



Parent's use of harsh punishment and young children's behaviour and achievement: A longitudinal study of Jamaican children with conduct problems

Baker-Henningham, Helen; Francis, Taja

Global Mental Health

DOI:
[10.1017/gmh.2018.21](https://doi.org/10.1017/gmh.2018.21)

Published: 12/10/2018

Peer reviewed version

[Cyswllt i'r cyhoeddiad / Link to publication](#)

Dyfyniad o'r fersiwn a gyhoeddwyd / Citation for published version (APA):
Baker-Henningham, H., & Francis, T. (2018). Parent's use of harsh punishment and young children's behaviour and achievement: A longitudinal study of Jamaican children with conduct problems. *Global Mental Health*, 5, [e32]. <https://doi.org/10.1017/gmh.2018.21>

Hawliau Cyffredinol / General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Parents' Use of Harsh Punishment and Young Children's Behaviour and Achievement: A
Longitudinal Study of Jamaican Children with Conduct Problems

Helen Baker-Henningham^{1,2}, Taja Francis²

¹School of Psychology, Bangor University, Bangor, UK LL57 2AS

²Caribbean Institute for Health Research, University of the West Indies, Kingston 7 , Jamaica

Corresponding Author:

Helen Baker-Henningham

School of Psychology

Bangor University

Bangor LL57 2AS UK

and

Caribbean Institute for Health Research

University of the West Indies

Mona, Kingston 7

Jamaica

E-mail: h.henningham@bangor.ac.uk; helen.henningham@uwimona.edu.jm

Tel: +44 1248 383289 (UK)

+1 876 927 2471 (Jamaica)

Abstract

Introduction: Harsh punishment by parents is common in low- and middle-income countries (LMIC), yet there is limited evidence from LMIC of the effects of harsh punishment on child outcomes.

Methods: A longitudinal, prospective study was conducted with children with conduct problems to examine associations between parents' use of harsh punishment during the preschool years on child behaviour and school achievement in grade one of primary school. As part of an efficacy trial in 24 preschools, 225 children with the highest level of teacher-reported conduct problems were evaluated and their parents reported on how often they used harsh punishment. Outcome measures in grade one included child conduct problems by independent observation, teacher and parent-report, child social skills by teacher and parent-report, direct tests of children's academic achievement and language skills, and teacher-ratings of child attention and impulse-control.

Results: Children had a mean age of 6.92 years and 61% were boys. All parents reported using harsh punishment. After controlling for child age and sex, socio-economic status, parents' involvement with child and maternal education, frequency of harsh punishment was associated with growth in child conduct problems by independent classroom observations ($p=0.037$), parent ($p=0.018$) and teacher ($p=0.044$) report, a reduction in child social skills by teacher ($p=0.024$) and parent ($p=0.014$) report and poorer attention during the test session ($p=0.049$).

Conclusion: The associations between frequency of parents' use of harsh punishment with their preschoolers with conduct problems and later child behavior indicate a need to train parents in non-violent behaviour management.

Background

Violence against children is a global public health problem and is highly prevalent in low- and middle-income countries. Violence against children within the family is one of the most common forms of child maltreatment and often occurs due to harsh punishment methods being used to discipline children (UNICEF, 2010). Parent discipline practices can be classified into three main categories: 1) non-violent (e.g. removing privileges, explaining why something is wrong), 2) psychologically aggressive (e.g. name-calling, yelling) and 3) physically violent (e.g. slapping, beating with an object). Harsh punishment includes the use of psychologically aggressive and physically violent practices and these are considered violence against children or child maltreatment (Strauss et al. 1998).

Harsh punishment in childhood is associated with multiple negative outcomes, which persist into adulthood. In a meta-analytical review of 88 studies, Gershoff (2002) found that corporal punishment was associated with increased aggression (Effect size (ES): 0.36), poor mental health (ES=-0.49), negative parent-child relationships (ES=-0.58), and delinquent and antisocial behavior (ES=0.42) in childhood. Effects of corporal punishment persisted into adulthood leading to increased aggression (ES=0.57), poor mental health (ES=-0.09), criminality and antisocial behaviour (ES=0.42) and an increased risk for perpetrating child or spouse abuse (ES=0.13) (Gershoff 2002). A more recent meta-analytical review of 124 studies found significant associations between child physical and emotional abuse and depression (physical abuse: Odds Ratio (OR)=1.54, emotional abuse: OR=3.06); drug use (physical abuse: OR=1.92, emotional abuse: OR=1.41); suicide attempts (physical abuse: OR=3.40, emotional abuse: OR=3.37); and sexually transmitted infections and risky sexual behavior (physical abuse: OR=1.78, emotional abuse: OR=1.75) (Norman *et al.* 2012). Studies examining associations

between harsh punishment and academic achievement show mixed results (Romano *et al.* 2015). There is some evidence that the effect of harsh punishment on achievement is moderated by risk status with more vulnerable children at particular risk, for example children in out-of home care (Romano *et al.* 2015) and children with HIV (Sherr *et al.* 2016).

Theoretical and empirical models of the mechanisms through which harsh punishment affects child outcomes are numerous and include observational learning, social control theory, social informational processing theory and emotional and sensory arousal (Gershoff 2002). The models share a common theme, which is that the effect of harsh punishment on child outcomes is mediated through its effects on children's internal cognitive and affective processes (Gerschoff, 2002, Straus & Paschall, 2009, Maguire-Jack *et al.* 2012). That is, harsh punishment is hypothesized to affect children's thoughts and emotions which in turn influences their behaviour and makes them more susceptible to further negative experiences and/or interactions from others, including parents, teachers and peers.

In the Jamaican context, the use of harsh punishment as a disciplinary strategy is pervasive at home and at school. In the UNICEF Multiple Indicator Cluster Study, 84% of caregivers of 2-4 year old children reported that they or someone in their household had used physical violence with their child in the past month while 71% had used psychological aggression (Lansford & Deater-Deckard, 2012). In a study of 1300 children in grade five of primary school, 92.5% of children had been reported being physically punished at school during the school year and exposure to physical punishment was associated with children's academic achievement in a dose-response manner: maths (high exposure: ES=-0.23; moderate exposure: ES=-0.09); reading (high exposure: ES=-0.44; moderate exposure: ES=-0.17); and spelling (high exposure: ES=-0.24; moderate exposure: ES=-0.14) (Baker-Henningham *et al.* 2009). A further study of 1,171 children aged 11-12 years reported a lifetime experience of verbal aggression and physical

violence of 97.2% at home and 86.2% at school and poly-victimisation (including harsh punishment, exposure to community violence and witnessing domestic violence) was associated with poor intellectual functioning and for boys, increased behavioural risk (Samms-Vaughan & Lambert, 2017).

In this study, we investigate associations between harsh punishment and later child outcomes for young children with high levels of conduct problems. Harsh punishment is considered a causal risk factor not only for the development, but also for the persistence of child behaviour problems (Jaffee *et al.* 2012). The prevalence of conduct problems in children ranges from 7-25% and children with conduct problems are at heightened risk for developing disruptive behaviour disorders in later childhood (Webster Stratton & Hammond 1998). Disruptive behaviour disorders, (encompassing conduct disorder and oppositional defiant disorder), are one of the most common forms of child psychopathology with a worldwide prevalence estimate of 5.7% (Polanczyk *et al.* 2015). They predict negative outcomes across the lifespan including continued antisocial behaviour, school failure and involvement in crime and violence (Moffitt & Scott, 2008). In Jamaica, 12% of 5-6 year old children were identified as having externalizing disorders and none of these children had accessed mental health services (Samms-Vaughan 2005). Furthermore, in a study in 24 inner-city Jamaican preschools, 21% (364/1733) of 3-6 year old children had four or more symptoms of conduct problems as reported by the teacher (Baker-Henningham *et al.* 2012).

We are aware of no longitudinal studies with prospective measures of parent discipline and child behaviour from Jamaica or the wider Caribbean and the majority of studies in LMIC involve older children with limited evidence of the effect of harsh punishment in the early childhood years. Early childhood is a particularly sensitive period and experiences in early childhood have long term effects on brain function, cognition and psychosocial functioning thus

providing the foundation for future physical and mental health (Walker *et al.* 2011; Black *et al.* 2016). We hypothesized that the frequency of parents' use of harsh punishment, defined as psychologically and physically violent discipline practices, during the preschool years with disadvantaged children with high levels of conduct problems would be associated with: 1) worsening behavior over time including increased conduct problems and decreased social skills at school and at home between preschool and grade one of primary school and 2) poorer academic achievement, oral language and self-regulation skills in grade one of primary school.

Methods

Sampling

Data for this paper were collected as part of a follow-up study of a previously conducted efficacy trial in 24 community preschools situated in disadvantaged areas of Kingston, Jamaica (Baker-Henningham *et al.* 2012). The sampling procedure for the preschools involved surveying all preschools in a specified geographical location to determine the number of classes and number of children per class and selecting preschools that fit the following inclusion criteria: i) consisted of 3-4 classes of children, ii) had a minimum of twenty children per class and iii) all teachers consented to participate in the trial. Fifty preschools were assessed for eligibility: twenty-five preschools had too few children per class and/or did not have 3-4 classes and one preschool refused to participate. All classrooms in each preschool were included in the study giving a total of 73 classrooms. Children at high risk of developing conduct problems were selected in preschool and were evaluated as part of the efficacy trial. In the summer term, teachers in the 24 preschools rated all children in their class on a 10-question screen for conduct problems using a 4-point scale. Questions were based on age appropriate items for a diagnosis of conduct disorder from the ICD-10 Classification of Mental and Behavioural Disorders: Diagnostic Criteria for

Research (WHO, 1993) and included: loses temper, back chats, disobedient/breaks rules, annoys others, blames others, easily annoyed, often angry, spiteful to others, fights or bullies and destroys property. The responses were summed and the three children scoring the highest on the screen from each class were selected. Six children were kept back in their previous class after the summer holiday and these children were retained in the study and additional children enrolled (Baker-Henningham et al, 2012). A total of 225 children were recruited and 214 of these children were tracked into primary school. Three parents were unable to be contacted for interview; the final sample included 211 children in primary school.

This paper includes data collected at two time points: i) on enrolment, when the child was in preschool (time 1) and ii) in the final term of grade one in primary school (time 2). Jamaican preschools cater to children aged 3-6 years and children transition to primary school at age 6. We enrolled children from all classes in preschool and hence, the outcome data in grade one were collected over four separate years until all of the children had transitioned to primary school. Data were collected in a total of 50 primary schools and 149 classrooms. See Figure 1 for the study profile.

The study was approved by the University of the West Indies ethics committee and written informed consent was obtained from all school principals, teachers and parents in the study. Child assent was not obtained due to the young age of the children in the study (Wendler, 2006).

Measures

All data were collected as part of an intervention trial and outcomes across multiple informants in school and home environments were used to evaluate intervention effectiveness (Scott, 2001). Baseline measures of child behaviour were conducted when the children were in preschool and

included conduct problems by independent observation, teacher and parent-report and social skills by teacher and parent-report. Parents also reported on their use of harsh punishment and their involvement with their child at time 1. Baseline measures of child behaviour at home and parents' use of harsh punishment were conducted in the summer term (May/June) and the measures of child behaviour at school were conducted in the Autumn term (October/November). Outcome measures at time 2 included conduct problems by independent observation, teacher and parent-report, social skills by teacher and parent-report, academic achievement and language skills by direct testing, and self-regulation by tester ratings of children's behaviour during the test session (Table 1). All outcome measures were conducted in the summer term of grade one of primary school.

All questionnaires were interviewer administered. Eleven research assistants collected the outcome data for this study. Two research assistants administered the parent interviews, three conducted teacher interviews, three conducted child tests and three conducted child observations. Inter-rater reliabilities were calculated between the trainer and data collectors for all measures during training and for a minimum of 10% of all measures during the study. For the questionnaires and child tests, inter-interviewer/tester intraclass correlation coefficients (ICCs) were >0.95 . Details of inter-observer reliabilities for observations are provided below. The parent interview was conducted with the primary caregiver, defined as the mother if she spent a minimum of four nights a week with the child. Parent interviews were conducted at the parents' home, teacher interviews and child tests were conducted at school. All measures were conducted by research staff blind to the study hypothesis and design.

Table 1 provides information of the measures used at each time point. All outcome measures had good internal consistency (Cronbach's alpha: mean=0.86, range: 0.71-0.97) and test-retest reliability over 2 weeks (intraclass correlation coefficient: mean = 0.90, range: 0.75-0.99). Full

details of the psychometric properties of the measures are given in webtables 1 and 2. Further details of the measures of observed conduct problems and parents' use of harsh punishment are provided below.

Observed Conduct Problems

Observed Child Behaviour in Preschool: Within each class, three children were observed for 5 minutes each on a rotational basis for a total of 15 minutes per day per child over 4 days to give a total of 1 hour of observation. Event sampling was used to record aggressive/disruptive behaviours (e.g. hitting, throwing objects) and expressed as frequency per hour. Instantaneous sampling (i.e. recording whether or not the behaviour occurred at each sample point) was used to code disruptive behaviours (e.g. out of seat, shouting) at 15-second intervals, with a maximum possible score of 240. The aggressive/destructive and disruptive behaviours chosen were based on the Dyadic Parent–Child Interaction Coding System (DPICS) (Eyeberg & Robinson, 1981) and Multi-Option Observation System for Experimental Studies (MOOSES) (Tapp *et al.* 1995) behaviour categories, operationalised for the Jamaican context. All behaviours were defined in a manual. In addition to the measures of aggressive and disruptive behaviours described above, at the end of each 5-minute period, observers rated child behaviour on four 7-point rating scales (see Table 1). Higher scores indicate higher levels of the behaviours. The mean score over twelve 5-minute intervals for each rating scale was used in the analyses. Observations were conducted by four research assistants and interobserver reliabilities (ICCs) were: median 0.83 (0.67-0.91) during training and 0.83 (0.67-0.91) during the study.

Primary School:

The observation schedule in primary school used the same measures as those described above except that observations were conducted over two school days for 30 minutes each day (rather

than over four school days for 15 minutes each day). When there was more than one target child in the class, children were observed in 5-minute intervals on a rotational basis with either two or three children being observed during each observation period until each child had been observed for a total of 30 minutes. This was then repeated on day two. When there was only one target child per class, children were observed for 5 minutes out of every 10-15 minutes. Observations were conducted by three research assistants with only one observer present in a classroom at a time. Interobserver reliabilities were calculated for 5-minute observation intervals and the intraclass correlation coefficients (ICCs) were median 0.93 (range 0.90-0.95) during training and (0.93 (0.84-0.97) during the study.

Parents' use of harsh punishment

Harsh punishment was defined as the use of psychologically and physically violent discipline practices and was measured using items adapted from the Parent-Child Conflict Tactics Scale (CTSPC) (Straus et al. 1998). The psychological aggression, corporal punishment and physical abuse subscales of the CTSPC were piloted with mothers of children who were not in the study to ensure they were appropriate and understandable. After piloting, several questions were adapted and two items were removed as they were considered too offensive to parents (and could lead to reduced cooperation in the intervention trial). The final scale included four physically violent behaviours and three psychologically aggressive responses. Parents were asked if there was anyone else in the home who disciplines their child regularly and if so, their name was included in the question - e.g. "Do you (or grandma) ever pinch (child's name)?" Parents were then asked whether they used each form of punishment and if so, how often they had used it in the past month. Scores ranged from 0=no, 1= not in the past month, 2= a few times in the past month, 3=

once or twice a week and 4= almost every day. Internal reliability of the scale was adequate ($\alpha=0.64$).

Analysis

Multilevel multiple regression analyses were used to determine the association between frequency of parents' use of harsh punishment on child outcomes in grade one of primary school, controlling for child age and sex, socio-economic status, mothers' involvement with child, maternal education and baseline score where available. Multilevel multiple regression models are the appropriate form of analysis for clustered data where outcomes are observed at level 1 (children), who are taught in classrooms (level 2), nested in schools (level 3). Random intercept models were used. The dependent variables were child conduct problems by observation, teacher and parent-report, child social skills by teacher and parent-report, child academic achievement and oral language skills by direct testing and tester ratings of child attention and child impulse control. In all analyses child age and sex, SES and mothers' involvement with child at time 1 (preschool), maternal education, dummy variables to control for data collector, intervention group, baseline score (for measures of child conduct problems and social skills at home and at school), and parents' use of harsh punishment at time 1 were entered as fixed effects and school and classroom were entered as random effects. All multilevel analyses were conducted in MLWin (version 2.10) (Rasbash *et al.* 2009).

Exploratory factor analysis with varimax rotation was used to reduce the number of outcome variables with separate factor analyses conducted for child observed behaviour, academic achievement and self-regulation during the test. One factor was produced from the observed child behaviour variables (webtable 3) and the academic achievement tests (webtable 4). Factor analysis of the rating scales from the Preschool Self-Regulation Assessment (PSRA), using

varimax rotation, produced two factors: a factor reflecting child attention and a factor reflecting child impulse control (webtable 6). The factor scores for these four outcome variables, (1. observed conduct problems, 2. academic achievement, 3. attention and 4. impulse control), were saved as regression scores in SPSS (v. 23) and used in the analyses (DiStefano et al. 2009). Teacher and parent-reported child conduct problems and social skills were each measured using a single scale and the raw score of each scale was used in the analyses. The scores of the oral language scales (following direction and story recall) were standardised and summed to give a measure of child oral language skills (Woodcock *et al.* 2001).

Covariates were computed as follows. A factor score of three variables measured in preschool: number of possessions, sanitation and crowding, was used as a measure of SES. Mothers were asked if they had completed primary school, middle school or high school (table 1) and maternal education was coded as a binary variable representing completed high school or not (0=no, 1=yes). Dummy variables were created to represent tester, observer, parent interviewer and teacher interviewer at time 2. These variables were entered as control variables in all regressions.

Results

Sample characteristics

Children had a mean age of 6.9 years and over 60% were boys (Table 2). The mother was the primary caregiver for 79% of children. A relatively high proportion of these children were currently in the clinical range for conduct problems by teacher and parent-report (approximately one third of the sample). These children were selected because they had the highest levels of behaviour problems during the preschool years (nearly 55% were in the clinical range for conduct problems by teacher report in preschool). Children had a mean age of 4.24 years when baseline assessments were conducted. Raw scores on all outcome measures are given in table 3.

Parents' use of harsh punishment

All parents reported using harsh punishment with their child when they were in preschool (time 1) and scores ranged from 1-23. The most commonly used punishment was slapping on the bottom, hand, arm or leg with approximately 50% of parents reporting slapping their child at least once a week in the past month (table 4).

Parents' use of harsh punishment at time 1 and child outcomes in primary school

More frequent harsh punishment at time 1 significantly predicted growth in conduct problems over time by independent observation ($p=0.037$), teacher ($p=0.044$) and parent ($p=0.018$) report (table 4). More frequent use of harsh punishment by parents at time 1 also significantly predicted declining social skills from preschool to grade one of primary school by teacher ($p=0.024$) and parent ($p=0.014$) report. Frequent harsh punishment by parents during the preschool years also predicted poorer attention skills ($p=0.049$) but no associations were found with child impulse control ($p=0.738$), academic achievement ($p=0.225$) and oral language skills ($p=0.703$) (table 5).

Significant covariates for child outcomes in primary school

Socio-economic status, maternal education and maternal involvement with her child at time 1 and child sex were controlled for in each analysis. Higher socio-economic status was associated with reduced conduct problems at school by observation ($p=0.037$), increased social skills by teacher-report ($p=0.037$) and better academic achievement ($p=0.007$), oral language skills ($p=0.017$) and attention ($p=0.001$) in grade one of primary school (table 5). Maternal involvement with her child was associated with increased social skills by parent report ($p=0.047$) and teachers reported increased social skills for girls ($p=0.02$).

Discussion

This is the first longitudinal prospective study to examine associations between harsh punishment during the preschool years and later child outcomes for children with conduct problems in LMIC. We found that higher frequency of parent's use of harsh punishment in preschool was associated with worsening child behavior outcomes as children transition into grade one of primary school. The children were selected as being at high risk for developing conduct problems and children were scoring in the top 12.5% in their classroom for conduct problems in preschool. Higher frequency of parents' use of harsh punishment predicted growth in child conduct problems and a reduction in child social skills at school and at home; harsh punishment also predicted poorer attention although there were no effects on achievement, language skills and impulse control.

Parents' use of harsh punishment with these high-risk children was pervasive: 99% of parents used physical violence and 84% used psychological aggression. This high prevalence of harsh punishment corresponds to other studies with parents of young children in Jamaica and the wider Caribbean (Lansford & Deater-Deckard, 2012, Gardner *et al.* 2008). When harsh punishment is normative within a culture, the effects on child outcomes may be less severe (Gershoff *et al.* 2010); however, in this study we showed that even though harsh punishment is highly normative in Jamaica, frequency of harsh punishment by parents was associated with growth in conduct problems and deteriorating social skills over time for children with high levels of conduct problems at baseline. These results were robust across measurements of child behaviour using multiple informants and across home and school settings.

The children who participated in this study 1) had high levels of conduct problems and 2) were exposed to harsh punishment at baseline. Hence we are unable to assess whether harsh

punishment played a causal role in the development of children's conduct problems; we can only state that harsh punishment led to worsening behavior over time. We also have no data to indicate whether these high-risk young children are particularly vulnerable to the negative effects of harsh punishment or whether similar associations would be evident with children without behaviour problems. This study also demonstrates the importance of operationalizing the measurement of harsh punishment in terms of frequency and/or severity, rather than using measures of prevalence or incidence, when conducting research in contexts in which harsh punishment is widely used.

Child socio-economic status (SES) in preschool was controlled for in all analyses and higher SES was associated with a fewer child conduct problems at school through observation and higher social skills by teacher-report. Higher SES was also associated with children's academic achievement, language skills and attention. Poverty is a well-established risk factor for child development (Grantham-McGregor *et al.* 2007) and for mental health (Lund *et al.* 2010).

Strengths and limitations of the study

This study has several strengths. Parents reported on their use of harsh punishment; child behaviour was measured through multiple informants including independent observations, teacher and parent-report and school achievement, oral language, child attention and child impulse control were assessed by trained research personnel. We chose well-validated and widely-used teacher and parent questionnaires to measure child conduct problems and social skills. Frequency measures rather than categorical measures were used as these child behaviours fall along a continuum in the population and using frequency scores maintains the individual variability between children, increases sensitivity and reduces measurement error, especially for children with scores in a borderline range. The achievement tests were delivered in a standardized way and are likely to be more valid than using school-administered tests and more

sensitive than binary and categorical measures such as grade retention, special education placement and school drop-out. All measures had good test-retest and adequate internal reliabilities and quality control of all measures was maintained throughout the study. Attrition was low, only 6% were lost to follow-up. Several important covariates were controlled for in all analyses including child age and sex, socio-economic status, maternal education, frequency of parent involvement with child. Baseline scores for children's behaviour at school and at home were also controlled in the analyses on child behaviour.

The study also has some limitations. The small sample size limits power and there are other potential confounders that were not measured. For example, frequency of harsh punishment may covary with other risks for child behaviour problems (e.g. maternal depression, low maternal warmth and sensitivity) and children experiencing higher levels of harsh punishment may also be exposed to higher levels of other forms of violence (e.g. domestic abuse, community violence, harsh punishment at school) which are also risk factors for poor child outcomes (Baker-Henningham et al. 2009, Samms-Vaughan & Lambert, 2017). We had no baseline measures for child academic achievement, oral language skills and child attention and impulse control and hence these analyses are less robust as they do not measure change in child functioning over time. Measures of child behavior at school were conducted in the autumn term in preschool and in the summer term in grade one. It is possible that child behaviour varies across the school year and this was not controlled for in the analyses. However, all children were evaluated over the same period at both time 1 and time 2 and baseline measures were controlled in the analysis. Parents self-reported on their use of harsh punishment and they may have under- or over-reported. However, the consistency of the results suggests that the measure had reasonable validity. The measures used in this study have not been normed in the Jamaica context; however, all outcome measures have been used previously in Jamaica, have good psychometric properties and have

been shown to be sensitive to change with intervention (Baker-Henningham *et al.* 2012) or sensitive to differences between children (Baker-Henningham *et al.* 2007). The sample included children with the highest level of conduct problems in community preschools situated in urban, disadvantaged areas and hence the results are not generalisable to the general population.

Study implications

The high prevalence of harsh punishment by parents of young Jamaican, from this study and from previous studies (Lansford & Deater-Deckard, 2012; Samms-Vaughan & Lambert, 2017), demonstrates the urgent need for appropriate parenting interventions to train parents in alternative discipline strategies and prevent violence against children. This is important not only for moral reasons, but also because of the negative effects on child development and the associated social and economic costs (Ward *et al.* 2016). There is evidence that parenting programmes can reduce the risk of child maltreatment and improve parenting competencies (Chen & Chan, 2015); however, evidence from LMIC is limited (Knerr *et al.* 2013). Integrating such programmes into existing services would increase access and promote program sustainability and the most common services accessed by young children are the health and education sector. In Jamaica, over 98% of young children attend preschool and hence integrating a parenting intervention to prevent harsh punishment into the preschool network is a promising approach with potential for near universal coverage. Training Jamaican preschool teachers in appropriate discipline techniques has shown benefits to teachers' child management practices, including reductions in harsh punishment (Baker-Henningham *et al.* 2009b, Baker-Henningham & Walker 2018) and a similar approach could be developed to train parents of preschool children as they enter school. Previous qualitative work with parents of preschool children in Jamaica has shown that although parents report frequent use of corporal punishment with their young child, they believe it is

undesirable and ineffective (Baker-Henningham & Walker, 2009), suggesting that they would be receptive to training in behaviour management.

Conclusion

Disadvantaged, inner-city, Jamaican children identified as high risk for developing conduct problems during the preschool years were exposed to high levels of harsh punishment (defined as physical violence and psychological aggression) at home. This study presents preliminary evidence that the frequency of parents' use of harsh punishment leads to worse behavior trajectories over time, in terms of increased conduct problems and reduced social skills at home and at school, for these young children. The high prevalence of harsh punishment, and the evidence for its negative effect on children's development, demonstrate an urgent need for parenting programmes to train parents in alternative discipline strategies and to prevent violence against young children in Jamaica.

Acknowledgements

This work was supported by The Wellcome Trust (grant numbers 080534/Z/06/Z and 094307/Z/10/Z). We thank the teachers, parents and children for their participation and the research assistants for data collection.

Conflict of Interest

None

Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

References

Baker-Henningham H, Meeks-Gardner J, Chang S, Walker S. (2009). Experiences of violence and deficits in academic achievement among primary school aged children in Jamaica. *Child Abuse and Neglect* **33**, 296-306.

Baker-Henningham H, Scott S, Jones K, Walker S (2012). Reducing child conduct problems and promoting social skills in a middle income country: cluster randomised controlled trial. *British Journal of Psychiatry* **201**, 101-108.

Baker-Henningham H, Vera-Hernandez M, Alderman H, Walker S (2016). Irie Classroom Toolbox: a study protocol for a cluster randomised trial of a universal violence prevention programme in Jamaican preschools. *BMJ Open* **6**, e012166. doi: 10.1136/bmjopen-2016-012166.

Baker-Henningham H, Walker S (2009) A qualitative study of teachers' perceptions of an intervention to prevent conduct problems in Jamaican pre-schools. *Child Care Health and Development* **35**, 632-642.

Baker-Henningham H, Walker S (2018). Transporting an evidence-based, violence prevention intervention to Jamaican preschools: A cluster randomized trial. *Global Mental Health* **5**, e7.

Baker-Henningham H, Walker S, Chang-Lopez S. (2007) *Special Education Needs Study: End of Study Report*. Primary Education Support Project Office, Ministry of Education and Youth: Kingston, Jamaica

Baker-Henningham H, Walker S, Powell C, Meeks-Gardner JM (2009b) A pilot study of the Incredible Years Teacher Training Programme and a curriculum unit on social and emotional skills in community preschools in Jamaica. *Child Care Health and Development* **35**, 624-631.

Black M, Walker S, Fernald L Andersen C, DiGirolamo A, Lu C, Fink G, Shawar Y, Shiffman J, Devercelli A, Wodon Q, Vargas-Baron E, Grantham-McGregor S for the Lancet Early Childhood Development Series Steering Committee (2016). Early childhood development coming of age: science through the life course. *Lancet* **389**, 77-90.

Chen M, Chan KL (2013). Effects of parenting programs on child maltreatment prevention: A meta-analysis. *Trauma, Violence and Abuse* **17**, 88-104.

DiStefano C, Zh, M, Míndrilă D (2009). Understanding and Using Factor Scores: Considerations for the Applied Researcher. *Practical Assessment, Research & Evaluation* **14**, 1-11.

Eyberg S, Robinson EA (1981). *Dyadic Parent–Child Interaction Coding System*. Parenting Clinic, University of Washington:

Eyberg S, Ross A (1978). Assessment of child behavior problems: The validation of a new inventory. *Journal of Clinical Child Psychology* **7**, 113-116.

Gershoff ET (2002). Corporal Punishment by Parents and Associated Child Behaviors and Experiences: a Meta-Analytic and Theoretical Review. *Psychological bulletin* **128**, 539-579.

Gerschoff ET, Grogan-Kaylor A, Lansford JE, Chang L, Zelli A, Deater-Deckard K, Dodge KA (2010). Parent discipline practices in an international sample: Associations with child behaviours and moderation by perceived normativeness. *Child Development* **81**, 487-502.

Goodman R (1999). The Extended Version of the Strengths and Difficulties Questionnaire as a Guide to Child Psychiatric Caseness and Consequent Burden. *Journal of Child Psychology and Psychiatry* **40**, 791-799.

Grantham-McGregor S, Cheung Y, Cueto S, Glewwe P, Richter L, Strupp B (2007). The International Child Development Steering Group. Developmental potential in the first 5 years for children in developing countries. *Lancet* **369**, 60-70.

Jaffee SR, Strait LB, Odgers CL (2012). From correlates to causes: Can quasi-experimental studies and statistical innovations bring us closer to identifying the causes of antisocial behavior. *Psychological Bulletin* **138**, 272-295.

Knerr W, Gardner F, Cluver L (2013). Improving positive parenting skills and reducing harsh and abusive parenting in low and middle-income countries: A systematic review. *Prevention Science* **14**, 352-363.

Lansford JE, Deater-Deckard K (2012). Childrearing discipline and violence in developing countries. *Child Development* **83**, 62-75.

Lund C, Breen A, Flisher AJ, Kakuma R, Corrigall J, Joska JA, Swartz L, Patel V (2010). Poverty and common mental disorders in low- and middle-income countries: A systematic review. *Social Science and Medicine* **7**, 517-528.

Maguire-Jack K, Gromoske AN, Berger LM (2012). Spanking and child development during the first five years of life. *Child Development* **83**, 1960-1977.

Meeks Gardner J, Henry-Lee A, Chevannes P, Thomas J, Baker-Henningham H, Coore C (2008). Violence Against Children in the Caribbean: A Desk Review. *Promoting child rights through*

research: *Proceedings of the Caribbean Child Research Conference 2006* (eds. A. Henry-Lee and J. Meeks) pp: 149-165. SALISES, UWI: Kingston, Jamaica.

Merrell KW (2002). *School Social Behavior Scales, 2nd Edition (SSBS-2)*.: Assessment Intervention Resources: Eugene, OR.

Merrell KW (1996). Assessment of social skills and behavior problems in early childhood: The Preschool and Kindergarten Behavior Scales. *Journal of Early Intervention* **20**, 132-145.

Moffitt T, Scott S (2008). Conduct disorders in childhood and adolescence. *Rutter's Child and Adolescent Psychiatry* (eds. M. Rutter, D. Bishop, D. Pine, S. Scott, J. Stevenson, E. Taylor and A. Thapar) pp. 543-564. Blackwell Publishing Inc: Oxford.

Norman R, 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**, e1001349. Doi:10.1371/journal.pmed.1001349.

Polanczyk GV, Salum GA, Sugaya LS, Caye A, Rohde LA (2015). Annual Research Review: A meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. *Journal of Child Psychology and Psychiatry* **56**, 345-365.

Rasbash J, Charlton C, Browne WJ, Healy M, Cameron B (2009). *MLwiN Version 2.10*. Centre for Multilevel Modelling: University of Bristol.

Rayfield A, Eyberg S, Foote R (1998). Revision of the Sutter-Eyberg Student Behavior Inventory: Teacher Ratings of Conduct Problem Behavior. *Educational and Psychological Measurement* **58**, 88-98.

Romano E, Babchishin L, Marquis R, Fréchette S (2015). Childhood maltreatment and educational outcomes. *Trauma, Violence & Abuse* **16**, 418-437.

Samms-Vaughan M (2005). *Profiles: The Jamaican preschool child. The status of early childhood development in Jamaica*. Planning Institute of Jamaica, Kingston, Jamaica.

Samms-Vaughan M, Lambert M (2017). The impact of polyvictimisation on children in LMICs: the case of Jamaica. *Psychology, Health & Medicine* **22 (Sup 1)**, 1-14.

Scott S (2001). Deciding whether interventions for antisocial behaviour work: Principles of outcome assessment, and practice in a multicentre trial. *European Child and Adolescent Psychiatry* **10 (S1)**, I/59-I/70.

Sherr L, Hensels IS, Skeen S, Tomlinson M, Roberts KJ Macedo A (2016). Exposure to violence predicts poor educational outcomes in young children in South Africa and Malawi. *International health* **8**, 36-43.

Smith-Donald R, Raver C, Hayes T, Richardson B (2007). Preliminary Construct and Concurrent Validity of the Preschool Self-Regulation Assessment (PSRA) for Field-Based Research. *Early Childhood Research Quarterly* **22**, 173-187.

Straus M, Hamby S, Finkelhor D, Moore D, 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.

Strauss M, Paschall MJ (2009) Development of children's cognitive ability: A longitudinal study of two nationally representative age cohorts. *Journal of Aggression, Maltreatment & Trauma* **18**, 459-483.

Tapp J, Wehby JH, Ellis D (1995). A multiple observation system for experimental studies: MOOSES. *Behaviour Research Methods Instrument Computing* **27**, 25–31.

UNICEF (2010). *Child Disciplinary Practices at Home: Evidence from a Range of Low and Middle-Income Countries*. UNICEF, NY.

- Walker S, Wachs T, Grantham-McGregor S, Black M, Nelson C, Huffman S, Baker-Henningham H, Chang S, Hamadani J, Lozoff B, Meeks Gardner J, Powell C, Rahman A, Richter L** (2011). Inequality begins in early childhood: Risk and protective factors for early child development. *The Lancet* **3781**, 325-338.
- Ward C, Sanders MR, Gardner F, Mikton C, Dawes A** (2016). Preventing child maltreatment in low and middle-income countries. *Child Abuse and Neglect* **54**, 97-107.
- Webster-Stratton C, Hammond M** (1998). Conduct problems and level of social competence in Head Start children: prevalence, pervasiveness and associated risk factors. *Clinical Child and Family Psychology Review* **1**, 101–124.
- Wendler DS** (2006). Assent in pediatric research: theoretical and practical considerations. *Journal of Medical Ethics* **32**, 229-234.
- Woodcock R, McGrew K Mather N** (2001). *Woodcock-Johnson III tests of cognitive abilities*. 1st edition. Riverside Publishing: Itasca, IL.
- Woodcock R, McGrew K, Werder J** (1994). *Woodcock-McGrew-Werder Mini-Battery of Achievement*. Riverside Publishing: Itasca, IL
- World Health Organization** (1993). *The ICD-10 Classification of Mental and Behavioural Disorders. Diagnostic Criteria for Research*. World Health Organisation: Geneva.

Table 1. Child assessments conducted in preschool and/or primary school

| Child Development | Measures Used |
|---|---|
| <i>Measures conducted at time 1 (preschool) and time 2 (primary school)</i> | |
| Conduct Problems | Factor score of 6 variables used in analysis |
| Observed conduct problems* | Observations over a total of 12 5-minute observation periods (totaling 1 hour of observation), including event sampling of aggressive/destructive behavior, scan sampling of disruptive behavior and four 7-point rating scales: antisocial behavior, activity level, on-task behavior and follows rules and expectations |
| Teacher-reported conduct problems | Sutter-Eyberg Child Behaviour Inventory (SESBI) frequency scale (Reyfield et al. 1998). |
| Parent-reported conduct problems | Eyberg Child Behaviour Inventory (ECBI) frequency scale (Eyberg & Ross, 1978). |
| Social Skills | |
| Teacher-reported social skills | Prechool and Kindergarten Behaviour Scales (PKBS): Social Skills Scale (Merrell, 1996) at time 1. School Social Behaviour Scales 2 (SBSS-2): Social Competence Scale (Merrell, 2002) at time 2. |
| Parent-reported social skills | Strengths and Difficulties Questionnaire: Prosocial Scale (Goodman, 1999). |
| <i>Measures conducted at time 2 only</i> | |
| Academic Achievement ** | Factor score of reading, maths and spelling tests used in analysis |
| Reading | Letter word identification and Passage Comprehension subscales from the Woodcock-Johnson III Tests of Achievement (Woodcock <i>et al.</i> 2001). |
| Maths | Calculation and Reasoning and Concepts subscales of the Woodcock-McGrew-Werder Mini-Battery of Achievement (Woodcock <i>et al.</i> 1994). |
| Spelling | Spelling subscale from the Woodcock-Johnson III Tests of Achievement (Woodcock <i>et al.</i> 2001). |
| Oral Language Skills** | Composite of sum of standardised raw scores of both scales used in analysis |
| Receptive and expressive language | Understanding Directions and Story Recall from the Woodcock-Johnson III Tests of Achievement (Woodcock <i>et al.</i> 2001). |
| Self Regulation | Rated during the test session using 10 4-point scales from the Preschool Self Regulation Assessment: Assessor Report (Smith-Donald <i>et al.</i> 2007). |
| Attention | 5 items: pays attention, careful, concentrates, daydreams, distracted. |
| Impulse Control | 5 items: thinks and plans, refrains from touching test materials, doesn't interrupt tester, difficulty waiting, remains in seat. |
| Parenting | Measures Used |
| <i>Measures conducted at time 1</i> | |
| Harsh punishment* | The scale included seven questions, answered on a 5-point frequency scale: 4 questions on physical violence and 3 questions on psychological aggression: i) |

| | |
|-------------------------------|---|
| | <p>slap on bottom, hand or leg, ii) hit with a hard object e.g. brush, belt, stick, iii) pinch, iv) slap child on the head, face or ears, v) cuss bad words at him/her, vi) call child names e.g. idiot, dummy, stupid and vii) say you will send him/her away. The scores were summed to give an overall score ranging from 0-28.</p> |
| <p>Involvement with child</p> | <p>The scale included eight questions, answered on a 5-point frequency scale: i) reading storybooks, ii) playing outside with child, iii) playing inside with child, iv) talking with child about school or friends, v) sit with child as they write, colour or draw, vi) take the child out (e.g. to market), vii) involve child while doing chores and viii) spend 30 minutes or more doing something fun with the child. Responses were summed to give an overall score ranging from 0-32.</p> |

*Full details of assessment is given in text

** For the child achievement and language tests, the raw scores were used, rather than the grade based norms, as the tests have not been normed in Jamaica.

Table 2. Child and caregiver characteristics at time 1 (preschool) and time 2 (grade 1 of primary school)

| | Preschool: All classes | Primary School: Grade 1 |
|--|-----------------------------------|------------------------------------|
| <i>Child Characteristics</i> | | |
| Child age, years (Mean (SD)) | 4.24 (0.87) | 6.92 (0.36) |
| Number (%) boys | 138 (61.3) | - |
| Clinical range for conduct problems by teacher report ¹ , n (%) | 123 (54.7) | 72 (33.8) |
| Clinical range for conduct problems by parent report ² , n (%) | 77 (34.2) | 69 (32.7) |
| Clinical range for conduct problems at home and at school ³ , n (%) | 45 (20.0) | 27 (12.9) |
| <i>Caregiver Characteristics</i> | | |
| Caregiver: mother n (%) | 172 (81.5) | 166 (78.7) |
| father n (%) | 16 (7.1) | 18 (8.5) |
| grandmother n (%) | 10 (4.7) | 8 (3.8) |
| other relative n (%) | 13 (5.8) | 19 (9.0) |
| Age of caregiver, years (Mean (SD)) | 30.74 (9.74) | 33.39 (9.61) |
| Number of possessions (Mean (SD)) ⁴ | 8.89 (2.52) | 8.55 (2.45) |
| Crowding (Mean (SD)) ⁵ | 2.08 (1.16) | 1.86 (1.07) |
| Sanitation (Mean (SD)) ⁶ | 9.47 (2.73) | 9.82 (2.48) |
| Caregiver employed, n (%) | 86 (40.8) | 125 (59.2) |
| Caregiver education: primary school only n (%) | 1 (0.4) | - |
| completed middle school n (%) | 131 (58.2) | |
| completed high school n (%) | 93 (41.3) | |
| <i>Caregiver Practices</i> | | |
| Harsh punishment (Mean (SD)) ⁷ | 8.32 (4.84) | - |
| Involvement with child (Mean (SD)) ⁸ | 20.20 (5.28) | - |

¹Above cut-off (>150) on Sutter–Eyberg Student Behaviour Inventory (SESBI) intensity scale. ²Above cut-off (>130) on Eyberg Child Behaviour Inventory (ECBI) intensity scale. ³Above cut-off on SESBI and ECBI intensity scales. ⁴Number of possessions from a list of 15 items: stove, fridge, washing machine, sofa or soft chair, mobile telephone, landline, radio, CD player, TV, Cable TV, DVD player, computer, bicycle, motorbike, motor car. ⁵Number of people per room. ⁶Type of toilet and water supply. ⁷Min score=0, max score=28. ⁸Min score=0, max score=32.

Table 3. Raw scores of child outcomes measured in grade 1 of primary school

| | Subsample (n=211) |
|---|--------------------------|
| <i>Structured observations of child behaviour</i> | |
| | <i>Median (range)</i> |
| Aggressive/Destructive behaviour ¹ | 7 (0-40) |
| Disruptive behaviour ² | 26 (0-99) |
| <i>Observer rating scales of child behaviour³</i> | |
| | <i>Mean (SD)</i> |
| Conduct problems | 2.12 (0.71) |
| Activity level | 2.88 (0.34) |
| Follows rules and expectations | 5.27 (0.70) |
| On-task behavior | 4.86 (0.95) |
| <i>Teacher reports of child behavior</i> | |
| | <i>Mean (SD)</i> |
| Conduct problems (SESBI) | 133.85 (45.72) |
| Social skills (SSSBS-2) | 101.40 (22.28) |
| <i>Parent reported child behaviour</i> | |
| | <i>Mean (SD)</i> |
| Conduct problems (ECBI) | 119.59 (25.29) |
| Social skills (SDQ) | 8.00 (1.93) |
| <i>Child academic tests</i> | |
| | <i>Mean (SD)</i> |
| Letter word Identification ⁴ | 23.05 (8.92) |
| Reading comprehension ⁴ | 9.92 (4.75) |
| Spelling ⁴ | 18.16 (4.65) |
| Math calculation, median (range) ⁴ | 5.00 (0-12) |
| Math reasoning, median (range) ⁴ | 25.00 (0-31) |
| Following directions ⁴ | 19.02 (9.01) |
| Story recall ⁴ | 22.15 (14.60) |
| <i>Tester ratings of child behaviour during academic test session</i> | |
| | <i>Median (Range)</i> |
| Child attention ⁵ | 13.00 (2-15) |
| Child impulse control ⁶ | 13.00 (2-15) |

SESBI, Sutter–Eyberg School Behavior Inventory; SSBS, Student School Behaviour Scales; SDQ, Strengths and Difficulties Questionnaire; ECBI, Eyberg Child Behavior Inventory.

¹Event sampling: number of events in 1 hour. ²Instantaneous sampling at 15s intervals over a total of 1 hour (max possible score=240). ³Mean of 12 ratings conducted every 5 min on a 7-point scale, where 0 is low and 7 is high. ⁴Raw scores are presented and were used in the analyses. ⁵Sum of 5 ratings on a 4-point scale (0-3): not distracted, pays attention, sustains concentration, doesn't daydream & careful.

⁶Sum of 5 ratings on a 4-point scale (0-3): doesn't interrupt, refrains from touching, thinks and plans, no difficulty waiting, remains in seat.

Table 4: Parents' use of harsh punishment with 3-6 year old children. Values are n (%)

| | Never | Less than once a month | Few times in the past month | Once or twice a week in the past month | Almost everyday in the past month |
|--|--------------|-------------------------------|------------------------------------|---|--|
| Parents' use of harsh punishment at age 3-6 years (n=225) | | | | | |
| Swear at child | 91 (40.4) | 38 (16.9) | 32 (14.2) | 40 (17.8) | 24 (10.7) |
| Call child names | 132 (58.7) | 20 (8.9) | 24 (10.7) | 37 (16.4) | 12 (5.3) |
| Threaten to send child away | 152 (67.6) | 18 (8.0) | 14 (6.2) | 33 (14.7) | 8 (3.6) |
| Slap on bottom hand arm or leg | 5(2.2) | 33 (14.7) | 73 (32.4) | 75 (33.3) | 39 (17.3) |
| Hit with hard object | 97 (43.1) | 35 (15.6) | 33 (14.7) | 47 (20.9) | 13 (5.8) |
| Pinch | 128 (56.9) | 38 (16.9) | 17 (7.6) | 30 (13.3) | 12 (5.3) |
| Hit in face, head or ears | 188 (83.6) | 17 (7.6) | 10 (4.4) | 8 (3.6) | 2 (0.9) |

Table 5. Multilevel regression analyses showing longitudinal associations between parent's use of harsh punishment at time 1 (preschool) and child behavior, academic achievement, oral language skills and executive function at time 2 (primary school) n=211 children.

| | Harsh Punishment | | | Significant covariates ^d |
|--|-----------------------------------|----------|------------------|---|
| | B (95% CI) | P- value | ICC ^c | |
| Observed conduct problems ¹ | 0.03 (0.00, 0.06) ^a | 0.037* | 0.08 | SES: B=-0.17 (95% CI: -0.31 -0.04) |
| Teacher reported conduct problems ² | 1.29 (0.03, 2.55) ^a | 0.044* | 0.05 | None |
| Parent reported conduct problems ³ | 0.76 (0.13, 1.39) ^a | 0.018* | 0.01 | None |
| Teacher reported social skills ⁴ | -0.70 (-1.30, -0.09) ^b | 0.024* | 0.00 | SES: B=3.20 (95% CI: 0.20, 6.21) Child Sex: B=6.87 (95% CI: 0.97, 12.77) |
| Parent reported prosocial skills ⁵ | -0.06 (-0.11, -0.01) ^a | 0.014* | 0.00 | Maternal Involvement: B=0.05 (0.01, 0.1) |
| Oral language skills ⁶ | 0.01 (-0.02, 0.04) | 0.703 | 0.00 | SES: B=0.16 (95% CI: 0.03, 0.30) |
| Academic Achievement ⁷ | -0.02 (-0.04, 0.01) | 0.225 | 0.15 | SES: B=0.18 (95% CI: 0.05, 0.32) |
| Attention ⁸ | -0.03 (-0.05, 0.00) | 0.049* | 0.04 | SES: B=0.22 (95% CI: 0.09, 0.36) |
| Impulse Control ⁹ | -0.01 (-0.03, 0.02) | 0.738 | 0.00 | None |

*p<0.05. All analyses control for child age and sex, intervention group, mothers' education, SES, parent involvement with their child and data collector as fixed effects and school and classroom as random effects. ^a Controlling for baseline score.

^b Controlling for baseline score = Preschool and Kindergarten Behaviour Scale. ^cIntra-cluster correlation coefficient. ^dPotential covariates include child sex, SES, maternal involvement and mothers' education

¹⁻⁹Independent variables. ¹ Factor score of 6 child observational measures (see table 2); ²Sutter-Eyberg Student Behaviour Scale; ³Eyberg Child Behaviour Scale; ⁴School Social Behaviour Scales 2; ⁵Strengths and Difficulties Questionnaire Prosocial Scale; ⁶Sum of the standardised raw scores for story recall & following directions; ⁷Factor score of letter word ID, reading comprehension, maths calculation, maths reasoning & spelling; ⁸Factor score of 5 items from Preschool Self-Regulation Assessment (PSRA) rating scale: attention; ⁹Factor score of 5 items from PSRA rating scale: impulse control.

Webtable 1: Test-Retest of Child Tests of Reading, Maths, Spelling, Language and Ratings of Executive Function

| | Intra-class correlation coefficient |
|----------------------------|-------------------------------------|
| Letter-word identification | 0.98 |
| Reading comprehension | 0.98 |
| Mathematical reasoning | 0.95 |
| Maths calculation | 0.99 |
| Spelling | 0.94 |
| Story recall | 0.75 |
| Following directions | 0.88 |
| Executive function | 0.85 |

Conducted with 20 children over a 2-week period

Webtable 2: Internal reliability and test-retest of child behaviour by teacher and parent report parents' use of harsh punishment and involvement with child

| | Preschool Measurements | | Primary School Measurements | |
|---|------------------------|--|-----------------------------|--|
| | Cronbach's alpha | Test-retest ¹ (ICC ²) | Cronbach's alpha | Test-retest ³ (ICC ²) |
| <i>Teacher reported child behaviour</i> | | | | |
| Sutter-Eyberg Student Behaviour Inventory | 0.96 | 0.92 | 0.97 | 0.95 |
| Preschool and Kindergarten Behaviour Scales/ School Social Behaviour Scales 2 (Social Skills Scale) | 0.92 | 0.85 | 0.95 | 0.90 |
| <i>Parent reported child behaviour</i> | | | | |
| Eyberg Child Behaviour Inventory | 0.80 | 0.99 | 0.83 | 0.93 |
| Prosocial skills (Strengths and Difficulties Questionnaire) | 0.65 | 0.70 | 0.71 | 0.75 |
| <i>Parent reported discipline and involvement with child</i> | | | | |
| Parents' use of harsh punishment | 0.64 | 0.88 | 0.69 | 0.91 |
| Parents' involvement with child | 0.67 | 0.96 | 0.70 | 0.90 |
| <i>Child self-regulation skills by tester observations</i> | | | | |
| Child attention | - | - | 0.87 | 0.88 |
| Child impulse control | - | - | 0.85 | 0.85 |

¹Over 2 weeks: n=20 for teacher report measures, n=18 for parent report measures

²ICC: intraclass correlation coefficient

³Over 2 weeks: n=20 for all measurements

Webtable 3: Factor analyses of observed child behavior in preschool and in primary school

| Child Observed Behaviour | Preschool Factor Loading | Primary School Factor Loading |
|---------------------------------|-------------------------------------|--|
| Aggression | 0.814 | 0.800 |
| Disruptive behavior | 0.665 | 0.834 |
| Conduct problems | 0.863 | 0.824 |
| Activity | 0.783 | 0.793 |
| Follows rules | -0.909 | -0.916 |
| On-Task behaviour | -0.640 | -0.708 |
| Variance explained, % | 61.63 | 66.41 |

Webtable 4: Factor analysis of child academic achievement in primary school

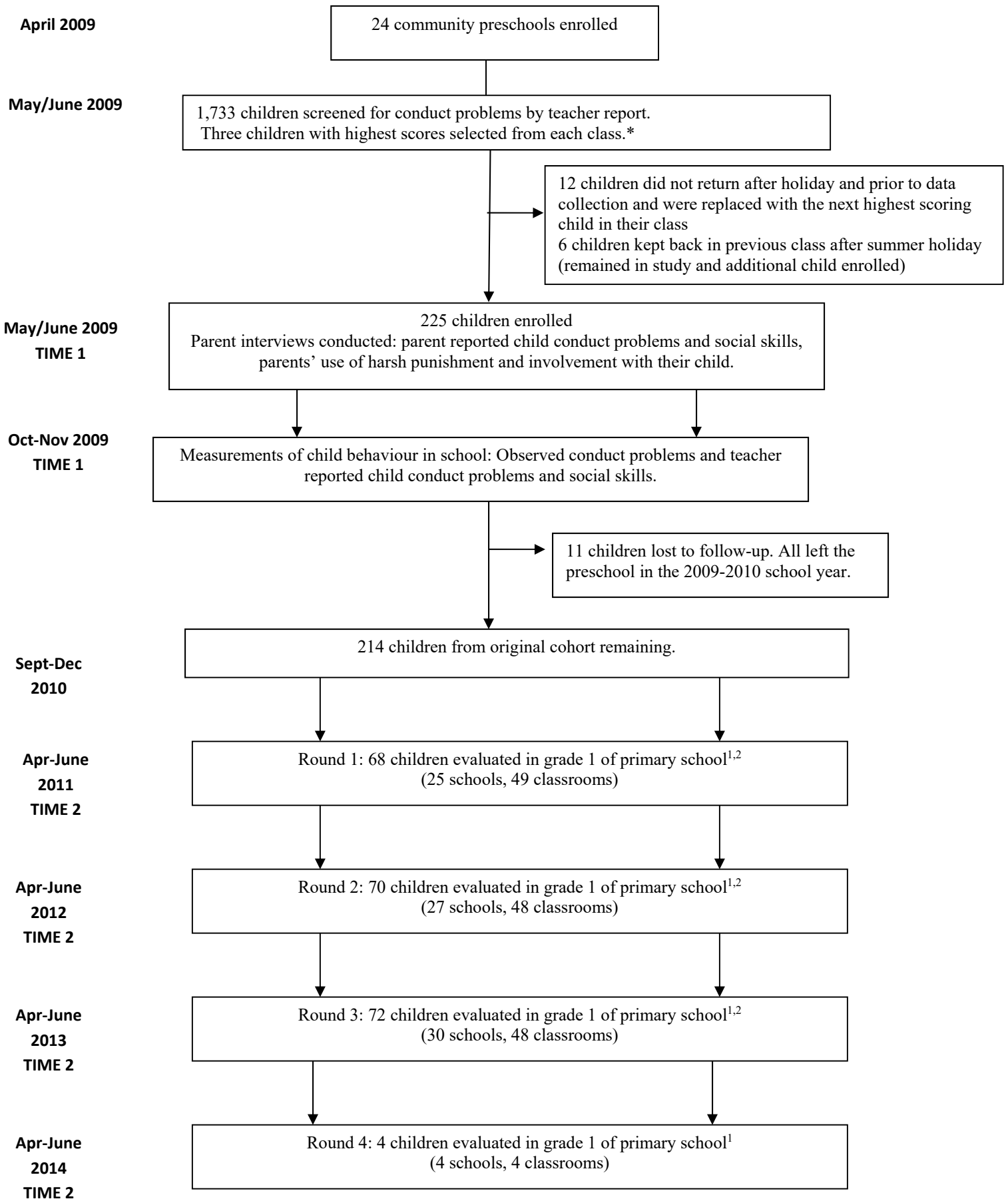
| Academic Achievement Tests | Factor Loading |
|-----------------------------------|---------------------------|
| Letter-word ID | 0.936 |
| Reading comprehension | 0.900 |
| Spelling | 0.930 |
| Maths | 0.783 |
| Calculation | 0.794 |
| Variance explained, % | 75.92 |

Webtable 5: Factor analysis of Preschool Self-Regulation Assessment Rating Scale

| | Factor 1 | Factor 2 |
|---------------------------------------|-----------------|-----------------|
| Not distracted by sights and sounds | 0.812 | |
| Pays attention during instructions | 0.801 | |
| Sustains concentration | 0.797 | |
| Doesn't daydream | 0.786 | |
| Careful, interested in accuracy | 0.618 | 0.415 |
| Doesn't interrupt examiner | | 0.800 |
| Refrains from touching test materials | | 0.790 |
| Thinks and plans | | 0.763 |
| No difficulty waiting | | 0.756 |
| Remains in seat | | 0.593 |
| Variance explained, % | 65.44 | |

Figure 1. Study Profile

TIMELINE



*24 high-scoring children excluded: 17 children with low attendance (<70%), 3 were siblings of enrolled child, 1 child with autism, 3 were living in an institution.

¹Evaluations included observations of child behaviour at school, teacher and parent reports of child behaviour, parent reported harsh discipline and involvement with child.

²1 parent unavailable for interview in round 1, 2 and 3. Final sample=211 children.