The Impact of a Preventive Intervention on Persistent, Cross-situational Early Onset
Externalizing Problems

Michael F. Lorber

New York University

David Olds and Nancy Donelan-McCall

University of Colorado at Denver Health Sciences Center

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Abstract

The Nurse-Family Partnership (NFP) home visiting intervention for low income first time mothers was evaluated for its preventive impact on persistent, cross-situational early onset externalizing problems (EXT). Seven hundred and thirty-five women in the Denver, Colorado area were randomly assigned into one of two active conditions (nurse or paraprofessional home visiting from pregnancy through child age 2) or a control group in which children were screened and referred for behavioral and developmental problems. Externalizing behavior was assessed by parent report when the children were 2, 4, 6, and 9 years old; teachers provided reports at ages 6 and 9. Latent profile analyses suggested the presence of persistent, cross-situational early onset EXT in approximately 6% to 7% of girls and boys. The intervention deflected girls away from these EXT and toward a pattern marked by a persistent moderate elevation of externalizing behavior that was evident at home and not at school. This finding should be interpreted cautiously given the small number of girls with the elevated EXT. Surprisingly, the intervention also moved girls away from stable low level externalizing behavior toward the moderately elevated pattern. Both of the significant effects on girls' externalizing behavior were modest. No statistically significant effects were found for boys' externalizing behaviors, which exhibited a somewhat different patterning across time and reporter. Effect sizes were generally similar for the nurse and paraprofessional-visited groups. The results are discussed in the context of prior efforts to prevent early EXT and emerging evidence on the normative development of externalizing behavior.

Key words: prevention, externalizing, infancy, toddlerhood, RCT.

The Impact of a Preventive Intervention on Persistent, Cross-situational Early Onset Externalizing Problems

Persistent early onset child externalizing problems (EXT) – characterized by high levels of aggression, destruction, defiance, and negative affect– are a significant public health concern. Early externalizing behaviors appear to be highly stable, with 2-year stability correlations exceeding .5 by as early as age 2 (e.g., O’Leary, Slep, & Reid, 1999). Moreover, there are replicated findings to suggest that children who will exhibit a pattern of persistent early EXT for years to come are already elevated relative to their peers by age 2 (NICHD Early Child Care Research Network, 2004; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). Further, persistent early EXT confer risk for a multitude of negative outcomes in childhood and adulthood, including depression, substance dependence, financial and work problems, crime, and the perpetration of violence against family members (e.g., Moffitt, Caspi, Harrington, & Milne, 2002). In sum, persistent early EXT are costly to individuals, families, and society. Accordingly, their prevention is a national public health priority (NIMH National Advisory Mental Health Council Workgroup on Mental Disorders Prevention Research, 2001).

If persistent early EXT are established by age 2, primary prevention programs for early EXT must begin prior to age 2. Several interventions have been designed for that purpose (see the comprehensive review of Matjasko et al., 2012). One such intervention is the Nurse Family Partnership (NFP) intervention developed by Olds and colleagues (Olds, Sadler, & Kitzman, 2007a). NFP is a broad intervention designed to impact multiple child and family outcomes, engaging high risk mothers in a program of regular nurse home visiting beginning in pregnancy and continuing through child age two. In three randomized controlled trials, NFP has been shown to consistently impact several risk factors for child psychopathology (e.g., reduced rates of

abusive parenting; Donelan-McCall, Eckenrode, & Olds, 2009) and has also shown benefits to child functioning (e.g., superior performance on cognitive tests; Olds et al., 2004b). A description of additional intervention effects can be found in Olds et al. (2007a).

Although NFP has shown replicable preventive effects on early to late childhood internalizing and/or total child behavior problems, summed across the internalizing and externalizing spectra (e.g., Kitzman et al., 2010; Olds et al., 2014; Olds et al., 2004b), its record in specifically preventing EXT is more complicated. NFP was first tested in a sample primarily composed of European American families in Elmira, New York. Children of nurse visited mothers in Elmira exhibited decreased rates of antisocial outcomes such as arrests and convictions at age 15 and 19, effects at age 19 that were limited to girls (Eckenrode et al., 2010; Olds et al., 1998a). Yet initial published reports from the second trial of NFP (Memphis, Tennessee) indicated that the intervention failed to produce significant main effects on externalizing behavior measured at ages 2, 6, 9 and 12 in a sample heavily populated by African Americans (Kitzman et al., 2010; Olds et al., 2004b; Olds et al., 2007b; Sidora-Arcoleo et al., 2010). Notwithstanding the lack of main effects on early onset EXT, analyses of the Memphis trial suggest that program effects are conditioned by child gender and mothers' baseline psychological resources (a composite reflecting intelligence, mental health, and self-efficacy). Sidora-Arcoleo et al. (2010) reported significant preventive effects for toddler girls' physical aggression and for elementary school age physical aggression in children born to higher functioning mothers.

In the most recent trial (Denver, Colorado), the NFP intervention has thus far failed to produce significant main effects on age 4, 6, or 9 externalizing behavior in a sample primarily composed of Latinos, European Americans, and African Americans (Olds et al., 2004a; Olds et

al., 2014). Earlier externalizing measures were not available in the Elmira trial, nor are age 15 measures of EXT yet available for the two replication trials, preventing fully parallel comparisons across all three trials. However, considered together, the published findings from the Memphis and Denver trials suggest that the NFP intervention does not have a significant preventive main effect on early onset EXT, although it may have effects for girls or children of mothers with higher than average psychological resources.

The Present Investigation

The present report describes the results of new analyses of additional waves of assessment in the Denver trial (age 2 through 9), conducted to determine if NFP home visiting prevents persistent early onset EXT exhibited at both school and home. As described above, persistent early onset EXT – in contrast to time-limited EXT that emerge in toddlerhood and soon dissipate – are associated with significantly more negative outcomes. Moreover, children who show problematic behavior both at home and school (i.e., cross-situationally) may be at particularly high risk for compromised future outcomes (Robins, 2006). Accordingly, determining if the NFP intervention is capable of preventing stable, cross-situational early EXT, rather than “snapshots” of child EXT at one time and/or in one setting, is of substantial interest. NFP targets several environmental risk factors for early EXT, such as prenatal maternal smoking and alcohol use (Loukas, Zucker, Fitzgerald, & Krull, 2003; Wakschlag, Pickett, Kasza, & Loeber, 2006), rapid repeat births (Crowne, Gonsalves, Burrell, McFarlane, & Duggan, 2012), negative or otherwise insensitive parenting during infancy and toddlerhood (Lorber & Egeland, 2011), and early child abuse (Aguilar, Sroufe, Egeland, Carlson, 2000). Thus, notwithstanding genetically driven variance in externalizing behavior (Silberg, Moore, & Rutter, 2015), NFP could potentially prevent stable, cross-situational early EXT.

Taking cues from Sidora-Arcoleo et al.'s. (2010) finding that aggression was prevented among girls born to mothers with higher psychological resources, we also examined moderated impacts in the Denver trial. If the NFP intervention reliably prevents cross situational, persistent early onset EXT in at least some segments of the population, a potential benefit to public health is indicated. Just as importantly, the identification of population groups for whom the intervention does not appear to be especially effective can suggest areas for improvement. From an empirical stance, child gender and maternal psychological resources are potential moderators of program impact on early EXT per Sidora-Arcoleo et al. (2010). It may be girls and/or children born to high resource mothers who benefit the most from intervention. These findings are especially in need of replication and extension given that parenting practices are more strongly associated with preadolescent boys' vs. girls' externalizing behavior (e.g., Rothbaum & Weisz, 1994), although such patterns are not universal (e.g., Lorber & Egeland, 2011). Parenting is a major target of NFP, and if parenting is indeed more strongly associated with boys' early EXT, it follows that NFP may have greater impacts on boys' EXT.

With respect to the potential moderating impact of mothers' psychological resources, it may be that high resource mothers have a level of functioning that enables them to make better use of the NFP intervention, leading to greater prevention of EXT in this group as in Sidora-Arcoleo et al. (2010). Conversely, the children of low resource mothers may enjoy the most benefit. Children of low resource mothers may be at especially high risk for the development of EXT, as maternal characteristics such as intelligence and psychopathology are known correlates of EXT (Mesman et al., 2009; Whitley, Gale, Deary, Kivimaki, & Batty, 2011). Program effects may be greater for this low maternal resources group because there is putatively more to prevent. The benefits of NFP on parenting, children's injuries, and child cognitive-related outcomes are

consistently concentrated among low resource mothers, providing additional support for this hypothesis (Olds et al., 2007a).

In sum, there is a need to evaluate the impact of NFP home visiting on stable, cross situational early EXT. It was hypothesized that intervention would deflect children away from a trajectory marked by early EXT noted by both parents and teachers. Given empirical and theoretical considerations, the influence of child gender and maternal psychological resources as moderators of the impact of NFP on persistent early EXT was also investigated. Given conflicting indications outlined above, it was hypothesized that both child gender and maternal psychological resources would moderate the impact of the intervention on EXT, but no specific predictions were offered regarding the nature of these interactions.

Method

Participants

As more fully described in Olds et al. (2002), participants were 735 women pregnant with their first child who qualified for Medicaid or did not have private insurance. The resulting study sample had large groups of Latino (48.71%), African American (16.33%), and European American (35.64%) women. The women were 19.79-years-old on average ($SD = 4.00$) and 14.01% of them were married or cohabiting with a partner. Analyses are restricted to an N of 706; 29 cases were excluded from the analyses due to missing gender data due to death, adoption, or missing birth record information in the medical chart. Missing data were handled via Full Information Maximum Likelihood estimation. All available data were used for each model estimated; N s per variable are reported in Table 1.

Procedures

Questionnaire assessments pertaining to this report were conducted with participating mothers at baseline (prior to randomization) and at child age 2, 4, 6, and 9 years. Teachers completed assessments at child age 6 and 9 years. The descriptions of these assessments are provided below.

Intervention

After completion of a baseline interview conducted during the mothers' pregnancy, they were randomized into one of three conditions: nurse home visiting, paraprofessional home visiting (visits by clinicians with no formal training in the helping professions), or no intervention control. Control women ($n = 243$) were offered developmental screening and referral to services for their children at multiple points between child ages 6 and 24 months. Mothers in the nurse ($n = 225$) and paraprofessional ($n = 238$) groups received home visiting that began in pregnancy and continued at regular intervals through child age two, for up to 64 total sessions. Both nurses and paraprofessionals were charged with three major goals: (1) to improve the outcomes of pregnancy by helping women improve their prenatal health; (2) to improve children's subsequent health and development by helping parents provide more competent care of the child; and (3) to improve maternal life-course by helping women articulate a vision for their future and to engage in behaviors consistent with those values (e.g., completing their educations, finding work, and planning subsequent pregnancies). Nurses helped parents achieve these goals by engaging fathers and other family members and friends in the program, by helping parents address environmental health factors such as environmental lead exposure, and linking mothers with other needed health and human services. The NFP intervention has been described in detail in Olds et al. (1998).

Measures

Externalizing behavior. Mothers' reports of externalizing behavior were measured by their responses on the broadband Externalizing scale of the Child Behavior Checklist at ages 2 (CBCL/2-3), 4, 6 and 9 (CBCL/4-17) (Achenbach, 2009). Teachers' reports of externalizing behavior were measured via their responses on the Externalizing scale of the Teacher Report Form at ages 6 and 9 (TRF; Achenbach, 2009). The Externalizing scale items tap aggression, rule breaking/defiance, and moodiness/tantrums. The scores analyzed were averages of Externalizing scale items at each assessment. All Cronbach's alphas exceeded .85. T-scores based on normative reference samples were also calculated.

Maternal psychological resources. Mothers' psychological resources were measured upon registration to the study, during their pregnancies. To be consistent with previous evaluations of the NFP program (Olds et al., 2004a), it was operationalized as a composite of z-scores of mothers' intelligence, mental health, and sense of mastery, standardized to have a *M* and *SD* of approximately 100 and 10, respectively. It is an index score that does not make assumptions about the relations among its components (Streiner, 2003). The measures of the above constructs were, respectively, the Shipley-Hartford IQ scale (Shipley, 1940), RAND mental health assessment (Ware, Veit, Donald, 1985), and Pearlin and Schooler's (1978) sense of mastery measure. The psychological resources score was used as a covariate in testing intervention effects and was also examined as a moderator of intervention effects.

Conflict with the mother. Mothers' frequency of conflict with their own mothers was measured as a baseline characteristic to use as a covariate. Mothers were asked to indicate the number of days in the last two weeks each of the following events occurred: (1) their own mothers criticized something they did or said, (2) they had an unpleasant disagreement with their own mothers, and (3) their own mothers talked to them in a cruel or mean way (Olds et al.,

1983). To be consistent with previous evaluations of the NFP program (Olds et al., 2004a), an item average was calculated across these three items. It too is an index score that does not make assumptions about the relations among its components (Streiner, 2003).

Results

Descriptive statistics for study variables and demographic characteristics are presented in Table 1. Hypothesis tests were conducted with Mplus version 8.0 software (Muthén & Muthén, 1998-2017).

Identification of Latent Externalizing Behavior Profiles

Latent profile analyses (LPA) were used to identify subgroups among the children by jointly using mothers' and teachers' continuous reports of externalizing behavior between age 2 and 9. Persistently high, medium, and low externalizing classes emerged for girls and boys (Figure 1). Based on CBCL and TRF Externalizing scale means, the high and low externalizing classes were generally well separated across time and reporter. The medium externalizing classes were not as consistently distinguished from the high and low externalizing classes. Model details and results, as well as additional analyses to evaluate the criterion related validity of the LPA-derived classes are reported in the supplement to this article, available online.

Intervention Effects on Girls

Main effects. The effect of the intervention on externalizing class membership was evaluated in the LPA context with a series of latent multinomial regression tests. The first set of analyses addressed whether home visiting as performed by either nurses or paraprofessionals significantly affected which externalizing class a girl would eventually be in. Externalizing class was regressed on a dummy variable with nurse or paraprofessional conditions coded 1 and control coded 0. To control for possible confounds, maternal psychological resources, age, and

maternal conflict with their own mothers – all measured prior to the intervention – were entered as covariates due to group non-equivalencies on these measures (reported in Olds et al., 2004a) and because they were each associated with externalizing behavior. The results of these analyses are reported in the first section of Table 2. Coefficients corresponding to covariates are not reported for the sake of parsimony, but are available from the first author. Because there were 3 categories of the dependent variable (latent externalizing class), the multinomial regression is expressed as 2 contrasts. Thus two runs of each multinomial regression model were conducted, shifting the reference category to allow the comparison of all three externalizing classes. Class indicators' means were fixed to the values obtained in the model selection phase.

Results indicated that intervention decreased the odds of girls' ($n = 344$) being in the high externalizing group relative to the medium externalizing group. However, intervention did not significantly alter their chances of being in the high, relative to the low, externalizing group. Additionally, intervention significantly increased girls' odds of being in the medium externalizing group, relative to the low externalizing group. To further describe the intervention effects, predicted probabilities of membership in each class for girls in the combine intervention and control groups, and assuming mean levels of the three covariates, were computed. In the combined intervention group, 4.1% of the girls were in the high externalizing class, 39.9% were in the medium externalizing class, and 56.0% were in the low externalizing class. In control group girls, the corresponding rates were 7.4%, 24.1%, and 68.5%, respectively. See Table S2 of the on-line supplement for predicted probabilities reported separately for the two intervention groups.

The second set of analyses decomposed the intervention group into its constituent conditions: nurse and paraprofessional home visiting. Latent externalizing class was

simultaneously regressed on dummy variables representing nurse visiting vs. control (coded 1 and 0, respectively), paraprofessional home visiting vs. control (coded 1 and 0, respectively), as well as the same three covariates used above. Results from these analyses are presented in the second and third sections of Table 2. The effects of nurse and paraprofessional visiting were in the same direction as in the previous regression analyses, effect sizes were similar, but the findings were not as consistent. Nurse visiting did not significantly decrease the odds of being in the high vs. medium externalizing groups. But, as above, it did significantly increase girls' odds of being in the medium externalizing group, as compared to the low externalizing group. Also consistent with the previous analyses, nurse visiting did not alter the odds of girls belonging to the high vs. low externalizing group. The effects of paraprofessional visiting were similar to those of nurse visiting in terms of the effect size and direction, but were statistically nonsignificant.

Moderation by maternal psychological resources. Hypotheses concerning the moderation of intervention effects by maternal psychological resources were tested by conducting additional latent multinomial regression analyses in the context of LPA models. Intervention $\times$ Psychological Resources interaction terms were added to the regression equations specified above. In no case were these interaction terms significant. Thus, there was no evidence that intervention effects were moderated by mothers' psychological resources.

Intervention Effects on Boys

Boys' data ($n = 362$) were analyzed in an identical manner to girls' data (Table 3). Intervention had no significant main or moderated effects on externalizing class. Based on predicted probabilities, among the combined intervention group boys, 4.7% were in the high externalizing class, 13.4% were in the medium externalizing class, and 81.5% were in the low

externalizing class. In control group boys, the parallel rates were 4.3%, 22.6%, and 72.7%, respectively.

Gender Moderation

Gender moderation could not be examined within a single statistical model because it was necessary to conduct the LPAs separately for boys and girls. Accordingly, gender moderation was examined descriptively by comparing the above results concerning girls and boys, as well as by comparing their respective CIs. The intervention effects observed for girls' externalizing behavior did not replicate in the sample of boys. Moreover, the 95% CI for the combined nurse/paraprofessional intervention effect on children's membership in medium vs. low externalizing behavior classes was more positive, and zero exclusive, for girls (0.10 to 1.31) than for boys (-1.36 to 0.08). Notwithstanding the complications of comparing treatment effects on classes that are not strictly equivalent in boys and girls (see on-line supplement), this finding suggests the possibility of some degree of gender moderation. Yet all other CIs around the intervention effect estimates overlapped for boys and girls; it is thus difficult to conclude that these intervention effects are different for boys and girls.

Discussion

The primary aim in the present article was to study the efficacy of NFP home visiting in preventing children's membership in groups with persistent, cross-situational early onset EXT. Latent classes of girls and boys were identified based on mothers' and teachers' reports of child externalizing behavior between ages 2 and 9. Consistent with developmental theory and previous findings, approximately 6-7% of boys and girls showed persistently elevated externalizing behavior across time and situation. Larger intermediate and low level externalizing groups were also identified, although the intermediate externalizing groups were not consistently distinct from

their high and low level externalizing counterparts at all times and according to all reporters. Moreover, the nature of the classes somewhat differed by gender, most evident in teachers' ratings of children in the intermediate externalizing classes. Intermediate externalizing boys, but not girls, were seen by their teachers as highly problematic.

The findings suggest that the NFP intervention has modest effects on girls' externalizing behavior that are not enjoyed by boys. Home visiting decreased girls' risk of being in a class of children who showed highly elevated externalizing behavior across time and situation, in favor of membership in a group marked by moderately elevated externalizing behavior at home and relatively normative externalizing behavior at school. Girls whose mothers received home visiting (either nurse- or paraprofessional-delivered) were about 55% as likely as controls to exhibit the stable cross-situational EXT pattern. Thus, NFP home visiting deflected girls away from a highly problematic outcome. Underscoring the severity of this behavioral pattern, validation analyses revealed that these girls were more likely than other girls to have received treatment for emotional/behavior problems or ADHD symptoms (see on-line supplement). Statistical and clinical significance notwithstanding, a degree of caution is warranted in interpreting this finding, as we describe in the limitations section below.

At the same time, NFP home visiting appeared to deflect girls away from low and toward intermediate levels of externalizing behavior, although their problem behavior was not as evident at school. Girls whose mothers received home visiting were about 65% more likely than controls to be members of the moderately elevated externalizing class; they were also about 18% less likely to be in the low externalizing class. Thus, home visiting appeared to "push girls toward the middle," away from both low and high levels of externalizing behaviors. Although not as severely troubled as the high externalizing girls, girls in the moderately elevated externalizing

class received treatment for emotional/behavior problems or ADHD symptoms at a higher rate than did their low externalizing peers (see on-line supplement). Thus the effect may be clinically significant. In contrast to the findings of Sidora-Arcoleo et al. (2010), intervention effects on girls did not depend on mothers' baseline psychological resources, as jointly indicated by their IQ, mental health, and sense of mastery.

Whatever impacts NFP home visiting had were of modest magnitude and restricted to altering the probability of girls' membership in adjacent externalizing behavior classes (e.g., high vs. medium). In no case did home visiting have a large effect or deflect girls away from stable high level externalizing behavior toward stable low level externalizing behavior. Thus, the intervention appears to have an incremental impact in the outcomes of girls. The protective impact of NFP on girls' EXT, however, retains clinical relevance, although qualified by the small number of girls who exhibited the persistent high EXT pattern. Home visiting significantly decreased the odds of a very serious pattern of early antisocial behavior. Some girls who might have assumed this pattern of behavior were instead part of a group of girls who showed moderately and situationally specific elevated externalizing behavior as a result of their mothers' participation in the NFP program. This clear preventive benefit for the highest risk girls is balanced against the increased likelihood of mildly but consistently elevated externalizing behavior in other girls at home, although perhaps not at school.

How can NFP home visiting push girls away from both high level and low level externalizing behavior? NFP seeks to modify several risk factors for child psychopathology, including biological and social factors implicated in the development of externalizing behaviors, such as maternal smoking during pregnancy and abusive parenting practices (Olds et al., 2007a). Reductions in these and other risk factors may explain why NFP home visiting is able to deflect

girls away from high levels of externalizing behaviors. At the same time, it is possible that some intervention strategies “backfire” to a certain extent. In emphasizing maternal responsiveness and deemphasizing harsh parenting practices, NFP practitioners may inadvertently discourage parents from using firm discipline techniques in the face of the normative contests of will between child and parent that characterize toddlerhood. Ineffective discipline practices may not be independently sufficient to cause high level externalizing behaviors, but may turn what would otherwise be normative toddler limited challenges into stable, situationally specific, moderately elevated externalizing behavior in girls.

An alternative explanation for the non-linear effects is that NFP home visiting changes mothers’ views of their girls’ behavior and that these views are reflected in how they complete study questionnaires. The medium externalizing girls significantly differed from the low externalizing girls on parent- but not teacher-reported behavior. In contrast, high and low externalizing girls’ behavior was statistically distinguishable irrespective of reporter. Intervention group mothers of girls in the medium externalizing class may have been more sensitive to or overreported slight elevations in their daughters’ externalizing behaviors that were not detected or reported by teachers. Medium externalizing girls were also more likely to have received treatment for psychological problems, perhaps because of their mothers’ increased sensitivities to their girls’ externalizing behaviors. Increased sensitivity in maternal reports was found in the Elmira trial of NFP. Intervention mothers were (a) more accurate in predicting how their children would perform on IQ tests relative to controls (Olds, Henderson, Chamberlin, & Tatelbaum, 1986a), and (b) more accurate in their self-reports of tobacco use when compared to serum cotinine than controls (Olds, Henderson, Tatelbaum, & Chamberlin, 1986b).

We note that the contrasting effects on girls' externalizing behavior were unanticipated. Thus, the above explanations are necessarily post hoc and must be interpreted with caution. Future research is required to substantiate these preliminary suggestions.

Findings for boys followed a different pattern. NFP home visiting did not reliably alter boys' early externalizing behavior, nor did they depend on mothers' psychological resources. Despite the apparent gender differences in intervention effects, it is important to note that in only one case did the confidence intervals for intervention effects reliably differ between boys and girls. Thus, it is not safe to broadly conclude that NFP home visiting has different effects on stable, cross situational variation in girls' and boys' early externalizing behavior. Moreover, because the nature of the intermediate externalizing class differed in boys and girls, direct comparisons are not straightforward. Yet, parallels are found in the findings of Sidora-Arcoleo et al. (2010; Memphis trial) in which NFP nurse home visiting was found to have a stronger impact on girls' aggression at age 2, and girls' arrests and convictions in the second half of adolescence (Eckenrode et al., 2010; Elmira trial). In sum, results from all three trials of NFP suggest that, where externalizing behaviors are concerned, girls are disproportionately likely to benefit from the intervention.

Integration with Prior Findings and Indications for Future Research

The preventive effect for girls' persistent, cross-situational early onset EXT partly substantiates and extends our prior research on the prevention of EXT by the NFP program (e.g., Sidora-Arcoleo et al., 2010). Yet the bifurcated effects in girls and the lack of reliable preventive effects in boys – if they prove to be replicable – suggest the need to refine and/or supplement at least some of content of the NFP intervention, without sacrificing its many documented preventive effects. More generally, the efficacy of infancy interventions in preventing early EXT

is quite limited. Many of these interventions have been shown to positively affect risk factors for EXT, such as insecure attachment, child maltreatment, and emotionally unsupportive parenting (e.g., Bugental et al., 2002; Love et al., 2005; Van Zeijl et al., 2006). Critically, however, where early onset EXT themselves are concerned, these interventions have often shown null effects (e.g., St. Pierre & Layzer, 1999), small effects (e.g., Love et al., 2005), or effects limited to subpopulations and narrow aspects of behavioral adjustment (e.g., Sidora-Arcoleo et al., 2010; Van Zeijl et al., 2006).

The limited efficacy of infancy preventive interventions for early onset EXT may be due to a mismatch between the timing and content of intervention activities with the natural developmental course of externalizing behaviors. Emerging literature suggests that physical aggression and defiance are present and consequential considerably earlier than had been previously suspected. Alink et al. (2006) found approximate 50% prevalence of and substantial one-year stability of 12-mo-olds' aggression. Two other recent findings, push the envelope even further in suggesting that physical aggression and defiance appear in the majority of children by 6 or 8 mos, exhibit theoretically interpretable correlations with other factors in their nomological network (e.g., parenting), and show significant rank-order stability (Hay et al., 2010; Lorber, Del Vecchio, & Slep, 2015). These findings represent an advance in our understanding of the normative developmental course of externalizing behavior in the first year of life – one that has yet to be translated to preventive interventions. Perhaps interventions that improve parents' management of externalizing behaviors when they are first developing, and prior to when they are engrained “externalizing problems,” will yield enhanced preventive efficacy.

Limitations

Statistical power was the primary limitation of the present study. Intervention effects were most consistently observed when the nurse and paraprofessional home visiting conditions were combined into a single intervention vs. control contrast, despite similar magnitude nurse and paraprofessional group effects considered separately. Furthermore, persistent, cross-situational early onset EXT occurred in only about 6 to 7% of this at risk sample. Thus, despite the inclusion of more than 700 families, a small number of children exhibited this pattern. Although significant preventive effects were obtained, they were modest, and the small number of girls with persistent, cross-situational early onset EXT raises the specter of sampling error. Interpretive caution is therefore advised, particularly in the separate comparisons of nurse and paraprofessional home visiting group vs. control comparisons involving the high EXT group, in which the girls with high EXT behavior are subdivided further (likely fewer than 10 girls per group). Replication is thus crucial.

The reliance on maternal report on externalizing behavior prior to age 6 is an additional limitation. This may be of special concern if parents hold different standards of child behavior as a result of the intervention – a possibility we describe above. The inclusion of teacher reports was one of the strengths of the design, allowing us to test hypotheses about cross-situational child behavior. The design would have been further strengthened by collecting data from key informants in other settings (e.g., child care) prior to elementary school, which would have allowed for more certain inferences about intervention effects on cross-situational EXT.

The increasing rate of missing data over time is another limitation (e.g., response rates of 78% for mothers and 67% for teachers by age 9), reflecting a classic attrition effect. Our approach allowed us to retain all cases in the analyses. However, the missing data undoubtedly

harmed precision of the EXT class membership estimates, thus increasing measurement error in our dependent variable, and making the detection of intervention effects more difficult.

Finally, we noted the statistical impossibility of examining gender moderation due to our decision to conduct LPAs separately for boys and girls. An apples-to-apples statistical comparison is not possible given the nonequivalence of the dependent variable (EXT class structure). Even though, *descriptively*, the intervention effects appear to be different for boys and girls, a firm conclusion is not warranted.

Conclusion

The NFP home visiting intervention modestly deflected the highest risk girls away from persistent, cross-situational early onset EXT from age 2 through 9 and toward a pattern of moderately elevated externalizing behavior that was evident at home and not at school. However, the small number of girls in the persistent, cross-situational early onset EXT group should qualify one's interpretation of this finding. Surprisingly, the intervention also deflected girls away from stable low levels of externalizing behavior and toward the middle, a pattern for which we offer competing explanations. No statistically significant effects were detected on boys' externalizing behavior. The preventive effect of the NFP intervention for girls' EXT is encouraging. Notwithstanding, the push of low risk girls toward moderately elevated externalizing behavior and the nonsignificant impact on boys' externalizing behavior suggests the need for further innovation. This need is particularly evident when considered in the larger context of the uneven record of infancy preventive interventions for EXT and recent evidence suggesting that externalizing behaviors begin to develop in the first year of infancy.

Compliance with Ethical Standards

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All procedures performed in studies involving human participants were in accordance with the ethical standards of the Colorado Multiple Institutional Review Board and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Michael Lorber and Nancy Donelan-McCall declare that they have no conflicts of interest. The Prevention Research Center for Family and Child Health (PRC), directed by David Olds, receives fees and travel expenses from governments and entities outside of the United States to implement the Nurse-Family Partnership®. Licensing fees are charged to international entities for implementing the program. The fees are used to support program implementation in international contexts and research on testing and improving the NFP and its implementation. In the US, the program is replicated by the NFP National Service Office, which provides funding to the PRC to conduct research aimed at improving the NFP model and its implementation. None of these fees are used to augment Dr. Olds's university salary. Professor Olds does receive honoraria for writing and speaking about the NFP.

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Table 1

Sample Characteristics

	Mothers and Girls					Mothers and Boys				
	<i>N</i>	<i>M</i>	<i>SD</i>	Min	Max	<i>N</i>	<i>M</i>	<i>SD</i>	Min	Max
Mother age ^a	344	19.68	3.72	12.00	34.00	362	19.84	4.22	13.00	39.00
Mother education ^a	344	11.24	1.91	6.00	20.00	361	11.06	1.92	3.00	17.00
Household income (tens of thousands) ^a	312	12.76	12.11	1.50	50.00	331	13.31	12.61	1.50	50.00
Maternal psychological resources ^a	344	100.83	9.76	75.41	125.94	362	99.37	10.11	68.95	124.33
Conflict with the mother ^a	344	1.18	2.09	0.00	14.00	362	1.19	2.15	0.00	14.00
CBCL externalizing - Age 2	299	0.64	0.31	0.00	1.54	319	0.65	0.30	0.00	1.54
CBCL externalizing - Age 4	303	0.34	0.20	0.00	1.03	324	0.38	0.23	0.00	1.46
CBCL externalizing - Age 6	290	0.18	0.18	0.00	0.97	302	0.20	0.18	0.00	0.94
CBCL externalizing - Age 9	265	0.20	0.17	0.00	0.88	289	0.22	0.19	0.00	1.30
TRF externalizing - Age 6	255	0.18	0.23	0.00	1.19	267	0.27	0.31	0.00	1.31
TRF externalizing - Age 9	229	0.17	0.23	0.00	1.25	241	0.26	0.31	0.00	1.59

Note. ^a = measured at intake, CBCL = mother completed Child Behavior Checklist; TRF = Teacher Report Form; CBCL and TRF are reported in their raw metric as item averages.

Table 2

Intervention Effects on Girls' Externalizing Behavior Class

	<i>B</i>	<i>SE</i>	<i>p</i>	95% CI		OR	RR ^a
				Low	High		
Nurse/Paraprofessional Intervention vs. Control							
High vs. Low Externalizing	-0.40	0.51	.439	-1.40	0.61	0.67	0.70
High vs. Medium Externalizing	-1.10	0.55	.046	-2.18	-0.02	0.33	0.39
Medium vs. Low Externalizing	0.70	0.31	.023	0.10	1.31	2.02	1.60
Nurse Intervention vs. Control							
High vs. Low Externalizing	-0.36	0.63	.570	-1.59	0.88	0.70	0.72
High vs. Medium Externalizing	-1.09	0.69	.115	-2.43	0.26	0.34	0.40
Medium vs. Low Externalizing	0.73	0.36	.044	0.02	1.43	2.06	1.61
Paraprofessional Intervention vs. Control							
High vs. Low Externalizing	-0.43	0.62	.486	-1.65	0.78	0.65	0.67
High vs. Medium Externalizing	-1.11	0.65	.087	-2.38	0.16	0.33	0.39
Medium vs. Low Externalizing	0.68	0.36	.059	-0.03	1.38	1.97	1.57

Note. Coefficients represent intervention effects on latent externalizing behavior class; mothers' age, psychological resources, and conflict with their own mothers entered as covariates for all analyses; ^a risk ratio calculated from model implied predicted probabilities.

Table 3

Intervention Effects on Boys' Externalizing Behavior Class

	<i>B</i>	<i>SE</i>	<i>p</i>	95% CI		OR	RR ^a
				Low	High		
Nurse/Paraprofessional Intervention vs. Control							
High vs. Low Externalizing	-0.04	0.60	0.946	-1.21	1.13	0.96	0.96
High vs. Medium Externalizing	0.60	0.67	0.366	-0.70	1.91	1.83	1.60
Medium vs. Low Externalizing	-0.64	0.37	0.080	-1.36	0.08	0.53	0.59
Nurse Intervention vs. Control							
High vs. Low Externalizing	-0.85	0.81	0.295	-2.44	0.74	0.43	0.44
High vs. Medium Externalizing	-0.21	0.90	0.819	-1.98	1.56	0.81	0.84
Medium vs. Low Externalizing	-0.64	0.46	0.161	-1.54	0.26	0.53	0.59
Paraprofessional Intervention vs. Control							
High vs. Low Externalizing	0.39	0.65	0.547	-0.88	1.66	1.48	1.44
High vs. Medium Externalizing	1.03	0.74	0.167	-0.43	2.48	2.79	2.14
Medium vs. Low Externalizing	-0.64	0.43	0.136	-1.47	0.20	0.53	0.59

Note. Coefficients represent intervention effects on latent externalizing behavior class; mothers' age, psychological resources, and conflict with their own mothers entered as covariates for all analyses; ^a risk ratio calculated from model implied predicted probabilities.

Figure 1. Latent externalizing behavior classes. Numbers above bars are mean T-scores, relative to age and gender, based on posterior class assignments.

On-line Supplement

Lorber, M. F., Olds, D. L., & Donelan-McCall, N. (2019). The impact of a preventive intervention on persistent, cross-situational early onset externalizing problems. *Prevention Science*. doi:10.1007/s11121-018-0973-7

Identification of Latent Externalizing Behavior Profiles

Analyses were conducted using Mplus version 8.0 software (Muthén & Muthén, 1998-2017). Latent profile analyses (LPA) were used to identify subgroups among the children by jointly using mothers' and teachers' continuous reports of externalizing behavior between age 2 and 9. The LPAs identified groups of children that represented prototypical developmental patterns (latent profiles or classes), in a way that optimally described the patterns in the obtained data. These analyses were conceptually similar to the increasingly common growth mixture modeling (GMM) method in which groups of individuals with similar developmental trajectories are identified (Muthén et al., 2002). However, the present analyses differed from GMM in two important ways. First, although the data had a longitudinal structure similar to the type used in GMM, different scales of measurement were used at different occasions (CBCL 2/3, CBCL 4/18, and TRF). Second, the TRF and CBCL were administered at around the same time at 6 and 9 years of age, violating serial data structure. Thus, GMM could not be used.

As suggested by Brennan and Shaw (2013), a disadvantage of the combined mixture modeling of boys' and girls' externalizing behaviors is that "females demonstrating clinically meaningful levels of [externalizing behaviors] that are not as high as male levels may be placed in a 'lower' trajectory in mixed-sex models; however, in female-specific models this group would be more clearly identified as distinct from those with lower levels of [externalizing behaviors]" (p. 37). Thus, LPAs were conducted separately for boys and girls to identify children based on their externalizing behavior, relative to their same gendered peers. The nonequivalence of the gender specific LPA solutions was then evaluated via multigroup analyses.

LPA for Girls

Models were estimated using all mother and teacher reports of externalizing behavior. An iterative procedure was used to identify the class solution. A series of analyses specifying different numbers of classes were conducted and the Bayesian Information Criterion (BIC; Nylund, Asparouhov, & Muthén, 2007) index of model fit was calculated for each model. The BICs for models including progressively more classes were plotted. Following the logic of the "scree plot" in factor analysis, a 3 class solution was deemed appropriate. BIC decreased with the addition of a fourth class, but the function reached a near asymptote at 3 classes, with the addition of an extra class yielding very little improvement in model fit at the expense of decreased parsimony. BICs for models with 1 to 4 classes were, respectively, -269.20, -545.49, -659.14, and -707.80. Further supporting the 3-class solution, the Lo-Mendell-Rubin (LMR; Lo, Mendell, & Rubin, 2001) test comparing the fit of 3- and 4-class models was nonsignificant ($p = .264$). The entropy value (0.81) and average latent class probabilities for most likely class membership (range = 0.86 to 0.93), further suggested acceptable model fit of the 3-class solution.

LPA for Boys

Based on BICs, a 3-class solution was deemed appropriate. BIC again decreased with the addition of a fourth class, but the function reached a near asymptote at 3 classes, with the addition of an extra class yielding very little improvement in model fit at the expense of decreased parsimony. BICs for models with 1 to 4 classes were, respectively, 107.16, -173.08, -242.70, and -274.34. Moreover, the Lo-Mendell-Rubin (LMR; Lo, Mendell, & Rubin, 2001) test comparing the fit of 3- and 4-class models was nonsignificant ($p = .347$). The entropy value (0.87) and average latent class probabilities for most likely class membership (range = 0.89 to 0.95), further suggested acceptable model fit of the 3-class solution.

Multigroup LPA: Girls vs. Boys

We next evaluated LPA model nonequivalence in girls vs. boys. Multigroup LPA models were estimated using the "knownclass" function in Mplus to incorporate child gender into the estimation, following Example 7.21 in Muthén & Muthén (1998-2017), Finch (2015), and Kim, Cao, Wang, and Nguyen (2017). Based on the results of the gender specific LPA models, reported above, a 6-class model was estimated: 3 (latent externalizing class) $\times$ 2 (known child gender class). Latent externalizing class was also regressed on gender class. Two versions of the model were estimated. In the freely

estimated model, the means of the class indicators (i.e., CBCL and TRF externalizing scores) were allowed to vary across the externalizing and gender classes. In the constrained model, the means of the class indicators were constrained to be equal for males and females *within* each latent externalizing class. If the constrained model fit worse than the freely estimated model, one would conclude that the latent structure of externalizing behavior is different in girls and boys. Per Finch (2015) and Kim et al. (2017), the two models were compared with several metrics. These comparisons included one statistical test ($-2 \times \text{loglikelihood difference [LL } \Delta]$, similar to the more familiar chi-square difference) and 3 information criteria: Akaike Information Criterion (AIC), BIC, and sample size adjusted BIC (aBIC). Higher LL indicates better fit; lower AIC, BIC, and aBIC indicate better fit. For the freely estimated model, LL = 107.49, AIC = -120.98, BIC = 90.94, aBIC = -58.29. For the constrained model, LL = 62.93, AIC = -67.86, BIC = 62.89, aBIC = -29.19. The LL Δ ($df = 18$) was 89.11, $p < .001$. The LL Δ , as well as AIC and aBIC differences, suggest that the freely estimated model fits better. The BIC difference suggests that the constrained model fits better. Given the preponderance of the evidence suggesting gender-based differences in model fit, we modeled girls and boys separately in subsequent analyses.

Description of Final LPA Models

Estimated means of CBCL and TRF scores are presented in Figure 1 (main article) and Table S1 (supplement) for both girls ($n = 328$) and boys ($n = 343$) included in the LPAs; all children with at least one CBCL or TRF score. A group that exhibited consistently high externalizing behavior compared to their peers and irrespective of reporter constituted 6.8% of the girls (“high”). Their mean normatively references T-scores, based on posterior class assignments, ranged from 61.9 to 70.5; the T-score cutoffs for borderline and clinical significance are 60 and 63, respectively (Achenbach, 2009). Another group of girls (59.6%; “low”) exhibited consistent low levels of externalizing behavior. Their mean T-scores ranged from 43.6 to 53.7. All mean externalizing scores differed significantly between the high and low externalizing classes ($ps < .05$). The remaining class (33.5%; “medium”) exhibited an intermediate pattern of externalizing behavior. Their mean T-scores ranged from 56.5 to 60.1. At ages 2 through 9, their mean CBCL scores were elevated relative to the low externalizing class. Yet, their mean age 6 and 9 TRF scores did not significantly differ from the mean of the low externalizing class. Although their CBCL scores did not reliably differ from the high externalizing class at age 2 or 4, the medium externalizing class exhibited significantly less severe externalizing behavior at three of the four additional assessments; age 6 TRF scores were the exception.

Persistently high (6.0%; mean T-scores ranged from 63.8 to 71.1), medium (16.2%; mean T-scores ranged from 56.4 to 68.3), and low (77.9%; mean T-scores ranged from 48.8 to 53.9) externalizing classes emerged for boys as well. All mean externalizing scores significantly differed in the low vs. high externalizing classes (Table S1). Medium externalizing boys exhibited greater mean externalizing behavior than the low externalizing group at all assessments other than at age 2. Their age 4, 6, and 9 CBCL means were lower than the corresponding high externalizing boys’ means, but their age 2 CBCL and age 6 and 9 TRF means were statistically indistinguishable from high externalizing boys.

In the next section, we report on additional analyses to evaluate the criterion related validity of the LPA-derived classes against study children’s receipt of treatment for emotional/behavioral problems and Attention Deficit/Hyperactivity Disorder (ADHD) symptoms (ages 6 and 9), as well as school suspensions (age 9). The analyses were generally supportive of the distinctions between classes identified via LPA, as described in detail below.

Predicted Probabilities for Class Membership by Group

Predicted probabilities of membership in each of the 3 externalizing classes by group (nurse intervention, paraprofessional intervention, and control), corresponding to the models reported in Tables 2 and 3 of the main article, are reported here in Table S2.

Table S1. Descriptive Statistics for Latent Externalizing Behavior Classes

Class/Measure	Girls						Boys					
	Mean			Variance			Mean			Variance		
	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
		Low	High		Low	High		Low	High		Low	High
Low												
CBCL EXT 2	0.506 ^{a,b}	0.440	0.573	0.071	0.058	0.084	0.613 ^b	0.575	0.652	0.085	0.073	0.097
CBCL EXT 4	0.247 ^{a,b}	0.211	0.283	0.028	0.022	0.033	0.338 ^{a,b}	0.313	0.363	0.041	0.034	0.048
CBCL EXT 6	0.076 ^{a,b}	0.057	0.095	0.008	0.006	0.010	0.146 ^{a,b}	0.129	0.163	0.019	0.015	0.023
CBCL EXT 9	0.100 ^{a,b}	0.070	0.130	0.014	0.009	0.018	0.173 ^{a,b}	0.153	0.194	0.019	0.015	0.024
TRF EXT 6	0.129 ^b	0.098	0.160	0.049	0.036	0.062	0.141 ^{a,b}	0.105	0.176	0.039	0.027	0.051
TRF EXT 9	0.123 ^b	0.090	0.156	0.046	0.028	0.064	0.169 ^{a,b}	0.129	0.210	0.064	0.043	0.085
Medium												
CBCL EXT 2	0.818	0.750	0.886	0.071	0.058	0.084	0.695	0.569	0.822	0.085	0.073	0.097
CBCL EXT 4	0.458	0.398	0.519	0.028	0.022	0.033	0.471 ^c	0.385	0.557	0.041	0.034	0.048
CBCL EXT 6	0.266 ^c	0.212	0.321	0.008	0.006	0.010	0.304 ^c	0.235	0.373	0.019	0.015	0.023
CBCL EXT 9	0.293 ^c	0.244	0.341	0.014	0.009	0.018	0.287 ^c	0.239	0.336	0.019	0.015	0.024
TRF EXT 6	0.217	0.159	0.274	0.049	0.036	0.062	0.737	0.598	0.876	0.039	0.027	0.051
TRF EXT 9	0.193 ^c	0.127	0.259	0.046	0.028	0.064	0.618	0.450	0.785	0.064	0.043	0.085
High												
CBCL EXT 2	0.878	0.740	1.016	0.071	0.058	0.084	0.946	0.816	1.077	0.085	0.073	0.097
CBCL EXT 4	0.599	0.478	0.720	0.028	0.022	0.033	0.741	0.589	0.892	0.041	0.034	0.048
CBCL EXT 6	0.685	0.578	0.792	0.008	0.006	0.010	0.580	0.451	0.709	0.019	0.015	0.023
CBCL EXT 9	0.499	0.417	0.580	0.014	0.009	0.018	0.752	0.643	0.860	0.019	0.015	0.024
TRF EXT 6	0.411	0.219	0.604	0.049	0.036	0.062	0.600	0.416	0.785	0.039	0.027	0.051
TRF EXT 9	0.466	0.263	0.670	0.046	0.028	0.064	0.583	0.303	0.863	0.064	0.043	0.085

Note. CBCL = Child Behavior Checklist; TRF = Teacher Report Form; EXT = externalizing scores; differences in class means were evaluated by comparing the 95% CIs around each estimated mean; non-overlapping CIs indicated significant differences ($p < .05$), denoted by ^a (low vs. medium), ^b (low vs. high), and ^c (medium vs. high).

Table S2. *Predicted Probabilities for Class Membership by Group*

	Girls Externalizing Class			Boys Externalizing Class		
	High	Medium	Low	High	Medium	Low
Nurse Intervention	0.043	0.405	0.552	0.022	0.129	0.848
Paraprofessional Intervention	0.041	0.395	0.564	0.072	0.124	0.804
Control	0.076	0.243	0.682	0.045	0.215	0.740

Validation of Externalizing Behavior Classes

The association of externalizing (EXT) class membership with treatment for emotional/behavioral problems and Attention Deficit/Hyperactivity Disorder (ADHD) symptoms (ages 6 and 9) and school suspensions (age 9) was evaluated with a series of latent multinomial regression tests.

The child's receipt of treatment for emotional/behavior problems or ADHD symptoms was measured via parent report. Parents were asked if the child had "ever received treatment services" for (a) "her/his ability to control her/his feelings, emotions, or behaviors," and (b) "difficulties with attention, concentration, impulsivity, or hyperactivity." These questions were also asked at age 9, but referred only to treatment received "between 6 and 9." At each age, treatment was scored 1/0 (present/absent) if the child received treatment for emotional/behavior problems and/or ADHD symptoms. At age 6, treatment rates were 7.3% (girls) and 18.6% (boys); at age 9 treatment rates were 18.8% (girls) and 29.8% (boys).

School suspension (either in-school or home) was measured via age 9 school records and scored 1/0 (present/absent). EXT class was regressed on each predictor in a separate model. Two runs of each multinomial regression model were conducted, shifting the reference category to allow the comparison of all three EXT classes (Table S3). Suspension rates were 4.7% (girls) and 12.1% (boys).

Emotional/Behavioral or ADHD Treatment (age 6 and 9)

At age 6, girls in the High EXT class were significantly more likely than either Medium or Low EXT girls to have received treatment; treatment was more common for the Medium EXT vs. Low EXT girls as well. The age 9 results followed the same pattern, however the difference between the Medium and High EXT classes was not significant.

At age 6 and 9, Low EXT boys were significantly less likely than Medium and High EXT boys to have received treatment. No differences were found for Medium vs. High EXT boys' likelihood of treatment at either age.

Suspension (age 9)

Girls' suspension rates did not significantly differ by EXT group, despite the fact that the odds of Low EXT girls being suspended were .13 and .11 those of Medium and High EXT girls, respectively. The low rate of suspensions among girls hampered statistical power to detect this association, despite its large effect size.

Low EXT boys were significantly less likely than High or Medium EXT boys to be suspended. No differences were found for Medium vs. High EXT boys' likelihood of suspension.

Table S3. Association of Externalizing Behavior Class with Behavior Problems Treatment and School Suspension

Child Gender, Outcome, Contrast ^a	<i>B</i>	<i>SE</i>	<i>p</i>	OR
Girls				
Age 6 Emotional/Behavioral or ADHD Treatment (ever)				
High vs. Low EXT	3.41	0.70	0.000	30.27
High vs. Medium EXT	1.97	0.60	0.001	7.16
Medium vs. Low EXT	1.44	0.64	0.025	4.22
Age 9 Emotional/Behavioral or ADHD Treatment (age 6-9)				
High vs. Low EXT	2.68	0.57	0.000	14.51
High vs. Medium EXT	0.96	0.55	0.080	2.62
Medium vs. Low EXT	1.71	0.41	0.000	5.54
Age 9 School Suspension				
High vs. Low EXT	2.20	1.47	0.135	9.01
High vs. Medium EXT	0.13	0.98	0.893	1.14
Medium vs. Low EXT	2.06	1.26	0.102	7.86
Boys				
Age 6 Emotional/Behavioral or ADHD Treatment (ever)				
High vs. Low EXT	1.61	0.54	0.003	5.02
High vs. Medium EXT	0.23	0.61	0.714	1.25
Medium vs. Low EXT	1.39	0.40	0.000	4.01
Age 9 Emotional/Behavioral or ADHD Treatment (age 6-9)				
High vs. Low EXT	2.66	0.63	0.000	14.32
High vs. Medium EXT	0.87	0.69	0.209	2.39
Medium vs. Low EXT	1.79	0.39	0.000	5.98
Age 9 School Suspension				
High vs. Low EXT	2.84	0.79	0.000	17.12
High vs. Medium EXT	-0.05	0.77	0.950	0.95
Medium vs. Low EXT	2.89	0.66	0.000	18.01

Note. ^a reference category in each comparison is listed second.

Sample Information

Table S4. *Sample Composition by Time and Group*

# Eligible and Invited to Participate	1178			
# Active Refusals	244			
# Passive Refusals	199			
# Randomized	735			
Treatment Group	Control	Paraprofessional	Nurse	Total
# Allocated to Treatment	255	245	235	735
# Missing gender data [†]	12	7	10	29
# Analyzed ^{††}	243	238	243	706
# Completed CBCL- Age 2	216	210	192	618
# Completed CBCL- Age 4	219	208	200	627
# Completed CBCL- Age 6	207	201	184	592
# Completed CBCL- Age 9	196	188	170	554
# Completed TRF- Age 6	176	174	172	522
# Completed TRF- Age 9	168	160	142	470

[†] Missing gender data due to death, adoption, or missing birth record information in the medical chart.

^{††} All cases with non-missing gender data.

Additional References

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