The Relationship of Child Functioning to Parental Physical Assault: Linear and Curvilinear Models

Jesse J. Helton and Theodore P. Cross

Child Maltreat 2011 16: 126 originally published online 25 March 2011
DOI: 10.1177/1077559511401742

Child Maltreatment
16(2) 126-136

DOI: 10.1177/1077559511401742
http://cm.sagepub.com
SAGE

The Relationship of Child Functioning to Parental Physical Assault: Linear and Curvilinear Models

Jesse J. Helton[1] and Theodore P. Cross[1]

Abstract

Previous research suggests a curvilinear relationship between child disability and physical abuse, with children with mild impairments at greater risk than both children with severe impairments and superior functioning. Using a national probability sample of families investigated for maltreatment ($N = 1675$), this study tested for both linear and curvilinear relationships of child functioning to parental physical assault. Linear relationships were found between problem behaviors and minor and severe assault, and between social skills and minor assault: the more impaired the level of child functioning, the greater the risk. Curvilinear relationships were found in which children with mildly impaired or average language skills were at greater risk for minor assault than both children with severe impairment or above average and superior skills. Children with superior daily-living skills were at lower risk for severe assault than all other children. Implications for understanding processes underlying parental physical assault of children with impairments are discussed.

Keywords

physical abuse, children with disabilities, parenting

A number of studies have found that children with physical, mental, developmental, and behavioral disabilities are more likely than other children to be victims of child maltreatment (Crosse, Kaye, & Ratnofsky, 1993; Jaudes & Mackey-Bilaver, 2008; Kendall-Tackett, Lyon, Taliaferro, & Little, 2005; Sullivan & Knutson, 1998, 2000). Reported estimates of maltreatment prevalence for children with a disability ranges anywhere from 3.1 to 11.5 times higher than the rate for children without a disability (Spencer et al., 2005; Sullivan & Knutson, 2000). A recent longitudinal analysis by Fluke, Schusterman, Hollinshead, and Yuan (2008) found that children with a disability were 1.5 times more likely to experience a substantiated rereport of maltreatment 2 years after an initial investigation. The connection between disability and physical assault is particularly well established (Ammerman, Hersen, Van Hasselt, Lubetsky, & Sieck, 1994; Sobsey, 1994; Sullivan & Knutson, 1998, 2000). Sullivan and Knutson (1998, 2000) found that children with a disability were 3.79 times more likely to be physically abused compared to children without a disability, and that this abuse persisted for a longer duration. The disproportionately high rate of physical abuse among children with a disability is especially troubling since abuse may further damage already compromised health and development. The recent National Incidence Study of Child Abuse and Neglect showed that children with a disability were much more likely to be seriously harmed from their assaults compared to children without a disability (Sedlak et al., 2010).

The causal pathway between disability and child maltreatment can go in either direction. Abuse and neglect, particularly at an early age, can cause physical damage or impair development in ways that lead to disability (Kempe, Silverman, Steele, Droegemueller, & Silver, 1962). At the same time, child disability can increase the risk that caregivers will abuse or neglect children (Jaudes & Mackey-Bilaver, 2008; Sullivan, 2009). The current study is concerned with disability's role as a risk factor for future maltreatment.

The finding that children with a disability are at increased risk for child maltreatment has been based on a dichotomous comparison between children with and without a disability. One conceptual model for explaining this difference in risk is a positive linear relationship between level of impairment and maltreatment. If there is a positive linear relationship, the risk of maltreatment would rise in tandem with the level of impairment, with the most severely impaired children having the greatest likelihood of suffering abuse or neglect. Several

[1] Children and Family Research Center, School of Social Work, University of Illinois at Urbana-Champaign, Urbana, IL, USA

Corresponding Author:
Jesse J. Helton, Children and Family Research Center, School of Social Work, University of Illinois at Urbana-Champaign, 1010 W Nevada St, Urbana, IL 61801, USA
Email: jhelton2@illinois.edu

explanations posited for the increased risk of maltreatment for children with a disability are consistent with a positive linear relationship. Sobsey (2002) suggests that children with a disability are at greater risk because their impairment makes them less able to avoid, escape from, or resist abusive adults. Sobsey also points out that children with a disability may be at greater risk because of the sheer number of additional adults involved in their lives, such as day care workers, respite workers, attendants, professionals, and so forth. Other explanations point to the relationship between children with a disability and their parents. The dependency-stress theory (Friedrich & Boriskin, 1978), suggests that aggressive parental responses to increased impairment are a direct result of the increased demands and stress produced by children's impaired conditions. Sobsey (2002) argues that this theory has been discredited, citing Benedict, Wulff, and White's (1992) finding of no relationship between an overall, four-domain measure of parental stress and maltreatment. However, two limitations of this study make it reasonable to conclude that the theory still needs to be tested. First, the authors' measurement of stress was current, while the maltreatment they measured actually occurred 2–10 years *before* the study; and second, the authors were unable to measure the social support received by the sampled families.

A number of findings from studies conducted on samples of children with a disability are not consistent with a positive linear relationship between level of impairment and maltreatment. Several studies have found that children with a more severe impairment are *less* likely to be maltreated than children with a less severe impairment (Ammerman et al., 1994; Benedict, White, Wulff, & Hall, 1990; Benedict et al., 1992; Knutson, Johnson, & Sullivan, 2004; Rodriguez & Murphy, 1997). Research using samples of children with a disability has found that increased risk of abuse was associated with higher levels of child social competence instead of lower (Ammerman et al., 1994), age-appropriate eating patterns instead of inappropriate (Benedict et al., 1990), slight developmental delays instead of more profound, and better functional movement instead of poorer movement (Verdugo, Bermejo, & Fuertes, 1995). In their study of parental stress in maltreating and nonmaltreating families of children with a disability, Benedict et al. (1992) discovered that families in which children were perceived to be seriously limited in physical functioning were less likely to have prior reports of maltreatment.

Taken together, the findings from these different studies suggest there may be a *curvilinear* relationship between level of functioning and maltreatment. The line best representing the relationship may be an inverted U with children with a minor impairment at greatest risk and children without impairment and children with a more severe impairment at lower risk at either end of the curve. The mathematical equation fitting this curve is a second degree or quadratic polynomial; thus testing for a curvilinear relationship of this form involves testing for a significant quadratic effect in a statistical model. Conceptually, we can hypothesize that children with minor impairment are at greater risk because they have a complicated mix of dysfunctionality and functionality. Their dysfunctionality increases the probability that they will act in a way that elicits a negative reaction from parents, while their functionality increases their parents' expectations of them and increases their ability to take actions that may frustrate their parents. In addition, the mix of dysfunctionality and functionality may make it harder for parents to understand these children, increasing the probability that parents will resort to aggressive responses.

Testing for a curvilinear relationship to maltreatment is best accomplished by using continuous measures of functionality, yet most studies do not do this. Usually disability is rendered as dichotomous yes–no variables based on the professional opinion of child protection caseworkers (Crosse et al., 1993), or on involvement in different types of services, such as early intervention (Burrell, Thompson, & Sexton, 1994), inpatient psychiatric units (Ammerman et al., 1994), and developmental disability centers (Rodriguez & Murphy, 1997). Even studies that have used more exact measurement of disability, such as multidisciplinary assessments conducted by medical, educational, and other professional staff (Benedict et al., 1990; Sullivan & Knutson, 1998, 2000) have still used categorizations of disability. Another methodological challenge is that different forms of impairment can have different effects on children's risk of maltreatment. In Verdugo et al.'s (1995) study of a sample with mental retardation, children and adolescents' risk of maltreatment was associated with *lower* levels of mental retardation but *higher* levels of language impairment and behavioral problems. Yet, most studies of the relationship between disability and maltreatment lump all forms of disability into one category or only deal with a particular type of disability. The World Health Organization (2001) has been critical of global, dichotomous assessments of disability because they are poor indicators of functionality. New models of disability, particularly the WHO International Classification of Functioning, Disability, and Health state that it is not the presence of a disorder within the body that defines a child as disabled, but how that disorder impairs body functions, limits activities of daily-living, and restricts participation in activities in environmental contexts. For instance, a child with autism may be diagnosed as disabled but may be indistinguishable from his or her peers without autism in most areas of functioning. A superior measurement method positions disability as a multidimensional construct that situates children on a continuum of distinct *abilities* that can vary substantially for children with the same medical diagnosis (Bricout, Porterfield, Tracey, & Howard, 2004). This method allows for a more complete picture of child impairment within different realms of functioning. Following the ICF, impairment in functionality is only a component a child's overall health and disabling condition within an environmental context, and therefore should not be mistaken for disability. Moving forward, the term *disability* will only be used to refer to previous research that adopts a categorical terminology, and *impairment* and *superior functioning* will be used to describe how we conceptualize and measure abilities on a continuum of functioning. Using multiple continuous measures of functioning in different domains, we can test for a curvilinear relationship to maltreatment in

each domain, and compare children with no impairment, a minor impairment, and a severe impairment on risk of maltreatment for each type of functionality.

Using a national probability sample of families who have been investigated for child maltreatment, the current study examines the relationship between levels of impairment and both minor and severe parental physical assault and responds to several of the methodological limitations discussed above. It includes children with no impairments, mild impairments, and severe impairments. It uses multiple continuous measures of functioning to capture ability and impairment in four areas: behavior problems, social skills, daily-living skills, and language development. It tests for both a linear and a curvilinear (quadratic) relationship. Our hope is to help clarify the relationship between impairment and physical assault and better inform prevention and treatment planning efforts.

Method

Sample

This study analyzed data from the National Survey of Child and Adolescent Well-Being (NSCAW) on children ages 3–10 residing with biological parents ($N = 1675$). NSCAW is a national probability study of 5,501 children who were subjects of child abuse and neglect investigations between October 1999 and December 2000. See NSCAW Research Group (2002) and U.S. Department of Health and Human Services, Administration for Children and Families (2008) for more information on NSCAW design and methodology. NSCAW is unique in its potential contribution to studies of child functionality, as it contains several standardized tests that can be used to construct valid measures of functioning capturing both ability and impairment. The NSCAW cases were selected from 92 Primary Sampling Units (PSUs) in 36 states. The PSUs were defined as geographic areas that encompassed the population served by a single CPS agency; most were counties. Two-stage random sampling was employed in which PSUs were first randomly selected and then children were randomly sampled within PSUs.

Baseline data were used. On average, these were collected 4 months following an investigation. The sample was restricted to children ages 3–10 because certain standardized measures of functionality were only used with children over the age of 2 and under the age of 11. The sample was further restricted to children with biological parents because these were the only ongoing caregivers in the sample who had been administered a self-report of physical assault. After the above restrictions, the sample included 1,675 cases.

Measures

Parental physical assault. The Conflict Tactics Scale Parent–Child version (CTS-PC) was used to measure minor and severe parental physical assault (Straus, Hamby, Finkelhor, Moore, & Runyan, 1998). The CTS-PC is a widely used measure of parental disciplinary tactics and maltreatment and has demonstrated reliability and validity. Parents reported on the CTS-PC the frequency and severity of different forms of discipline and maltreatment that they used in the past year against the index child. The CTS-PC contributed two separate dichotomous yes–no parental physical assault variables. *Minor physical assault* was coded when caregivers reported that they engaged in at least one of these acts in the previous year: shook the index child, hit them on the bottom with a hard object, spanked them with a bare hand, slapped them on the hand, arm, or leg, or pinched them. This type of assault, typically employed as corporal punishment, is not widely considered abuse, but can have negative effects on future physical, cognitive, and emotional well-being (Grogan-Kaylor, 2004) and can escalate into injurious levels of assault (Straus, 2001). *Severe physical assault* was coded when caregivers reported that they engaged in at least one of these acts in the previous year: hit the index child with a closed fist, kicked them hard, grabbed them around the neck and choked them, hit them hard over and over again, burned or scalded them on purpose, hit them on other parts of the body besides the bottom with a hard object, threatened them with a knife or gun, threw them or knocked them down, or slapped them on the face, head, or ears. Severe parental physical assault meets criteria for physical abuse.

Functionality. Sum scores from measures of child functioning in four different domains were used. Behavioral functioning was assessed by the Total Problem Score of the Child Behavior Checklist (CBCL; Achenbach, 1991), a widely used measure of behavioral problems reported by parents for children ages 2 and older. The total problem behavior scale was used, which combines both internalizing behavior problems such as somatic complaints, anxiety, and depression, and externalizing behavior problems such as delinquent and aggressive behaviors. To measure social functioning, parents completed the Social Skills Rating System (SSRS; Gresham & Elliot, 1990), for children ages 3 and over. The SSRS measures social skills in four domains: cooperation, assertion, responsibility, and self-control.

Functioning on daily-living skills was measured by the Vineland Adaptive Behavior Scale Screener (VABS; Sparrow, Carter, & Cicchetti, 1993), also completed by the parents. Daily-living skills include personal skills such as children's ability to feed and dress themselves and to take care of personal hygiene; domestic skills such as doing basic kitchen and housekeeping tasks; and community skills such as the ability to use the telephone and the ability to track time and day. Language functioning was measured by two scales—which scale was used depended on the age of the child. For children aged 3–5, parents completed the Preschool Language Scale (PLS; Zimmerman, Steiner, & Pond, 1992), which measures language functioning in the domains of auditory comprehension and expressive communication. For children aged 5 and over, language functioning was measured by the Vocabulary score from the Kaufman Brief Intelligence Test (K-BIT; Kaufman & Kaufman, 1990), which was administered to children

directly. This score, which measures expressive vocabulary, is derived from a task in which children name pictured objects.

All of these scales have been used in numerous studies and have demonstrated reliability and validity. These scores have been age-standardized and can be compared to scores obtained from normative samples of children in the same age range. The nationally normed mean for the CBCL is 50 with higher scores indicating more impairment. For all other measures, the nationally normed mean is 100 with higher scores indicating better functioning. Because higher scores represented greater impairment on CBCL while lower scores represented greater impairment on every other functionality measure, CBCL scores were reverse coded to make higher scores indicate better functioning. To facilitate comparison across functionality variables, scores for child behavioral problems (reverse coded), social skills, daily-living skills, and language skills were converted into standard (z) scores, so that each score on each variable represented the deviation of that child from the sample mean in standard deviations. In addition, to show rates of parental physical assault at different levels of functioning, additional five-category ordinal variables were created for each type of functioning, with the following categories: (a) *severe impairment*, or more than 1.5 standard deviations below the normative mean; (b) *minor impairment*, or between 1.5 and .5 standard deviations below the normative mean; (c) *average functioning*, or between .5 standard deviations below the normative mean to .5 standard deviations above the normative mean; (d) *above average functioning*, between .5 and 1.5 standard deviations above the normative mean; and (e) *superior functioning*, more than 1.5 standard deviations above the normative mean.

Covariates. A number of variables associated with physical abuse for both children with and without impairment were included in multivariable analyses to control for their potential confounding effects. Increased risk for physical assault has been associated with younger age for children with a disability (Crosse et al., 1993; Sullivan & Knutson, 1998) and those without a disability (Berger, 2005; Sedlak et al., 2010), male gender for children with a disability (Crosse et al., 1993; Sullivan & Knutson, 2000) and those without a disability (Berger, 2005), African American or Hispanic race compared to Caucasian for children with a disability (Crosse et al., 1993) and those without a disability (Berger, 2005; Sedlak et al., 2010), and younger age of parent compared to older for children with a disability (Ammerman et al., 1994) and those without a disability (Berger, 2005). Parent-reported child health status was also included to control for the possibility that a short-term medical condition might explain lower functionality scores.

Poverty status was also included as a covariate, since studies have shown a connection between poverty and an increased risk of physical abuse for both children with a disability (Verdugo et al., 1995) and without a disability (Way, Chung, Jonson-Reid, & Drake, 2001). An estimate of families' income-to-needs ratio was created using family income, family size, and the corresponding federal poverty threshold for 1999. This ratio expresses family income as a proportion of the official federal poverty level for a family of a given size (Bishaw & Iceland, 2003). Families with an income-to-needs ratio below 1.00 were coded as living in poverty. Help with child care from outside the home was additionally used as a covariate since studies have shown that parents who receive such help are less likely to physically abuse both children in general (Milner & Chilamkurti, 1991) and children with a disability (Ammerman et al., 1994). Parents were asked how many people outside the home help care for their child. Responses ranged from 0 to 50 people with a mean of 3, indicating a positively skewed distribution. This was thus coded as an ordinal variable, with no support coded as 0, 1–2 people coded as 1, and 3 and over coded as 2.

Data Analysis

All analyses were performed using STATA Statistical Software Release 10. Due to NSCAW's complex sampling design, special STATA survey commands were applied to obtain unbiased estimates of population parameters (NSCAW Research Group, 2002). All percentages were adjusted, or weighted, for sample probabilities. Multivariate logistic regression models were constructed to assess the linear and quadratic effects of each type of functionality on minor and severe physical assault, controlling for all covariates. The z-scored versions of the functionality measures were used. To test for quadratic effects, one set of logistic regression equations included both the z-scored functionality variables and the squares of those z-scored variables, following the method outlined by Cohen, Cohen, West, and Aiken (2003). The z-scored functionality variables test for the linear effect and the squares of those z-scored variables test for the quadratic effect. Note that, as Cohen et al. (2003) explain, a test for a linear effect must also be included in models that test for a quadratic effect, in order to produce an accurate estimate of the quadratic effect that is partialled out from the linear effect and thus not confounded with the linear effect.

The fact that z scores were used meant that functionality scores were centered (expressed as deviations from zero), which helps reduce multicollinearity. Altogether there were 16 regression models to take into account the 2 types of relationships (linear and curvilinear) $\times$ 4 functionality measures $\times$ 2 levels of assault. To help understand the relationship of each functioning measure to risk of assault, crosstabs were also constructed that showed the percentage of minor and severe assault for each level in the five-category ordinal functioning variables. Missing data were limited and therefore did not require adjustments in the analysis: the variable with the largest proportion of missing values was the language functioning variable, with 12% missing values, and other variables had less than 10% missing.

Results

Table 1 describes the sample and includes descriptive statistics on each measure of functioning. The average child age was 6.5 with a standard error (SE) of .1. There were about the same

Table 1. Sample Characteristics ($N = 1675$)

Total	*N*	Mean/Percentage	Range	*SE*
Child characteristics				
Age (mean)	1675	6.5	3–10	.1
Gender				
Male	804	55		2.9
Female	721	45		2.9
Race				
Caucasian	804	46		4.1
African American	446	27		3.1
Hispanic	310	20		3.2
Other	129	7		1.1
Health status				
Good	1552	94		1.0
Poor	138	6		1.0
Parental characteristics				
Age				
<35	1201	69		2.1
36–45	408	26		2.0
>45	71	5		1.0
Poverty status				
Above poverty line	859	53		2.0
Below poverty line	735	47		2.0
Number helping with child care[a]				
0	251	16		2.3
1–2	763	46		2.3
3+	655	38		2.1
Assault against the child[b]				
Minor	1273	78		.02
Severe	163	9		.01
Functionality				
Child Behavior Checklist	1688	44.8	9–76	.6
Social skills rating system	1688	90.9	44–130	.7
Daily-living skills	1688	94.9	19–161	1.0
Language skills	1487	93.7	40–158	.6

Note: CBCL=Child Behavior Checklist.
[a] Number of people outside the home who provide help with child care.
[b]At least one instance in the previous year.

proportion of boys and girls. A plurality was Caucasian, with substantial proportions African American and Hispanic. Over two-thirds of parents were younger than 35. Almost half of parents were below the poverty line. More than half had only 0–2 people outside the home to help care for the child. Mean functionality scores were on average slightly worse than for children in the general population for behavior problem, social skills, daily-living skills, and language skills. More than three-quarters of biological parents reported engaging in at least one instance of minor assault against the child in the previous year, and slightly less than 10% reported engaging in at least one severe assault against the child in the previous year.

Table 2 shows the odds ratios from logistic regression models explaining minor parental physical assault and the statistical significance of those odds ratios. Results from models testing linear and quadratic effects are presented for each type of functionality. Odds ratios from those models that only used a linear term (the z-scored functionality variables) to represent functioning are presented in the columns labeled Lin, and odds ratios from those models that used both a linear term and a quadratic term (the squares of the z-scored functionality variables) to represent functionality are presented in the columns labeled Quad. Odds ratios are also presented for all covariates in the model. An odds ratio greater than one indicates that the risk for assault is more likely with better functioning, and an odds ratio less than one indicates that assault is less likely with better functioning. Model *F* statistics are presented at the bottom of each column with corresponding *p* values. There were significant linear effects of problem behavior and social skills on minor parental physical assault. The odds ratios under one for problem behavior and social skills mean that the risk of minor assault decreased as children had better functioning behavior and social skills. There was a significant quadratic effect of language skills on minor assault, providing evidence for a curvilinear relationship. The daily-living skills variable was not significantly related to minor parental physical assault. Results for covariates showed that African American children, children with parents under the age of 35 (compared to those 46 and over), and children not in poverty were at greater risk for minor parental physical assault in every model. Child health was also a significant predictor of minor parental assault in those models that included behavioral functionality—children in poor health were significantly less likely to suffer parental physical assault in models in which behavior problems were controlled.

Figure 1 presents a Lowess curve that graphically depicts the curvilinear relationship between language skills and risk of minor parental physical assault in this sample. Lowess curves are special lines drawn through scatterplots according to mathematical algorithms that produce the best fitting line for the relationship between an independent variable and a dependent variable for the data points in a sample (see, e.g., Cohen et al., 2003). Figure 1 shows that the probability of minor assault approached .8 for a middle group of children with a standardized language skills score between the sample mean ($z = 0$) and one standard deviation above the sample mean ($z = 1$). Thus, it was children right at or very slightly above the mean who were most at risk, not children below the mean. Risk decreased noticeably the more scores fell below the mean or were greater than one standard deviation above the mean. The probability of minor assault approached .6 for children who were between three and four standard deviations below the mean and .55 for children four standard deviations above the sample mean.

Table 3 presents the results for logistic regression analyses predicting severe parental physical assault, in the same format as Table 2. As with minor parental physical assault, there was a significant linear effect of behavioral functionality on risk of severe parental physical assault. In the equation, risk of severe assault decreased as behavior was better, and risk of severe assault increased as behavior was worse. There was also a significant quadratic effect of daily-living skills, meaning children with daily-living scores around the mean were most at risk for severe assault. There was no significant relationship of social skills or language skills with severe assault. Results for

Table 2. Linear and Quadratic Logistic Regression Models Predicting any Minor Assault in the Previous Year by overall Standardized Functionality Score and Child and Parental Factors

	Type of Functionality							
	Behavior Problems		Social		Daily-Living		Language	
Odds Ratios	Lin.	Quad.	Lin.	Quad.	Lin.	Quad.	Lin.	Quad.
Functionality								
Linear term	.43***	.44***	.76***	.81**	.93	.94	1.08	1.04
Quadratic term	–	.97	–	.89	–	.95	–	.85***
Child variables								
Age	.91	.92	.93	.93	.93	.93	.93	.93
Male	.79	.80	.94	.98	.92	.92	.89	.92
Race								
Caucasian								
African American	2.26***	2.26***	2.03**	1.99**	2.00**	1.98**	1.99**	1.94**
Hispanic	.81	.81	.63	.63	.63*	.64*	.76	.79
Other	.71	.71	.61	.57	.57	.57	.60	.61
In poor health	.42**	.43**	.81	.85	.94	.94	.99	.94
Parent variables								
Age								
<35								
36–45	.74	.75	.67	.70	.67*	.67	.74	.73
46+	.35**	.34**	.36*	.35*	.32**	.31**	.32*	.31**
Below poverty	.56**	.56**	.57**	.57**	.58**	.58**	.65**	.63**
Number helping with child care								
None								
1–2	.71	.71	.66	.66	.68	.69	.65	.64
3+	.99	.99	1.01	1.00	.96	.97	.85	.83
Design-based *F*	3.78	3.57	2.15	1.94	1.79	2.15	1.83	1.99
	$p < .001$	$p < .001$	$p < .05$	$p < .05$	$p < .06$	$p < .05$	$p < .06$	$p < .05$

Note: All standard errors were between .1 and .7 and are available from the authors. The columns labeled *Lin* report odds ratios from models that only include a linear term for functionality. The columns labeled *Quad* report odds ratios from models that include both a linear and quadratic term for functionality.
* $p<.10$.
** $p<.05$.
*** $p<.01$.

covariates showed that older children, boys, and African American and Hispanic children were at greater risk for severe parental physical assault in every model.

To help communicate differences in the risk of parental physical assault by level of functioning, Table 4 presents the percentages of caregivers reporting minor and severe parental assault for the five-category variables representing level of functioning. These results are consistent with the logistic regression results but also show some of the complexity of the relationship between impairment and risk of parental physical assault. Consistent with the significant linear relationship that was found, children with severe behavior problems were at the greatest risk for minor parental physical assault, χ^2 (4, $n = 1{,}675$) = 11.9, $p = .001$. Children in the superior range in behavioral functioning were at the lowest risk of minor parental physical assault. The levels of behavioral functioning in between these extremes had intermediate levels of risk for minor parental physical assault, although children with average functioning were actually at somewhat greater risk than children with minor behavioral impairment. It was not statistically significant in the bivariate analysis, but children with severe behavioral problems were also at the greatest risk for severe parental physical assault, although children with minor impairment were at no greater risk than children with average functioning and other differences for behavioral functioning

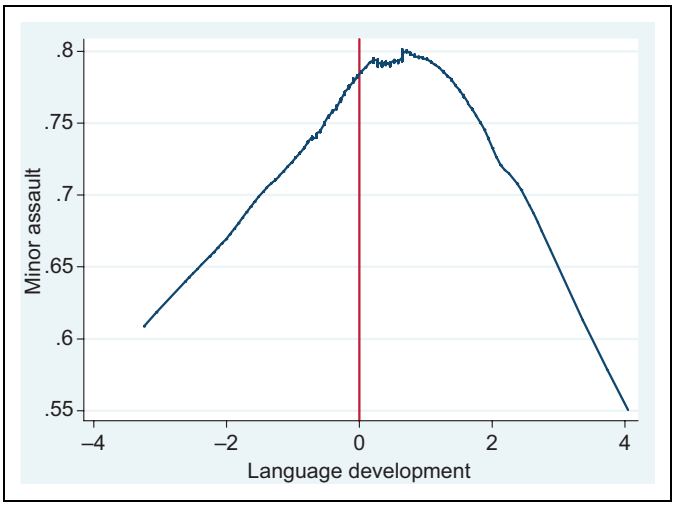

Figure 1. Minor physical assault by child language skills score.

Table 3. Linear and Quadratic Logistic Regression Models Predicting Any Severe Assault in the Previous Year by Overall Standardized Functionality Score and Child and Parental Factors

	Type of Functionality							
	Behavior Problems		Social		Daily-Living		Language	
Odds Ratios	Lin.	Quad.	Lin.	Quad.	Lin.	Quad.	Lin.	Quad.
Functionality								
Linear term	.63***	.61***	.85	.91	.97	1.02	1.07	1.07
Quadratic term	–	1.13	–	.78	–	.74***	–	.87
Child variables								
Age	1.19**	1.18**	1.20**	1.20**	1.20**	1.22**	1.20**	1.20**
Male	.50**	.48***	.59*	.62*	.58*	.57*	.55**	.56**
Race								
Caucasian								
African American	4.64***	4.72***	4.19***	4.11***	4.11***	3.91***	4.09***	4.02***
Hispanic	2.96**	2.97**	2.48**	2.58**	2.40**	2.37**	2.42*	2.45*
Other	1.3	1.22	1.21	1.11	1.12	1.15	1.05	1.08
In poor health	1.0	.96	1.36	1.51	1.48	1.47	1.47	1.42
Parent variables								
Age								
<35								
36–45	.87	.84	.79	.85	.80	.83	.89	.89
46+	1.42	1.44	1.20	1.19	1.14	1.14	1.24	1.23
Below poverty	1.06	1.04	1.04	1.02	1.04	1.01	1.24	1.17
Number helping with child care								
None								
1–2	1.16	1.14	1.07	1.05	1.08	1.15	1.12	1.09
3+	2.22	2.21	2.09	2.10	1.97	2.10	1.90	1.80
Design-based *F*	4.57	4.75	3.53	3.40	3.34	3.59	3.36	3.05
	$p < .001$	$p < .001$	$p < .001$	$p < .001$	$p < .001$	$p < .001$	$p < .001$	$p < .001$

Note: All standard errors were between .1 and 1.1 and are available from the authors. The columns labeled *Lin* report odds ratios from models that only include a linear term for functionality. The columns labeled *Quad* report odds ratios from models that include both a linear and quadratic term for functionality.
* $p < .10$.
** $p < .05$.
*** $p < .01$.

on this outcome were modest. Also consistent with the significant linear relationship was that children in the impaired social skills categories were at greater risk of minor parental physical assault than children in the above average and superior functioning levels, although they were no different than children with average functioning, χ^2 (4, n = 1,675) = 3.6, p = .01.

The significant curvilinear relationship of daily-living skills with severe parental physical assault in the multivariate model seems mostly to be indicated by substantially lower risk for children with superior daily-living skills; the risk for those with impairment was only a bit lower than the risk for those with average to above average functioning. Consistent with the significant curvilinear relationship that was found in the multivariate model, children with minor impairment in language skills or with average functioning were at greatest risk of minor parental physical assault, while children with severe impairment in language skills and children with superior functioning had the lowest risk, χ^2 (4, $n = 1{,}675$) = 2.7, $p = .05$. To explore the relationship of severity of overall impairment across domains of functioning to risk of parental physical assault, children with a severe or minor impairment in two or more areas were compared to children with a severe or minor impairment in only one area on risk of parental physical assault. There was no significant difference for either minor assault, χ^2 (1, $n = 1{,}675$) = .01, $p = .92$, or severe assault, χ^2 (1, $n = 1{,}675$) = .34, $p = .56$.

Discussion

Like other studies, the present study demonstrates that at least some forms of functional challenges are related to parental physical assault. There was a significant linear relationship of behavioral functioning with minor assault, which was primarily manifested in higher risk for children with severe behavioral problems and lower risk for children with superior behavioral functioning. There was also a significant linear relationship of behavioral functioning with severe assault, indicated primarily by elevated risk for children with severe behavior problems. Further, there was a significant linear relationship of social skills functioning with minor assault, with impaired and average functioning children at greater risk than children with above average to superior functioning.

There was a significant *curvilinear* relationship of daily-living skills with severe assault and of language skills with

Table 4. Level of Child Functioning and Parent Report of Minor and Severe Assault ($N = 1675$)

Percentage/(*SE*)	*N*	Minor	Severe
Behavior problems			
Severe impairment	506	89**	14
Minor impairment	447	56	8
Average functioning	485	74	8
Above average functioning	197	56	6
Superior functioning	53	47	9
Social skills			
Severe impairment	426	76**	10
Minor impairment	583	82	11
Average functioning	436	82	9
Above average functioning	205	63	7
Superior functioning	38	68	4
Daily-living skills			
Severe impairment	351	78	9
Minor impairment	412	77	9
Average functioning	434	81	11
Above average functioning	354	78	10
Superior functioning	137	66	4
Language skills			
Severe impairment	244	68*	8
Minor impairment	497	82	11
Average functioning	509	83	10
Above average functioning	198	74	6
Superior functioning	39	65	9

Note: All standard errors were between 1.8 and 12.5 and are available from the authors.
* $p < .05$.
** $p < .01$.

minor assault. For the curvilinear relationship of daily-living skills with severe assault, children with impairments only differed in risk from children with average and above average skills by the smallest of margins—this relationship was indicated mostly by lower risk among children with superior daily-living skills. For language skills, the curvilinear relationship meant that children with minor language impairment were actually at greater risk than children with more severe language impairment. This is consistent with several other studies that have found greater risk for children with less severe versus more severe impairments, although we are not aware of any previous study that found this for language skills and minor assault. It should be noted, however, that the children who were at greatest risk for minor assault were those children who had average or slightly above average language skills. The result for language skills contrasts with Verdugo et al.'s (1995) finding that children with the poorest language skills were most at risk of maltreatment. However, the authors measured language functioning only by a single, nonstandardized, 5-point Likert scale question asked of professionals, and their sample consisted only of children with mental retardation.

These results suggest several important inferences. First, the nature of the relationship of impairment to parental physical assault varies by type of functioning, making it all the more important to measure different disabilities separately and to avoid a global disability variable. Note too that children with impairment in two or more areas were not at significantly greater risk than children with impairment in one area, further casting doubt on the usefulness of disability as a global construct in this area of research. Second, these relationships can be curvilinear as well as linear, with the possibility that children with a less severe impairment can be at greater risk than children with a more severe impairment, and that changes in risk across levels of functioning may not be steady. Third, when dichotomous comparisons are made between children with and without disabilities, differences in risk can be a function of decreased risk among highly functioning children—children with average levels of ability may not always differ in risk from children with impairment. Fourth, it is valuable to measure impairment on a continuum in samples that include children with and without impairment, as this allows us to specify which level of functioning is associated with abuse.

The different relationships of different domains of functioning to parental physical assault should be considered in trying to understand the process that might lead parents to assault their children. Consider Knutson and colleagues' (2004) suggestion that parents may be more apt to use physical discipline on children with a disability because the impairment makes it more likely that parents will find other strategies ineffective. The fact that children with severe behavior problems and severe deficits in social skills are the most likely to be hyperactive, oppositional, and noncompliant may make their parents most likely to resort to physical discipline out of frustration with the ineffectiveness of other methods. With language development, on the other hand, parents might be most likely to find nonaggressive methods of discipline ineffective with children who are mildly impaired. These children's greater language abilities relative to severely verbally impaired children may increase the degree to which they verbally challenge parents and thereby increase the degree to which parents use physical assault as a disciplinary intervention. Their relatively better language abilities may also increase parental expectations of them (as Benedict et al., 1990; Murphy, 1982, suggest), which increases the probability that parents will be frustrated and resort to physical discipline. Children with advanced verbal skills, who were also at lesser risk, may be more responsive to verbal methods of discipline, may be able to communicate with their parents in ways that reduce the risk of assault, and may be less likely to behave in ways that anger or frustrate their parents.

The curvilinear effect for language skills is also consistent with the hypothesis suggested in previous publications (Sidebotham, Heron, & ALSPAC Study Team, 2006; Wilner & Crane, 1979) that lack of parental understanding of children's abilities may play a role in why parents hit their children. Because minor language deficits are more subtle, parents may not recognize their effects and may therefore not adapt to them, making their initial disciplinary efforts more likely to fail and their expectations more likely to be frustrated. This may be especially so if children function inconsistently because of limitations in their ability, being able to comply with parental expectations in some situations but not others. Parents may understand the effect of a more severe impairment better and

be better able to match their expectations and disciplinary methods to it. Along the same lines, parental knowledge of children's abilities and the expectations that result from this knowledge could also influence whether a parent interprets child noncompliance as willful disobedience or as a function of the child's limitations. If the parent believes their child's noncompliance is intentional, they may be more likely to respond with physical discipline. However, if the parent believes their child's noncompliance is due to limitations in their abilities, they may be less likely to respond punitively.

These results have important practice implications. The increased risk of parental physical assault with several forms of impairment underlines the need to provide psychosocial interventions to help parents deal with child noncompliance without resorting to corporal punishment. The linear relationship between child behavior problems and social skills deficits and risk of severe assault suggests that intervening early before children's problems are severe may help prevent physical abuse. The finding that the parents of children with minor impairment to average ability are the ones most at risk to assault their children suggests that these parents may have the greatest need for psychoeducational interventions that can provide them with greater knowledge of their children's abilities and help them set reasonable expectations. Research shows that interventions that provide parents with knowledge and skills to interact positively with children with developmental impairments can increase thoughtful interactions, appropriate expectations, parent responsiveness, appropriate limit setting, and other positive outcomes (Holtz, Carrasco, Mattek, & Fox, 2009).

This study has limitations that must be considered in interpreting the results. The cross-sectional nature of this study limits our ability to draw conclusions about causality in the relationships found here. The causal relationship between child functioning and parental assault is likely to be complex. Child functioning could have had a causal effect in that it led to parental cognitions that contribute to precipitating parental physical assault (see Black, Heyman, & Smith Slep, 2001). In an analysis of family incidents from child-protective case records, Herrenkohl, Herrenkohl, and Egolf (1983) found that certain child behavior, like refusal, fighting, and dangerous behavior, and the child not meeting parental expectations, often preceded physical abuse. On the other hand, it is possible that the aggression parents' reported in this study reflected long-standing patterns of parenting behavior that had a causal effect on children's functioning, though it seems difficult to us to explain the curvilinear patterns found here in this way. It is also possible that third variables associated with both child impairment and parental aggression could explain these results, at least in part. Parental conscientiousness, for example, may play a role, if parents who are more likely to act in ways that help prevent child impairment (e.g., obtain prenatal care, avoid smoking and drinking during pregnancy, seek well-child care) are also more likely to know about and use nonphysical methods of child discipline. Moreover, since almost all the independent variables (child functioning variables) *and* the dependent variable (parental physical assault) came from measures completed by parents, third variables that generally affect parents perceptions such as parental temperament may also help explain the results here.

The study focuses on parental physical assault and does not address other forms of maltreatment from caregivers or other adults, like neglect and sexual abuse that children with a disability could be at special risk for (see Horner-Johnson & Drum, 2006). Further, the NSCAW only sampled children involved in maltreatment investigations and therefore results cannot be generalized to families who were not investigated for abuse or neglect. Although one might believe that this population is particularly prone to physically assault their children, the fact that they were previously investigated might make them reluctant to report physical assault. One Federal NSCAW report notes that rates of CTS-PC physical assault reported at Wave 5 were actually lower than rates from a general population study of the CTS-PC (U.S. Department of Health and Human Services, Administration for Children and Families, 2008; see also Straus et al., 1998). The report notes that caregivers were repeatedly warned in the NSCAW caregiver interview that abuse and neglect would need to be communicated to child-protective services in accordance with the laws on mandatory reporting. It is beyond our scope to analyze the rates here relative to the general population to check for underreporting. If parental underreporting of assault against their children did occur, this would decrease the variability of responses and thereby decrease statistical power. It is also possible that those parents who hide their aggression against their children might tend to react to children's impairment in particular ways that would influence the direction of the results and the shape of the curves we found. This caveat has to be acknowledged as a limitation on the conclusions we can draw and underlines the need for more study on this topic in other populations. Another limitation is that several of the instruments used to measure child functioning are parental report measures, and it is possible that parents who assault their children may have a distorted perception of their children's functioning. It is not clear, however, if this would lead parents to overrate or underrate their children's functioning, so its potential effect on the results is difficult to estimate.

This study confirms the importance of disability in understanding risk and suggests new perspectives that take into account the specific form disability takes and where on a continuum of functioning a child's abilities lie. But it leaves many questions unanswered. Clearly research on the causal mechanisms linking different forms of impairment to maltreatment is needed. Studies are needed that show specifically how different forms of impairment affect parental perception and child and parent behavior that can precipitate physical assault. Better understanding is needed of the behavior of children with a mild impairment and below average abilities and its effect on families. New research should add parental variables found to be predictive of maltreatment in previous studies, such as unrealistic expectations, attribution, levels of anger and frustration at noncompliance, and knowledge of nonphysical disciplinary responses (Ateah & Durrant, 2005).

Research, policy, and practice efforts to prevent child maltreatment need to be based on a sophisticated understanding of how children's functioning affects their risk of maltreatment. Steps such as considering multiple domains of functioning and using more exact continuous measures are essential ways of understanding children better and their risk of maltreatment. Whatever direction future research takes, it is important to stress that focusing child abuse research, practice, and policy only on children with severe impairments may be missing a group of children more prone to experiencing physical assault.

Declaration of Conflicting Interests

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

Funding

The author(s) received no financial support for the research and/or authorship of this article.

References

Achenbach, T. M. (1991). *Manual for the child behavior checklist.* Burlington, VT: Department of Psychiatry, University of Vermont.

Ammerman, R. T., Hersen, M., Van Hasselt, V. B., Lubetsky, M. J., & Sieck, W. R. (1994). Maltreatment in psychiatrically hospitalized children and adolescents with developmental disabilities: Prevalence and correlates. *Journal of the American Academy of Child and Adolescent Psychiatry*, *33*, 567-576.

Ateah, C. A., & Durrant, J. E. (2005). Maternal use of physical punishment in response to child misbehavior: Implications for child abuse prevention. *Child Abuse & Neglect*, *29*, 169-185.

Benedict, M. I., White, R. B., Wulff, L. M., & Hall, B. J. (1990). Reported maltreatment in children with multiple disabilities. *Child Abuse & Neglect*, *14*, 207-217.

Benedict, M. I., Wulff, L. W., & White, R. B. (1992). Current parental stress in maltreating and nonmaltreating families of children with multiple disabilities. *Child Abuse & Neglect*, *16*, 155-163.

Berger, L. M. (2005). Income, family characteristics, and physical violence towards children. *Child Abuse & Neglect*, *29*, 107-133.

Bishaw, A., & Iceland, J. (2003). Poverty: 1999. *Census 2000 Brief.* U.S. Department of Commerce.

Black, D. A., Heyman, R. E., & Smith Slep, A. M. (2001). Risk factors for child physical abuse. *Aggression and Violent Behavior*, *6*, 121-188.

Bricout, J. C., Porterfield, S. L., Tracey, C. M., & Howard, M. O. (2004). Linking models of disability for children with developmental disabilities. *Journal of Social Work in Disability & Rehabilitation*, *3*, 45-67.

Burrell, B., Thompson, B., & Sexton, D. (1994). Predicting child abuse potential across family types. *Child Abuse & Neglect*, *18*, 1039-1049.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Lawrence Erlbaum.

Crosse, S. B., Kaye, E., & Ratnofsky, A. C. (1993). *A report on the maltreatment of children with disabilities.* Washington, DC: National Center on Child Abuse and Neglect.

Fluke, J. D., Schusterman, G. R., Hollinshead, D. M., & Yuan, Y. T. (2008). Longitudinal analysis of repeated child abuse reporting and victimization: Multistate analysis of associated factors. *Child Maltreatment*, *13*, 76-88.

Friedrich, W. N., & Boriskin, J. A. (1978). Primary prevention of child abuse: Focus on the special child. *Hospital and Community Psychiatry*, *29*, 248-251.

Gresham, F. M., & Elliot, S. N. (1990). *The social skills rating system.* Circle Pines, MN: American Guidance Systems.

Grogan-Kaylor, A. (2004). The effects of corporal punishment on antisocial behavior. *Social Work Research*, *28*, 153-162.

Herrenkohl, R. C., Herrenkohl, E. C., & Egolf, B. P. (1983). Circumstances surrounding the occurrence of child maltreatment. *Journal of Consulting and Clinical Psychology*, *51*, 424-431.

Holtz, C. A., Carrasco, J. M., Mattek, R. J., & Fox, R. A. (2009). Behavior problems in toddlers with and without developmental delays: Comparison of treatment outcomes. *Child & Family Behavior Therapy*, *31*, 292-311.

Horner-Johnson, W., & Drum, C. E. (2006). Prevalence of maltreatment of people with intellectual disabilities: A review of recently published research. *Mental Retardation and Developmental Disabilities*, *12*, 57-69.

Jaudes, P. K., & Mackey-Bilaver, L. (2008). Do chronic conditions increase young children's risk of being maltreated? *Child Abuse & Neglect*, *32*, 671-681.

Kaufman, A., & Kaufman, N. (1990). *Kaufman brief intelligence test.* Circle Pines, MN: American Guidance Service.

Kempe, C. H., Silverman, F. N., Steele, B. F., Droegemueller, W., & Silver, H. K. (1962). The battered-child syndrome. *Journal of the American Medical Association*, *181*, 17-24.

Kendall-Tackett, K., Lyon, T., Taliaferro, G., & Little, L. (2005). Why child maltreatment researchers should include children's disability status in their maltreatment studies. *Child Abuse & Neglect*, *29*, 147-151.

Knutson, J. F., Johnson, C. R., & Sullivan, P. M. (2004). Disciplinary choices of mothers of deaf children and mothers of normally hearing children. *Child Abuse & Neglect*, *28*, 925-937.

Milner, J. S., & Chilamkurti, C. (1991). Physical child abuse perpetrator characteristics: A review of the literature. *Journal of Interpersonal Violence*, *6*, 345-366.

Murphy, M. A. (1982). The family with a handicapped child: A review of the literature. *Journal of Developmental and Behavioral Pediatrics*, *3*, 73-82.

NSCAW Research Group. (2002). Methodological lessons learned from the National Survey of Child and Adolescent Well-being: The first three years of the USA's first national probability study of children and families investigated for abuse and neglect. *Children and Youth Services Review*, *24*, 513-541.

Rodriguez, C. M., & Murphy, L. E. (1997). Parenting stress and abuse potential in mothers of children with developmental disabilities. *Child Maltreatment*, *2*, 245-251.

Sedlak, A. J., Mettenburg, J., Basena, M., Petta, I., McPherson, K., Greene, A., & Li, S. (2010). *Fourth national incidence study of child abuse and neglect.* Washington, DC: DHS.

Sidebotham, P., Heron, J., & ALSPAC Study Team. (2006). Child maltreatment in the "Children of the nineties": A cohort study of risk factors. *Child Abuse & Neglect*, *30*, 497-522.

Sobsey, D. (1994). *Violence and abuse in the lives of people with disabilities: The end of silence accepted.* ? Baltimore, MD: Paul H. Brookes.

Sobsey, D. (2002). Exceptionality, education, and maltreatment. *Exceptionality*, *10*, 29-46.

Sparrow, S. S., Carter, A. S., & Cicchetti, D. V. (1993). *Vineland screener: Overview, reliability validity, administration, and scoring.* New Haven, CT: Yale University.

Spencer, N., Devereux, E., Wallace, A., Sundrum, R., Shenoy, M., Bacchus, C., & Logan, S. (2005). Disabling conditions and registration for child abuse and neglect: A population-based study. *Pediatrics*, *116*, 609-613.

Straus, M. A. (2001). *Beating the devil out of them: Corporal punishment in American families and its effects on children.* New Brunswick, NJ: Transaction.

Straus, M. A., Hamby, S. L., Finkelhor, D., Moore, D. W., & Runyan, D. (1998). Identification of child maltreatment with the parent-child conflict tactics scales: Development and psychometric data for a national sample of American parents. *Child Abuse & Neglect*, *22*, 249-270.

Sullivan, P. M. (2009). Violence exposure among children with disabilities. *Clinical Child and Family Psychological Review*, *12*, 196-216.

Sullivan, P. M., & Knutson, J. F. (1998). The association between child maltreatment and disabilities in a hospital-based epidemiological study. *Child Abuse & Neglect*, *22*, 271-288.

Sullivan, P. M., & Knutson, J. F. (2000). Maltreatment and disabilities: A population-based epidemiological study. *Child Abuse & Neglect*, *24*, 257-273.

U.S. Department of Health and Human Services, Administration for Children and Families. (2008). *From early involvement with child welfare services to school entry: A five-to-six-year follow-up of infants in the NSCAW. Report for the administration for children and families.* Washington, DC: Author.

Verdugo, M. A., Bermejo, B. G., & Fuertes, J. (1995). The maltreatment of intellectually handicapped children and adolescents. *Child Abuse & Neglect*, *19*, 205-215.

Way, I., Chung, S., Jonson-Reid, M., & Drake, B. (2001). Maltreatment perpetrators: A 54-month analysis of recidivism. *Child Abuse & Neglect*, *25*, 1093-1108.

Wilner, S. K., & Crane, R. (1979). A parental dilemma: The child with a marginal handicap. *Social Casework*, *60*, 30-35.

World Health Organization. (2001). *International classification of functioning, disability and health.* Geneva: Author.

Zimmerman, I., Steiner, V., & Pond, R. (1992). *Preschool language scale* (4th ed.). San Antonio, TX: Psychological.