S. R. H., Kogan, S. M., Windle, M., & Philibert, R. A. (2015). Harsh parenting and adolescent health: A longitudinal analysis with genetic moderation. *Health Psychology*, 33(5), 401–409. <https://doi.org/10.1037/a0032686>.

Choi, J., Jeong, B., Rohan, M. L., Polcari, A. M., & Teicher, M. H. (2009). Preliminary evidence for white matter tract abnormalities in young adults exposed to parental verbal abuse. *Biological Psychiatry*, 65(3), 227–234. <https://doi.org/10.1016/j.biopsych.2008.06.022>.

Davies, P. T., & Cummings, E. M. (1994). Marital conflict and child adjustment: An emotional security hypothesis. *Psychological Bulletin*, 116(3), 387–411. <https://doi.org/10.1037/0033-2909.116.3.387>.

Duhig, A. M., Renk, K., Epstein, M. K., & Phares, V. (2000). Interparental agreement on internalizing, externalizing, and total behavior problems: A meta-analysis. *Clinical Psychology Science and Practice*, 7(4), 435–453. <https://doi.org/10.1093/clipsy.7.4.435>.

Fergusson, D. M., Boden, J. M., & Horwood, L. J. (2008). Exposure to childhood sexual and physical abuse and adjustment in early adulthood. *Child Abuse & Neglect*, 32(6), 607–619. <https://doi.org/10.1016/j.chiabu.2006.12.018>.

Fergusson, D. M., & Lynskey, M. T. (1997). Physical punishment/maltreatment during childhood and adjustment in young adulthood. *Child Abuse & Neglect*, 21(7), 617–630. [https://doi.org/10.1016/S0145-2134\(97\)00021-5](https://doi.org/10.1016/S0145-2134(97)00021-5).

Forsa. (2011). Gewalt in der Erziehung (2011). Retrieved from http://www.eltern.de/c/pdf/umfrage-ohrfeigen/Studie_forsa_Gewalt%20in%20der%20Erziehung_2011.pdf.

Fuller-Thomson, E., Brennenstuhl, S., & Frank, J. (2010). The association between childhood physical abuse and heart disease in adulthood: Findings from a representative community sample. *Child Abuse & Neglect*, 34(9), 689–698. <https://doi.org/10.1016/j.chiabu.2010.02.005>.

Gershoff, E. T. (2002). Corporal punishment by parents and associated child behaviors and experiences: A meta-analytic and theoretical review. *Psychological Bulletin*, 128(4), 539–579. <https://doi.org/10.1037/0033-2909.128.4.539>.

Graziano, A. M. (1994). Why we should study subabusive violence against children. *Journal of Interpersonal Violence*, 9(3), 412–419. <https://doi.org/10.1177/088626094009003009>.

Hahlweg, K., Heinrichs, N., Bertram, H., Kuschel, A., & Widdecke, N. (2008). Körperliche Bestrafung: Prävalenz und Einfluss auf die psychische Entwicklung bei Vorschulkindern. *Kindheit und Entwicklung*, 17(1), 45–56. <https://doi.org/10.1026/0942-5403.17.1.46>.

Heinrichs, N., Bertram, H., Kuschel, A., & Hahlweg, K. (2005). Parent recruitment and retention in a universal prevention program for child behavior and emotional problems: Barriers to research and program participation. *Prevention Science*, 6(4), 275–286. <https://doi.org/10.1007/s11212-005-0006-1>.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>.

Johnson, J. G., Cohen, P., Smailes, E. M., Skodol, A. E., Brown, J., & Oldham, J. M. (2001). Childhood verbal abuse and risk for personality disorders during adolescence and early adulthood. *Comprehensive Psychiatry*, 42(1), 16–23. <https://doi.org/10.1053/comp.2001.19755>.

Kliem, S., Foran, H., & Hahlweg, K. (2014). Can corporal punishment be reduced by parent training? Results of a 3-year longitudinal study. *Kindheit und Entwicklung*, 24(1), 37–46. <https://doi.org/10.1026/0942-5403/a000157>.

Knox, M. (2010). On hitting children: A review of corporal punishment in the United States. *Journal of Pediatric Health Care*, 24(2), 103–107. <https://doi.org/10.1016/j.pedhc.2009.03.001>.

Lansford, J. E., Sharma, C., Malone, P. S., Woodlief, D., Dodge, K. A., Oburu, P., et al. (2014). Corporal punishment, maternal warmth, and child adjustment: A longitudinal study in eight countries. *Journal of Clinical Child and Adolescent Psychology*, 43(4), 670–685. <https://doi.org/10.1080/15374416.2014.893518>.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test the significance of mediation and other intervening variable effects. *Psychological Methods*, 7, 83–104.

MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research*, 39, 99–123. https://doi.org/10.1207/s15327906mbr3901_4.

Mills, R., Scott, J., Alati, R., O'Callaghan, M., Najman, J., & Strathearn, L. (2013). Child maltreatment and adolescent mental health problems in a large birth cohort. *Child Abuse & Neglect*, 37(5), 292–302. <https://doi.org/10.1016/j.chiabu.2012.11.008>.

- Morimoto, Y., & Sharma, A. (2004). Long-term outcomes of verbal aggression. *Journal of Emotional Abuse, 4*(2), 71–99. https://doi.org/10.1300/J135v04n02_04.
- Muthén, L. K., & Muthén, B. O. (1998). *Mplus user's guide* (6th ed.). Los Angeles, CA: Muthén & Muthén.
- Naumann, S., Bertram, H., Kuschel, A., Heinrichs, N., Hahlweg, K., & Döpfner, M. (2010). Der Erziehungsfragebogen (EFB). Ein Fragebogen zur Erfassung elterlicher Verhaltenstendenzen in schwierigen Erziehungssituationen. *Diagnostica, 56*(3), 144–157. <https://doi.org/10.1026/0012-1924/a000018>.
- Norman, R. E., Byambaa, M., De, R., Butchart, A., Scott, J., & Vos, T. (2012). The long-term health consequences of child physical abuse, emotional abuse, and neglect: A systematic review and meta-analysis. *PLoS Medicine, 9*(11), 1–32. <https://doi.org/10.1371/journal.pmed.1001349>.
- Polcari, A., Rabi, K., Bolger, E., & Teicher, M. H. (2014). Parental verbal affection and verbal aggression in childhood differentially influence psychiatric symptoms and wellbeing in young adulthood. *Child Abuse & Neglect, 38*(1), 91–102. <https://doi.org/10.1016/j.chiabu.2013.10.003>.
- Price, L. H., Kao, H.-T., Burgers, D. E., Carpenter, L. L., & Tyrka, A. R. (2013). Telomeres and early-life stress: An overview. *Biological Psychiatry, 73*(1), 15–23. <https://doi.org/10.1016/j.biopsych.2012.06.025>.
- Ravens-Sieberer, U., Görtler, E., & Bullinger, M. (2000). Subjektive Gesundheit und Gesundheitsverhalten von Kindern und Jugendlichen—Eine Befragung Hamburger Schüler im Rahmen der schulärztlichen Untersuchung. *Das Gesundheitswesen, 62*(3), 148–155. <https://doi.org/10.1055/s-2000-10487>.
- Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: Family social environments and the mental and physical health of offspring. *Psychological Bulletin, 128*(2), 330–366. <https://doi.org/10.1037/0033-2909.128.2.330>.
- Rodriguez, C. M., & Richardson, M. J. (2007). Stress and anger as contextual factors and pre-existing cognitive schemas: Predicting parental child maltreatment risk. *Child Maltreatment, 12*(4), 325–337. <https://doi.org/10.1177/1077559507305993>.
- Sachs-Ericsson, N., Verona, E., Joiner, T., & Preacher, K. J. (2006). Parental verbal abuse and the mediating role of self-criticism in adult internalizing disorders. *Journal of Affective Disorders, 93*(1–3), 71–78. <https://doi.org/10.1016/j.jad.2006.02.014>.
- Salzinger, S., Feldman, R. S., Hammer, M., & Rosario, M. (1991). Risk for physical child abuse and the personal consequences for its victims. *Criminal Justice and Behavior, 18*(1), 64–81. doi:10.1177/0093854891018001006.
- Sanders, M. R. (1999). Triple P-Positive Parenting Program: Towards an empirically validated multilevel parenting and family support strategy for the prevention of behavior and emotional problems in children. *Clinical Child and Family Psychology Review, 2*(2), 71–90. <https://doi.org/10.1023/A:1021843613840>.
- Sanders, M. R. (2012). Development, evaluation, and multinational dissemination of the Triple P-Positive Parenting Program. *Annual Review of Clinical Psychology, 8*(1), 345–379. <https://doi.org/10.1146/annurev-clinpsy-032511-143104>.
- Slep, A. M. S., Heyman, R. E., & Foran, H. M. (2015). Child maltreatment in DSM-5 and ICD-11. *Family Process, 54*(1), 1–16. <https://doi.org/10.1111/famp.12131>.
- Straus, M. A. (1994). *Beating the devil out of them: Corporal punishment in American families*. New York: Lexington Books.
- Straus, M. A. (2000). Corporal punishment and primary prevention of physical abuse. *Child Abuse & Neglect, 24*(9), 1109–1114. [https://doi.org/10.1016/S0145-2134\(00\)00180-0](https://doi.org/10.1016/S0145-2134(00)00180-0).
- Teisl, M., & Cicchetti, D. (2008). Physical abuse, cognitive and emotional processes, and aggressive/disruptive behavior problems. *Social Development, 17*(1), 1–23. <https://doi.org/10.1111/j.1467-9507.2007.00412.x>.
- Thomas, C., Hypponen, E., & Power, C. (2008). Obesity and type 2 diabetes risk in mid-adult life: The role of childhood adversity. *Pediatrics, 121*(5), e1240–e1249. <https://doi.org/10.1542/peds.2007-2403>.
- van der Veen-Mulders, L., Nauta, M. H., Timmerman, M. E., van den Hoofdakker, B. J., & Hoekstra, P. J. (2017). Predictors of discrepancies between fathers and mothers in rating behaviors of preschool children with and without ADHD. *European Child and Adolescent Psychiatry, 26*(3), 365–376. <https://doi.org/10.1007/s00787-016-0897-3>.
- Wang, M.-T., & Kenny, S. (2014). Longitudinal links between fathers' and mothers' harsh verbal discipline and adolescents' conduct problems and depressive symptoms. *Child Development, 85*(3), 908–923. <https://doi.org/10.1111/cdev.12143>.
- Wegman, H. L., & Stetler, C. (2009). A meta-analytic review of the effects of childhood abuse on medical outcomes in adulthood. *Psychosomatic Medicine, 71*(8), 805–812. <https://doi.org/10.1097/PSY.0b013e3181bb2b46>.
- Whipple, E. E., & Richey, C. A. (1997). Crossing the line from physical discipline to child abuse: How much is too much? *Child Abuse & Neglect, 21*(5), 431–444. [https://doi.org/10.1016/S0145-2134\(97\)00004-5](https://doi.org/10.1016/S0145-2134(97)00004-5).
- Wood, B. L., Lim, J., Miller, B. D., Cheah, P., Zwetsch, T., Ramesh, S., et al. (2008). Testing the biobehavioral family model in pediatric asthma: Pathways of effect. *Family Process, 47*(1), 21–40. <https://doi.org/10.1111/j.1545-5300.2008.00237.x>.
- Ziegenhain, U., Künster, A. K., & Besier, T. (2017). Vernachlässigung, Misshandlung und Missbrauch: Gewalt gegen Kinder ist weit verbreitet. *Pädiatrie, 29*(1), 8–15. <https://doi.org/10.1007/s15014-017-0960-7>.
- Zolotor, A. J., Theodore, A. D., Chang, J. J., Berkoff, M. C., & Runyan, D. K. (2008). Speak softly—And forget the stick: Corporal punishment and child physical abuse. *American Journal of Preventive Medicine, 35*(4), 364–369. <https://doi.org/10.1016/j.amepre.2008.06.031>.