

# Talking Tots and the Terrible Twos: Early Language and Disruptive Behavior in Toddlers

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**ABSTRACT:** *Objective:* The goal of this article is to investigate the association between the 2 most commonly reported parental concerns about young children—disruptive behavior (e.g., irritable, aggressive, and non-compliant behaviors) and language delay in toddlers. To test for salient subgroup differences, individual differences by the sex of the child and family poverty status were examined. *Methods:* Participants included 1259 mothers of children between 18 and 36 months of age. Mothers completed questions about their child's language development and disruptive behavior. Information regarding poverty status as well as child age and sex were also collected. *Results:* Stronger language skills were associated with fewer disruptive behaviors for children between 18 and 36 months of age. This negative association was stronger for females than for males ( $b = -0.243$ ;  $t[1251] = -3.555$ ;  $p < 0.001$ ) and stronger for children living in poverty than for those above the poverty line ( $b = -2.04$ ;  $t[1251] = -2.531$ ;  $p = 0.011$ ). *Conclusion:* Findings from our study suggest a developmental co-occurrence pattern that begins at a very early age. Individual differences suggest that there is substantial heterogeneity in these patterns; longitudinal investigation is needed to uncover causal pathways and underlying mechanisms. Awareness of the association between these 2 developmental domains, about which parents frequently express concerns, is critical to maximizing early detection and intervention.

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Language skills and disruptive behavior (e.g., irritable, aggressive, and noncompliant behaviors) are the 2 most commonly reported parental concerns about young chil-

dren.<sup>1</sup> In fact, 7% to 24% of toddlers display behavioral or socioemotional problems,<sup>2</sup> and 15% to 28% of toddlers exhibit language delays.<sup>3,4</sup> In addition, language delays and disruptive behavior often co-occur,<sup>5,6</sup> but little is known about this co-occurrence in the first years of life.<sup>4</sup> The goal of this article is to investigate the association between disruptive behavior and language delay in early childhood.

The association between disruptive behavior and language difficulties is well established in school-aged children, both concurrently and predictively.<sup>5,6</sup> Among school-aged children with a behavioral disorder, 81% have below-average language skills.<sup>6</sup> Furthermore, children with a language disorder are twice as likely to have behavioral difficulties as typically developing children.<sup>7</sup> Emergent research from small samples suggests that links between language delays and disruptive behavior are evident at even younger ages.<sup>4,8–10</sup> Although several studies have examined the association between language skills and disruptive behavior in toddlers in population-based samples,<sup>4,8–10</sup> only 1 of these studies began before 24 months of age.<sup>4</sup>

In addition, a number of methodologic limitations constrain the interpretation of previous work. First, most studies have treated disruptive behavior and/or language as categorical variables rather than continuous variables. As developmental variation is extensive during this period and categorical distinctions lose critical information about individual variation, the use of continuous measures

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M. Y. Roberts conceptualized and designed the study and drafted and approved the final manuscript as submitted. P. Curtis conducted the statistical analysis related to the language measures and approved the final manuscript as submitted. R. Estabrook supervised all statistical analyses and critically reviewed and approved the final manuscript as submitted. E. Norton assisted in the development of the language survey questions and critically reviewed and approved the final manuscript as submitted. M. Davis interpreted the data, critically revised the manuscript, and approved the final manuscript as submitted. J. Burns conducted the statistical analysis related to the disruptive behavior measures and approved the final manuscript as submitted. M. Briggs-Gowan codeveloped the items of the disruptive behavior measure, provided input regarding the statistical analyses, and critically reviewed and approved the final manuscript as submitted. A. Petitclerc codeveloped the items of the disruptive behavior measure, provided input regarding the statistical analyses, and critically reviewed and approved the final manuscript as submitted. L. S. Wakschlag codeveloped the items of the disruptive behavior measure, provided input regarding the statistical analyses, and critically reviewed and approved the final manuscript as submitted.

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is important for determining the nature of this association in very young children. For example, categorical comparisons preclude the examination of whether the language-disruptive behavior association is present across the whole continuum of function or only at the extremes. In addition, the majority of studies have focused solely on expressive language skills. Given that expressive-only delays are most likely to resolve over time,<sup>11</sup> it is important to understand the association between disruptive behavior and multiple dimensions of language skills (i.e., expressive and receptive language).

Another major gap in the science base is exploration of subgroup differences in these patterns, which is crucial for generalizability. A central source of individual difference in developmental pathways is sex.<sup>12-15</sup> It is widely known that males are more vulnerable to both disruptive behavior and impaired language.<sup>16,17</sup> However, sex differences at the intersection of language and disruptive behavior have received much less attention. This is in part because males are overrepresented in studies of both disruptive behavior and language impairment due to marked male preponderance.<sup>18-20</sup> Four studies have demonstrated an interaction between sex and disruptive behavior in relation to language development,<sup>21-24</sup> but the direction of these patterns is inconsistent. All 4 studies support the association between disruptive behavior and language for both females and males, but they varied in the strength of the association. That is, in 2 studies, the association was stronger for males,<sup>21,22</sup> whereas this pattern was opposite in the other 2 studies.<sup>23,24</sup> There is grounding in developmental science to inform the understanding of both of these alternate patterns. If replicated, the stronger association between language impairment and disruptive behavior in males may reflect their greater vulnerability to developmental problems.<sup>19,25</sup> In contrast, the stronger pattern in females might reflect the phenomenon that females are less likely to have developmental problems, but when they do, the problems tend to be more severe and comorbid.<sup>26</sup> Along these lines, disruptive behavior in young females may be a marker for reduced social competence (in contrast to females' typical advantage in social skills relative to males), which is an important substrate of language learning.<sup>19</sup> Furthermore, because disruptive behavior in females is less common and inconsistent with sex-based stereotypes, it may more adversely affect the richness of linguistic interactions (e.g., reductions in parents' feelings of self-efficacy may have concomitant reductions in engagement).<sup>20</sup> These conflicting results may also be artifactual, reflecting variations in the timing of measurement (e.g., cross-sectional or longitudinal), socioeconomic diversity of samples, and methods of measuring disruptive behavior (e.g., classroom observation, teacher report). These inconsistent findings highlight the need for further research that includes parent report and a larger socioeconomically diverse sample.

The effect of demographic variation on the association between language and disruptive behavior in young

children is also understudied. Children living in poverty have more disruptive behavior<sup>16</sup> and poorer language skills than those who do not live in poverty.<sup>27</sup> But, to our knowledge, the effect of poverty on the association between disruptive behavior and language development has not been examined. We theorized that disruptive behavior would be more strongly associated with greater language impairment in young children growing up in poverty because of the dampening effect of poverty on social exchanges<sup>12</sup> that occurs within the context of stressed and under-resourced environments.<sup>28</sup>

In this study, we drew on a large population-based sample and employed developmentally sensitive methods to evaluate the association between disruptive behavior and language skills in young children from 18 to 36 months of age. Often, disruptive behavior checklists include symptoms that are highly overlapping with the normative misbehaviors of early childhood (e.g., temper tantrums) and/or extreme behaviors (e.g., fire setting).<sup>29</sup> Developmentally specified measures, in contrast, take a dimensional approach covering a broad spectrum of both normative (e.g., hits peers when frustrated; says "no") and dysregulated disruptive behaviors (e.g., tantrums until exhausted; shows off while misbehaving).<sup>30</sup> Coverage of a broad spectrum of developmentally sensitive behaviors from common to extreme, combined with the assessment of frequency of occurrence, enables specification of a normal-abnormal continuum of behavior patterns.<sup>31</sup> We hypothesized that (1) there would be a negative linear association between language skills and disruptive behavior evident as early as 18 months of age, and (2) that the association between language skills and disruptive behavior would be moderated by sex and poverty status.

## METHOD

### Participants

Participants for this study included 1259 mothers of children between 18 and 36 months of age from a larger panel study of diverse parents of young children ( $n = 2001$ ). Toddlers younger than 18 months were excluded from the present study because 18 months is an age at which children's expressive language skills increase drastically. Mothers with at least 1 child aged 12 to 38 months were invited via e-mail to complete the survey. A quota sampling approach was used to obtain approximately equal numbers of males and females and to reflect 2015 United States Census data on the proportion of residents from the 2 largest racial/ethnic minority groups (approximately 15% African-American and 15% Hispanic), as well as the proportion of households living under the poverty line (approximately 25%). The sample was also educationally diverse, with nearly one quarter of mothers having a high school degree or less and approximately 35% holding a college degree or higher. Participants received \$9 for completing the survey. All procedures were approved by Northwestern University's

Institutional Review Board, and respondents provided online informed consent. The sociodemographic characteristics of the 18- to 36-month-old children are presented in Table 1 (Supplemental Digital Content 1, <http://links.lww.com/JDBP/A193>).

## Measures

### Language Skills

Mothers completed 9 questions about child communication and language development (Table 2, Supplemental Digital Content 2, <http://links.lww.com/JDBP/A193>). These questions and the response options were developed by project investigators with expertise in early childhood clinical assessment, speech-language pathology, and language delays. All items correlated with age at  $r > 0.30$ , except for “gesture use,” which plateaued at around 23 months ( $r = 0.17$ ). As a result, gesture use was not included in the item response theory (IRT) analysis as its discriminant abilities would be low. A major assumption in many IRT models is that the items on the scale measure a single, unidimensional construct. Horn’s parallel analysis was used to analyze the dimensionality of the 8 retained language items. The results suggested that the items represent a single dimension. A principal component analysis was conducted using 1 factor, which accounted for 45% of the variance in language item responses, with high internal consistency ( $\alpha = 0.85$ ). In order to create a single language score from the 8 retained language items, a graded response model (GRM) was used to fit the data. Graded response models are a type of IRT model used for ordered polytomous categories.<sup>32</sup> The GRM model in the current analysis was fitted in R using the `grm()` function of the `ltm` package.<sup>33</sup>

Table 3 (Supplemental Digital Content 3, <http://links.lww.com/JDBP/A193>) provides estimates from the GRM for the threshold parameters ( $\beta_{ik}$ ) and discrimination ( $\alpha_i$ ) for each item in the language scale. The threshold parameters for each response category represent the language ability at which there is a 50% probability that participants would select a higher response category. Ability estimates were calculated for each participant using the factor scores from this GRM model, and these factor scores were used in the regression analyses that follow.

### Disruptive Behavior

We adapted the Temper Loss, Aggression, and Noncompliance subscales of the preschool version of the Multidimensional Assessment of Preschool Disruptive Behavior (MAP-DB)<sup>29</sup> for use with infants/toddlers (Wakschlag L, et al., unpublished data, 2017).<sup>34</sup> Based on the project investigators’ developmental expertise, as well as the qualitative results of 3 focus groups with 18 mothers of children aged 12 to 36 months, we modified the existing items and created new items, resulting in 44, 41, and 38 items for the Temper Loss, Aggression, and Noncompliance domains, respectively. We reduced the item pool based on factor analyses and IRT analyses on each dimension, removing items with low factor loadings, balancing low versus high severity, and reducing

item overlap, to arrive at a final scale containing 70 items (30 for Temper Loss, 25 for Aggression, and 15 for Noncompliance). As with the original MAP-DB, items were rated in terms of frequency over the past month: 0 = never in the past month; 1 = rarely (less once per week); 2 = some (1-3) days of the week; 3 = most (4-6) days of the week; 4 = every day of the week; and 5 = many times each day. The overall disruptive behavior factor and all subscales demonstrated good internal consistency:  $\alpha = 0.98$  for Temper Loss,  $\alpha = 0.99$  for Aggression, and  $\alpha = 0.97$  for Noncompliance.

The individual MAP-DB items were scored using a unidimensional GRM<sup>32</sup> fit to 70 MAP-DB items, each with 6 response categories. The GRM assumes a sample mean of zero and standard deviation of 1, with estimated scores deviating slightly from this constraint. Estimated scores in this sample showed a mean score of  $-0.032$  with a standard deviation of 0.995 (minimum,  $-3.205$ ; maximum, 2.827). The theoretical framework and psychometric properties of the MAP-DB have been extensively described.<sup>29,31</sup>

### Poverty Status

Mothers reported on family income and the number of adults and children in the family. Poverty status (i.e., below or above the poverty threshold) was determined using the 2016 US Department of Health & Human Services poverty guidelines based on household size (<https://aspe.hhs.gov/poverty-guidelines>). We considered examining the extent to which maternal education was associated with disruptive behavior and language skills; however, it was colinear with poverty status (Table 5, Supplemental Digital Content 5, <http://links.lww.com/JDBP/A193>). As such, we only included poverty status in all models.

### Analytical Plan

In order to test the association between language skills and disruptive behavior and to determine whether sex and poverty status moderate this association, a series of nested models were created for each narrow band dimension of disruptive behavior on the MAP-DB: Aggression, Temper Loss, and Noncompliance. However, because the association with language did not vary across disruptive behavior dimensions, we used a unidimensional disruptive behavior score.

Each regression model contained the language IRT score, sex, and poverty status, with the age of the child entered as a covariate. In addition, a quadratic language variable, created by squaring the language IRT score, was included in each model to test for the presence of a nonlinear association between language and disruptive behavior. The second model added an interaction between language scores and sex to the base model. The third model added an interaction between language scores and poverty status to the base model. The fourth model included both the language score and poverty interaction and the language score and sex interaction. The fifth model added a 3-way interaction term between language scores, sex, and poverty status. These 5 models were then compared using likelihood ratio tests<sup>35</sup> in order to select

the best-fitting model (Table 4, Supplemental Digital Content 4, <http://links.lww.com/JDBP/A193>).

## RESULTS

Table 5 (Supplemental Digital Content 5, <http://links.lww.com/JDBP/A193>) includes bivariate correlations between all variables. Table 6 (Supplemental Digital Content 6, <http://links.lww.com/JDBP/A193>) presents regression coefficients for the model series with corresponding likelihood ratios. Results show that model 4, which contains interactions between language scores and both sex and poverty status, best fitted the data ( $R^2 = 0.125$ ;  $F[7, 1251] = 25.51$ ;  $p < 0.001$ ). Including a 3-way interaction between language scores, sex and poverty status in model 5 did not significantly improve model fit. The regression coefficients from model 4 reveal that, on average, children living in poverty had higher rates of disruptive behavior than those not living in poverty ( $b = 0.258$ ;  $t[1251] = 4.07$ ;  $p < 0.001$ ). Additionally, female children were rated as having higher rates of disruptive behavior than male children ( $b = 0.423$ ;  $t[1251] = 7.34$ ;  $p < 0.001$ ). The quadratic language term in this model was statistically significant ( $b = -0.205$ ;  $t[1251] = 6.77$ ;  $p < 0.001$ ), demonstrating that as language skills increase, disruptive behaviors decrease. The fact that it was the quadratic term that was significant reveals that this association is nonlinear—at higher levels of language skills, disruptive behaviors decrease at accelerated rates. The significant sex interaction indicates that the negative association between language and disruptive behavior is stronger for females than for males ( $b = -0.243$ ;  $t[1251] = -3.555$ ;  $p < 0.001$ ). That is, for female children, as language skills increase, disruptive behaviors decrease more rapidly than in male children. Similarly, the association between language and disruptive behavior was stronger for children living in poverty than for those above the poverty line ( $b = -2.04$ ;  $t[1251] = -2.531$ ;  $p = 0.011$ ). Specifically, for children living in poverty, as language skills increase, disruptive behaviors decrease more quickly than for those living above the poverty line.

## DISCUSSION

### Main Findings

The outcomes of this study indicate that the association between early language abilities and disruptive behavior is evident as early as 18 months of age. Toddlers between 18 and 36 months of age with better language skills had fewer disruptive behaviors. Although the present findings are correlational rather than conclusively causal, we theorize a number of pathways by which early language skills and disruptive behavior are linked. For example, a common risk across these domains may cause broad developmental weaknesses. One such common risk may be exposure to adverse environments (e.g., unpredictable, stressful, harsh, or understimulating), which impedes both language development and self-regulation by constraining learning

and development opportunities.<sup>36,37</sup> Alternatively, this dual deficit may occur via their reciprocal influence on each other. For example, because language is inherently social, language delays may hinder social interactions, reducing adaptive coping strategies, which subsequently results in aggression, temper tantrums, and defiance. Conversely, disruptive behavior may impede language development by reducing the quantity and quality of linguistic input because interactions with the child are aversive for social partners.

Furthermore, the outcomes in this national sample indicate that the language-disruptive behavior association in young children is influenced by both sex and socioeconomic status. Language skills are more strongly negatively associated with disruptive behavior for females than for males. Methodologic differences across previous work constrain interpretation of these findings. For example, when teacher report of disruptive behavior is used, patterns are in this same direction, indicating a stronger association for females than for males.<sup>23,24</sup> In contrast, studies that use direct classroom observation of disruptive behaviors of children show stronger associations for males. Of note, these latter studies were restricted to children in low socioeconomic environments.<sup>21,22</sup>

There are several possible reasons for the moderating effect of sex we found. When developing well, females tend to have greater social competence<sup>38</sup> and stronger language skills that enable them to competently navigate their environments and modulate their behavior. As such, females may have more to gain or more to lose. Thus, when young females demonstrate disruptive behavior, they lose their typical social advantages that stimulate language learning. In contrast, males may typically rely less on language for self-regulation and therefore may be less impeded by weaker language skills. However, these interaction analyses were exploratory and need to be replicated in longitudinal studies that chart these unfolding, bidirectional patterns over time.

Similarly, language skills are also more negatively associated with disruptive behavior for children living in poverty. For children living in poverty who are disproportionately more likely to experience significantly more malnutrition, insufficient health care, environmental hazards, and chronic stress,<sup>39</sup> any additional strain to an already taxed neurodevelopmental system may result in intensified strain on a corollary system, such as language. Consequently, when a child living in poverty experiences a language delay, this delay may exacerbate disadvantage for children already constrained by underresourced and strained environmental experiences. In contrast, young children from better-resourced environments may have access to more compensatory experiences and supports that prevent “spillover” from 1 developmental domain to another.

### Limitations

These findings should be considered in the context of study limitations. First, disruptive behavior and language skills were measured by maternal report rather than performance-based assessment. This may introduce

methodologic biases given differences in the rates of reported versus observed disruptive behaviors<sup>5</sup> and language skills.<sup>40</sup> Additionally, there was a shared method variance because both disruptive behavior and language skills were obtained by maternal report. Extension of these findings using performance-based measures, such as direct assessments of language skills and standardized observation of disruptive behavior,<sup>41</sup> is needed. Second, language is a multidimensional construct that includes receptive and expressive grammar and vocabulary. Given the limited number of language-related questions, it is unclear the extent to which different aspects of language drive the association with disruptive behavior. Future research should include more comprehensive measures of language skills. Although we did not detect differences in this association based on varied dimensions of disruptive behavior with our limited language measure, examination with more nuanced measures of language domains may yield a more differentiated pattern. Third, given the cross-sectional nature of the study, we were unable to test the developmental sequence underlying the relation between disruptive behavior and language skills. Future research should include longitudinal observational measures of language and disruptive behavior patterns.

## Interpretation

Results from this study suggest that children's disruptive behavior is associated with their language skills. However, pediatricians and parents may weigh these developmental difficulties differently. For example, a child with a language delay may have tantrums or act aggressively when they are unable to communicate their wants and needs or exhibit noncompliance when they have trouble understanding those around them. These disruptive behaviors may be more immediately salient to the parent than the language delays. However, given the early life co-occurrence of disruptive behavior and language delays, if a parent reports concerns about either developmental domain, pediatricians should consider screening for both language delays and disruptive behaviors.

## CONCLUSIONS

In this study, we examined the extent to which early disruptive behavior and language skills are related in toddlerhood. Findings from our study advance the field in the following ways. First, these findings suggest that the co-occurrence of language difficulties and disruptive behaviors begins at an early age. Second, these findings suggest that the association between disruptive behavior and language is stronger in females in toddlerhood and in children living in poverty. This is the first large-scale study to examine the moderating effects of sex and poverty on the association between disruptive behavior and language in a sample of toddlers. Awareness of the association between these 2 developmental domains, about which parents frequently express concerns, is critical to maximizing early detection and intervention.

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