

# Girls' Hyperactivity and Physical Aggression During Childhood and Adjustment Problems in Early Adulthood

## A 15-Year Longitudinal Study

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**Context:** The co-occurrence of hyperactivity and conduct problems in childhood seems to increase the risk of early adulthood adjustment problems in males. However, little is known about this topic in females.

**Objectives:** To describe the joint developmental trajectories of female hyperactivity and physical aggression during childhood and to examine the extent to which high trajectories of hyperactivity and physical aggression predict adjustment problems in early adulthood.

**Design, Setting, and Participants:** A total of 881 females from a population-based sample were studied. Developmental trajectories were described using teachers' ratings of behavior problems from the age of 6 to 12 years.

**Main Outcome Measures:** Age 21 years self-reports of substance use problems, criminal behaviors, aggression in intimate relationships, early pregnancy, educational attainment, and welfare assistance.

**Results:** Between the ages of 6 and 12 years, the frequency of hyperactivity and physical aggression tended to decrease for most girls. Those on a trajectory of high

hyperactivity (HH) and high physical aggression (HPA) and a trajectory of HH alone were significantly more likely to report nicotine use problems (odds ratio [OR], 2.16 [95% confidence interval {CI}, 1.30-3.56] and OR, 2.23 [95% CI, 1.39-3.58], respectively), mutual psychological aggression in intimate relationships (OR, 2.28 [95% CI, 1.24-4.18] and OR, 2.14 [95% CI, 1.19-3.85], respectively), and low educational attainment (OR, 4.09 [95% CI, 2.33-7.18] and OR, 3.21 [95% CI, 1.84-5.59], respectively) compared with the other females at the age of 21 years. Only the HH-HPA females were significantly more likely to report physical aggression (OR, 2.48 [95% CI, 1.41-4.37]) and psychological aggression (OR, 2.54 [95% CI, 1.48-4.36]) in intimate relationships, early pregnancy (OR, 2.31 [95% CI, 1.17-4.56]), and welfare assistance (OR, 2.68 [95% CI, 1.33-5.41]) compared with the other females.

**Conclusions:** Elementary school girls with elevated levels of hyperactivity should be targeted for intensive prevention programs. These interventions should take into account the presence or absence of HPA.

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**T**HE CO-OCCURRENCE OF childhood hyperactivity and conduct problems has been found to be a good predictor of male adjustment problems during young adulthood (eg, psychiatric disorders, including antisocial personality disorder, and criminal behaviors).<sup>1-5</sup> However, little is known about this topic in females, mostly because studies<sup>6-9</sup> are based on samples of males only or samples that combined both sexes without including a sufficient number of females or without examining the sex differences. To our knowledge, only 2 studies<sup>1,3</sup> specifically examined the relations between these 2 types of child-

hood behaviors and adjustment problems in young adult females. In one study<sup>1</sup> of clinically referred females, those with concomitant attention-deficit/hyperactivity disorder and conduct problems (conduct disorder or oppositional defiant disorder) in childhood had a higher risk of an adult psychiatric admission compared with those with only attention-deficit/hyperactivity disorder. In another study<sup>3</sup> of children identified as hyperactive from 3 sources of selection (parent, school, or physician), childhood hyperactive-impulsive behaviors and conduct problems (eg, physically aggressive and oppositional behaviors) predicted official criminality in males but not in females. However, hy-

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perative-impulsive behaviors in females increased the risk of self-reported criminality.

The results of these 2 studies indicate that young girls with hyperactivity and conduct problems are at high risk of a variety of long-term mental health outcomes. However, these studies were limited by the use of small samples of clinical cases. The present study aimed to address this problem with a large population sample observed from the age of 6 to 21 years. Specifically, we (1) traced the joint development of hyperactivity and physical aggression in girls aged between 6 and 12 years and (2) examined the extent to which high trajectories of hyperactivity and physical aggression predicted adjustment problems in early adulthood. We focused on hyperactivity and physical aggression instead of broader constructs like conduct disorder (which includes aggressive and nonaggressive conduct) and attention-deficit/hyperactivity disorder (which includes inattention, hyperactivity, and impulsivity). This design allows for a clear description of specific developmental patterns and for more specificity in the prediction of later outcomes.<sup>10,11</sup> We also used a multiple-outcome approach to better document the various adjustment domains that are potentially affected.

Based on studies of girls<sup>12-15</sup> and of boys<sup>16,17</sup> childhood behavior problems, we hypothesized that most girls would show decreasing frequencies of hyperactivity and physical aggression as a function of age, despite a relatively small group who would exhibit higher levels of 1 or both patterns throughout childhood (ie, aged 6-12 years). Similar to boys,<sup>16,17</sup> we also expected developmental overlap between hyperactivity and physical aggression in girls, so that girls high in one behavior would most likely be high in the other behavior. We hypothesized that girls who followed joint trajectories of high hyperactivity (HH) and high physical aggression (HPA) in childhood would be at highest risk of substance use problems,<sup>8,18</sup> criminal behaviors,<sup>7,19</sup> aggression in intimate relationships,<sup>20</sup> early pregnancy,<sup>9</sup> low educational attainment,<sup>21</sup> and welfare assistance<sup>22,23</sup> at the age of 21 years. We also hypothesized that girls in the HH-only group and in the HPA-only group would be more at risk for adverse outcomes in early adulthood compared with girls who did not have high levels of hyperactivity or physical aggression in childhood.<sup>3,6,9</sup>

## METHODS

### PARTICIPANTS

Participants were selected from a larger sample of girls attending kindergarten in French-speaking public schools in 1986 and in 1987 in the province of Quebec (Canada).<sup>14,24</sup> When the children were approximately aged 6 years (mean, 5.99 years; SD, 0.29 years), parents and teachers were asked to evaluate the children with the Social Behavior Questionnaire.<sup>25</sup> Two subgroups of girls were observed longitudinally: (1) 946 girls randomly selected to be representative of the Quebec school population and (2) 444 girls who, in kindergarten, scored at or above the 80th percentile (with sex-specific cutoff scores) on parent or teacher reports of the Social Behavior Questionnaire disruptive behaviors (hyperactive, physically aggressive, and oppositional behaviors). The 444 disruptive girls were oversampled to have more participants who were presumed at risk for later adjustment problems.

A total of 1390 girls (ie, 946 and 444) were approached for assessment in the spring of each year between kindergarten and grade 6 with parent and teacher questionnaires.<sup>14,24</sup> Participants were also approached for assessment in adolescence (mean age, 15.68 years; SD, 0.48 years) and in early adulthood (mean age, 21.23 years; SD, 0.73 years). In this study, we focused on the early adulthood outcomes. The sample was predominantly white and French speaking. This research was approved by the ethics board of the University of Montreal, and informed consent was obtained from all of the participants.

Of the 1390 females involved in the longitudinal study, 881 (604 from the representative sample and 277 from the disruptive sample) decided to participate in the early adulthood assessment and had complete information. Based on the kindergarten assessment, there was no statistical difference between participants in the final sample and those who were not included on hyperactivity ( $t_{967,31} = -1.68, P = .09$ ), physical aggression ( $t_{1388} = 0.69, P = .49$ ), and occupational status of the mothers ( $t_{1201} = 1.71, P = .09$ ). However, participants in the final sample, compared with those excluded, had mothers with higher levels of education ( $t_{1364} = 5.71, P < .001$ ) and who were older at the birth of their first child ( $t_{1232} = 2.29, P = .02$ ). In addition, the girls from the representative sample, compared with the girls from the disruptive sample, had mothers with a higher occupational status ( $t_{786} = 2.16, P = .03$ ), with higher levels of education ( $t_{864} = 4.18, P < .001$ ), and who were older at the birth of their first child ( $t_{806} = 2.79, P = .005$ ).

## MEASURES

### Childhood Behavioral Dimensions

Teachers assessed hyperactivity (restless, runs about, or jumps up and down, does not keep still; or squirmy, fidgety child) and physical aggression (fights with other children; bullies or intimidates other children; or kicks, bites, or hits other children) with the Social Behavior Questionnaire<sup>25</sup> yearly between kindergarten and grade 6. Each item was rated on a 3-point scale ranging from "never applies" to "frequently applies." The internal consistency index (Cronbach  $\alpha$ ) for assessments between the ages of 6 and 12 years ranged from .77 to .87 (mean, .83) for the hyperactivity scale and from .75 to .87 (mean, .80) for the physical aggression scale.

### Adjustment Problems in Early Adulthood

**Substance Use Problems.** A computerized French version<sup>26</sup> of the National Institute of Mental Health Diagnostic Interview Schedule III-R<sup>27-29</sup> was used to assess nicotine and alcohol use problems. The Diagnostic Interview Schedule III-R is a structured psychiatric interview designed to diagnose *DSM-III-R* psychiatric disorders.<sup>30</sup> For each of these 2 substances, use problems were based on 2 criteria: (1) a lifetime diagnosis and (2) at least 1 symptom within the past year. We did not include a measure of drug use problems—the frequencies were too low to expect any significant differences.

**Criminal Behaviors.** A measure of nonviolent criminal behaviors was obtained using the Life History Calendar (LHC) method.<sup>31,32</sup> The LHC is a large grid, with time along one axis (months and years) and various events across the other axis (eg, stealing). Participants were asked if, within the past year, they were implicated in stealing (eg, shoplifting or pick pocketing), fraud (eg, use of a false check or swindling someone), drug dealings (eg, drug making, sale, or delivery), prostitution, or pimping. A summed index of nonviolent criminal behaviors was used in the present study. We did not include a

measure of violent behaviors because the frequencies were too low to expect any significant differences.

**Aggression in Partner Relationships.** Scales of physical aggression and psychological aggression against partner were constructed based on existing questionnaires.<sup>33-35</sup> The scales were composed of 15 behaviors for physical aggression toward partner (eg, pushed or punched) and 9 behaviors for psychological aggression toward partner (eg, called names or impeded to see friends) with a “never,” “1 or 2 times,” “3 to 10 times,” and “11 or more times” Likert-type response format. We also examined the participants who were in a mutual physically and/or psychologically aggressive relationship. A participant was considered a perpetrator of physical aggression against a partner if she reported being in a serious relationship in the past year and self-reported at least 1 of the 15 construct-relevant behaviors. A participant was considered a perpetrator of psychological aggression against a partner if she reported being in a serious relationship in the past year and scored above the 80th percentile on construct-relevant behaviors. The Cronbach  $\alpha$  was .78 for the physically aggressive scale and .85 for the psychologically aggressive scale. The same criteria were used for creating the mutual physically and psychologically aggressive relationship variables, considering the participants’ reports as being perpetrators and victims of aggressive behaviors in their partner relationships. Self-report measures of aggression in intimate relationships have been reliable.<sup>36</sup>

**Pregnancies.** Pregnancies were assessed with the LHC.<sup>31</sup> A measure of early pregnancy was created based on a cutoff point criterion of age 18 years or younger used in previous studies.<sup>22,37</sup>

**Human Capital.** Educational attainment was assessed in the school section of the LHC.<sup>31</sup> Participants who had no high school certification by the age of 21 years were considered as having poor educational attainment. Finally, welfare assistance was measured with participants’ reports in the LHC of governmental income support (ie, social assistance) they had received in the past year.

**Accumulation of Adjustment Problems in Early Adulthood.** A cumulative index of the previously mentioned adjustment problems in early adulthood was created to measure pervasive maladjustment.<sup>38</sup> A total of 8 adjustment problems were summed, including nicotine use problems, alcohol use problems, nonviolent criminal behaviors, physical aggression against a partner, psychological aggression against a partner, early pregnancy, no high school certification, and welfare assistance.

### Control Variable

A family risk index, which was associated with behavioral disorders in childhood,<sup>39</sup> was used as a control variable. The index was created by averaging the following indices: (1) family structure (intact or not intact), (2) parents’ levels of education, (3) parents’ occupational status,<sup>40</sup> and (4) parents’ age at the birth of the first child. Families at or below the 30th percentile in 1 of these indices (or a nonintact family) were coded as having 1 adversity point. We imputed the missing values for 33 participants using computer software (PROC MI in SAS statistical software).<sup>41</sup>

## STATISTICAL ANALYSES

The analyses proceeded in 4 steps. The first and second steps were based on previous studies.<sup>11,16,17</sup> First, individual trajectory models were identified empirically for hyperactivity and

physical aggression with a semiparametric mixture model.<sup>42,43</sup> All the girls who participated in the longitudinal study ( $n=1390$ ) were included to estimate the childhood trajectories. The censored normal distribution was used to model the trajectories to account for the censoring at the lower and upper bounds of the psychometric scales. For each distinctive developmental group, the model defined the shape of the trajectory (ie, stable, increasing, or desisting) and the proportion of the children belonging to each group. A key issue in the application of group-based models concerns the determination of how many groups define the best-fitting models. Model selection was based on 2 criteria. We used the Bayesian Information Criterion (BIC), calculated as follows:  $-2\log(L) + \log(n) \times k$ , where  $L$  is the model’s maximized likelihood,  $n$  is the sample size, and  $k$  is the number of parameters in the model.<sup>43,44</sup> The BIC rewards parsimony for the number of groups included in a trajectory model. We also calculated the probability that each model was the correct model. This calculation is based on BIC scores, and information on the computation of these probabilities is described elsewhere.<sup>43</sup>

Second, a joint model of hyperactivity and physical aggression was estimated. The separate models identified in the first step guided this analysis. Key outputs of a joint model are the joint probabilities and the 2 sets of conditional probabilities. The joint probabilities reflect the proportion of children estimated to belong simultaneously to trajectories of hyperactivity and physical aggression (eg, the probability of following HH and HPA). The conditional probabilities obtained were (1) the probability of physical aggression conditional on hyperactivity (eg, the probability of HPA given HH) and (2) the converse probability (eg, the probability of following HH given HPA).

Third, logistic regressions were conducted to examine if the prevalence rate of each adjustment problem in early adulthood differed across the joint trajectory groups. Finally, a negative binomial regression<sup>45</sup> was performed to examine the relationships between the joint trajectory groups and the accumulation of adjustment problems in adulthood. We tested 3 specific a priori contrasts between the groups. The “Results” section provides a broader description and justification of the contrasts. Given that 3 contrasts were tested, Bonferroni correction was set at 0.017.<sup>46</sup> All analyses were weighted by the joint posterior probabilities to correct for potential uncertainty in trajectory assignment.

## RESULTS

### IDENTIFYING THE DEVELOPMENTAL TRAJECTORIES OF HYPERACTIVITY AND PHYSICAL AGGRESSION

For hyperactivity, a 4-group model (BIC = -6926.71) was identified as best fitting the data. The BIC scores for the 3- and 5-group models were -6933.42 and -6931.03, respectively. The probability that the 4-group model was the correct model for the data was 0.99 vs 0 for the 3-group model and 0.01 for the 5-group model. These results are similar to trajectories of hyperactivity identified in prior research<sup>47</sup> based on girls who are included in the present study. The present study, however, examined hyperactivity conditional on physical aggression (ie, a joint trajectory model). For physical aggression, a 3-group model (BIC = -4505.33) was identified as best fitting the data. The BIC scores for the 2- and 4-group models were -4531.71 and -4510.29, respectively. The probability that the 3-group model was the correct model was 0.99 vs 0 for the 2-group model and 0.01 for the 4-group model.

## JOINT DEVELOPMENTAL TRAJECTORIES OF HYPERACTIVITY AND PHYSICAL AGGRESSION

**Figure 1** depicts the joint trajectory model. The 4 trajectories of hyperactivity were as follows: no hyperactivity (25.5%), moderate declining hyperactivity (30.3%), moderate stable hyperactivity (25.3%), and high declining hyperactivity (19.0%). The 3 trajectories of physical aggression were as follows: no physical aggression (44.6%), moderate physical aggression (46.4%), and high declining physical aggression (8.9%). These percentages do not total 100 because of rounding.

The first part of **Table 1** presents the joint probabilities of hyperactivity and physical aggression. In total, 10.4% belonged to the HH trajectory without high levels of physical aggression (HH-only group). A small proportion of girls (0.4% of the sample) followed high levels of physical aggression, without high levels of hyperactivity (HPA-only group). Close to 1 girl in 10 (8.5%) was in the HH-HPA group. The remainder of the sample (others group) encompassed all other trajectories (80.6%) (percentages do not total 100 because of rounding). Virtually no girls were high in one type of behavior and low in the other.

The second part of Table 1 shows the probabilities for each physical aggression trajectory group conditional on a given hyperactivity trajectory. Girls on the no hyperactivity trajectory had a high probability (0.912) of following the no physical aggression trajectory. On the other hand, girls on the high trajectory of hyperactivity had only a 0.451 probability of following the HPA trajectory.

The third part of Table 1 presents the converse sets of probabilities (ie, each hyperactivity trajectory conditional on a given physical aggression trajectory). Girls on the no physical aggression trajectory had a 0.520 probability of following the no hyperactivity trajectory, but the ones on the HPA trajectory were almost certain to be found on the HH trajectory (0.957 probability).

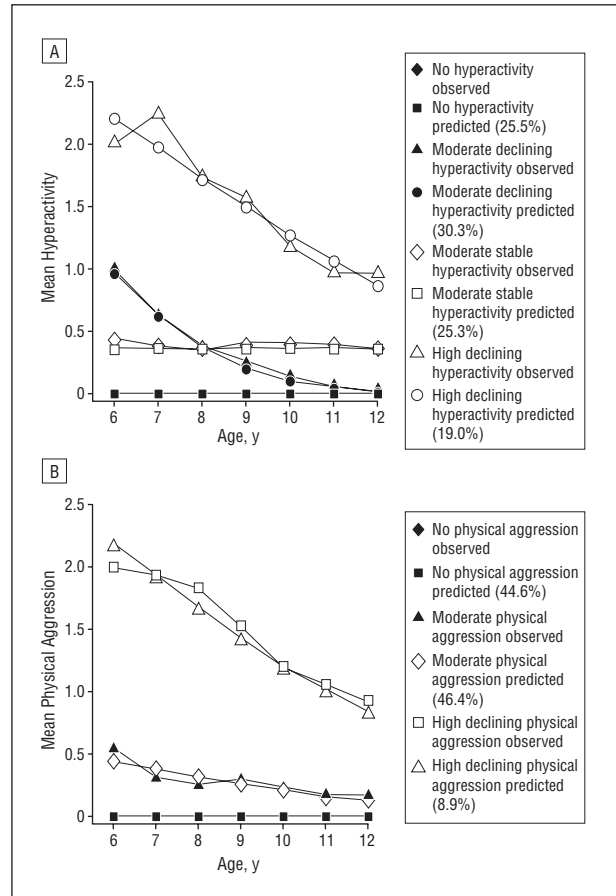
### PREDICTION OF ADJUSTMENT PROBLEMS IN EARLY ADULTHOOD

The distribution of adjustment problems in early adulthood within the groups is presented in **Table 2**. Because the HPA group is small (<1%), results for this group are not presented.

We used a step-down approach for interpreting the results.<sup>48</sup> An omnibus test was conducted for each adulthood outcome. A priori contrasts were examined when the omnibus test revealed significant differences between the groups. The omnibus test was significant in the case of 7 outcomes (Table 2).

Three a priori contrasts were tested to compare the groups on adjustment problems in adulthood: (1) HH-HPA vs others, (2) HH only vs others, and (3) HH-HPA vs HH only. Contrasts with the HPA-only group were not possible because of the small sample size. **Table 3** shows the odds ratios of the 3 contrasts with respect to adjustment problems found significant in Table 2. All the analyses were controlled for family risks.

The following sections detail the results presented in Tables 2 and 3 for each of the adulthood outcomes.



**Figure 1.** Developmental trajectories of hyperactivity (A) and physical aggression (B) between kindergarten and grade 6 (aged 6-12 years).

### Substance Use Problems and Criminal Behaviors

There were significant differences between the groups in regard to nicotine use problems (Table 2). The a priori contrast analyses revealed that the HH-HPA group and the HH-only group were more likely to have nicotine use problems in early adulthood compared with the others group, with odds ratios of 2.16 and 2.23, respectively. The comparison between the HH-HPA and the HH-only groups was not significant. No significant differences were found between the groups with respect to alcohol use problems.

Analyses on nonviolent criminal behaviors failed to reach significance (Table 2).

### Aggression in Partner Relationships

As can be seen in Table 2, statistical differences were found between the groups on physical and psychological aggression against partner and mutual psychologically aggressive relationships in early adulthood. Compared with the others group, the females in the HH-HPA group were more likely to be physically aggressive with their partner, to be psychologically aggressive, and to be in a mutual psychologically aggressive relationship. The females in the HH-only group were more likely to be in a mutual psychologically aggressive relationship vs the ones in the others group. No significant differences were found

**Table 1. Joint and Conditional Probabilities of Hyperactivity and Physical Aggression**

Trajectory of Physical Aggression	Trajectory of Hyperactivity			
	No Hyperactivity	Moderate Declining Hyperactivity	Moderate Stable Hyperactivity	High Declining Hyperactivity
<b>Probability of Joint Hyperactivity and Physical Aggression<sup>a</sup></b>				
No physical aggression	0.232	0.124	0.090	0.000
Moderate physical aggression	0.022	0.175	0.163	0.104
High declining physical aggression	0.000	0.004	0.000	0.085
<b>Probability of Physical Aggression Conditional on Hyperactivity<sup>b</sup></b>				
No physical aggression	0.912	0.409	0.357	0.000
Moderate physical aggression	0.088	0.578	0.643	0.549
High declining physical aggression	0.000	0.013	0.000	0.451
<b>Probability of Hyperactivity Conditional on Physical Aggression<sup>c</sup></b>				
No physical aggression	0.520	0.277	0.203	0.000
Moderate physical aggression	0.048	0.377	0.351	0.224
High declining physical aggression	0.000	0.043	0.000	0.957

<sup>a</sup>The sum of the cells is 1 after rounding.

<sup>b</sup>Each column sums to 1.

<sup>c</sup>Each row sums to 1.

**Table 2. Prevalence Rates of Adjustment Problems in Early Adulthood**

Adjustment Problem	Group <sup>a</sup>			$\chi^2$ Value <sup>b</sup>
	HH-HPA	HH Only	Others	
Substance use problem				
Nicotine use problems	40.96	40.85	23.28	17.03 <sup>c</sup>
Alcohol use problems	8.57	5.88	6.03	1.06
Nonviolent criminal behaviors	11.90	9.98	6.76	3.47
Aggression in partner relationships				
Physical aggression against partner	27.50	16.21	12.38	8.96 <sup>d</sup>
Mutual physically aggressive relationships	12.74	8.00	8.33	0.96
Psychological aggression against partner	31.98	24.63	14.78	13.56 <sup>e</sup>
Mutual psychologically aggressive relationships	22.24	20.53	10.56	10.74 <sup>e</sup>
Early pregnancy	18.43	13.23	7.11	6.98 <sup>d</sup>
Human capital				
No high school certification	40.51	30.48	11.77	33.15 <sup>c</sup>
Welfare assistance	17.86	12.77	5.82	9.24 <sup>e</sup>

Abbreviations: HH, high hyperactivity; HPA, high physical aggression.

<sup>a</sup>Data are given as percentage of each group. (The HH-HPA group was 8.4% of the adulthood sample, the HH-only group was 9.4% of the adulthood sample, and the others group was 81.8% of the adulthood sample.)

<sup>b</sup>Analyses are controlled for family risks. Likelihood ratio  $\chi^2$  values are reported.

<sup>c</sup> $P \leq .001$ .

<sup>d</sup> $P \leq .05$ .

<sup>e</sup> $P \leq .01$ .

between the groups with respect to mutual physically aggressive relationships.

### Pregnancies

The analysis for early pregnancy reached significance (Table 2). Females in the HH-HPA group reported higher rates of early pregnancy than females in the others group.

### Human Capital

There were significant differences between the groups with respect to high school certification and welfare assistance in early adulthood (Table 2). Compared with the

others group, the females in the HH-HPA group and the HH-only group were more likely to fail to complete high school certification, with odds ratios of 4.09 and 3.21, respectively. Furthermore, compared with the others group, the HH-HPA group was more likely to have used welfare assistance.

### Prediction of Accumulation of Adjustment Problems in Early Adulthood

The results of the negative binomial regression revealed significant relations between the groups and the cumulative index of adjustment problems in early adulthood (likelihood ratio  $\chi^2=43.71$ ,  $P < .001$ ). **Table 4** presents the a

**Table 3. Data for Contrasts Predicting Adjustment Problems in Early Adulthood<sup>a</sup>**

Contrast	HH-HPA vs Others	HH Only vs Others	HH-HPA vs HH Only
Nicotine use problems	2.16 (1.30-3.56) <sup>b</sup>	2.23 (1.39-3.58) <sup>c</sup>	0.97 (0.51-1.84)
Aggression in partner relationships			
Physical aggression against partner	2.48 (1.41-4.37) <sup>b</sup>	1.33 (0.71-2.49)	1.86 (0.85-4.07)
Psychological aggression against partner	2.54 (1.48-4.36) <sup>c</sup>	1.84 (1.07-3.17)	1.38 (0.68-2.79)
Mutual psychologically aggressive relationships	2.28 (1.24-4.18) <sup>b</sup>	2.14 (1.19-3.85) <sup>d</sup>	1.06 (0.49-2.30)
Early pregnancy	2.31 (1.17-4.56) <sup>d</sup>	1.83 (0.90-3.73)	1.26 (0.52-3.07)
Human capital			
No high school certification	4.09 (2.33-7.18) <sup>c</sup>	3.21 (1.84-5.59) <sup>c</sup>	1.28 (0.62-2.61)
Welfare assistance	2.68 (1.33-5.41) <sup>b</sup>	2.17 (1.04-4.51)	1.24 (0.50-3.06)

Abbreviations: HH, high hyperactivity; HPA, high physical aggression.

<sup>a</sup>Data are given as odds ratio (95% confidence interval). Analyses are controlled for family risks. The level of significance is reported only for contrasts that reached significance when the Bonferroni correction was applied (ie,  $P \leq .017$ ).

<sup>b</sup> $P \leq .01$ .

<sup>c</sup> $P \leq .001$ .

<sup>d</sup> $P \leq .02$ .

priori contrasts. These analyses revealed that females in the HH-HPA group and in the HH-only group self-reported more adjustment problems in early adulthood compared with the ones in the others group. **Figure 2** is composed of the 3 groups with respect to the cumulative index of adjustment problems in early adulthood. Females in the HH-HPA, HH-only, and others groups had a mean (SD) number of adjustment problems of 1.98 (0.45), 1.54 (0.48), and 0.88 (1.02), respectively.

## COMMENT

To our knowledge, this study is the first to estimate joint developmental trajectories of female hyperactivity and physical aggression and to examine how these joint trajectories relate to adjustment problems in early adulthood. We identified 4 trajectories of hyperactivity (no hyperactivity, 25.5%; moderate declining hyperactivity, 30.3%; moderate stable hyperactivity, 25.3%; and high declining hyperactivity, 19.0%) and 3 trajectories of physical aggression (no physical aggression, 44.6%; moderate physical aggression, 46.4%; and high declining physical aggression, 8.9%) (percentages do not total 100 because of rounding). The trajectories are similar to those described for boys, in whom hyperactivity and physical aggression tend to decrease with age.<sup>13,16,17,49</sup> The relatively high proportion of girls on the high trajectories, compared with other trajectory studies,<sup>13,48</sup> is because of the fact that our sample included an oversampling of girls high on disruptive behaviors in the first assessment (ie, kindergarten).

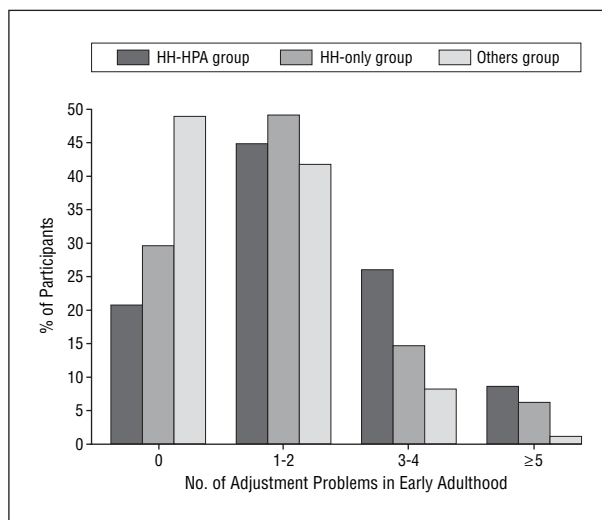
**Table 4. Negative Binomial Regression Between the Groups and the Number of Adjustment Problems in Early Adulthood<sup>a</sup>**

Contrast	Estimate (SE)	95% Confidence Interval	t Value
HH-HPA vs others	0.70 (0.12)	0.47 to 0.94	5.82 <sup>b</sup>
HH only vs others	0.54 (0.12)	0.30 to 0.77	4.43 <sup>b</sup>
HH-HPA vs HH only	0.17 (0.16)	-0.14 to 0.48	1.06

Abbreviations: HH, high hyperactivity; HPA, high physical aggression.

<sup>a</sup>Analyses are controlled for family risks.

<sup>b</sup> $P \leq .001$ .



**Figure 2.** Number of adjustment problems in early adulthood. HH indicates high hyperactivity; HPA, high physical aggression.

An examination of the joint association of the hyperactivity and physical aggression trajectories indicated that approximately 1 in 10 girls (10.4%) belonged to the HH trajectory without high levels of physical aggression. Fewer than 1 in 200 girls (0.4%), however, followed high levels of physical aggression without high levels of hyperactivity, indicating that physically aggressive girls are almost always perceived to be hyperactive. Indeed, a substantial group of girls did follow high levels of hyperactivity and physical aggression (8.5%). Similar to what is found for boys,<sup>16,17</sup> our results indicate that most girls high in physical aggression were also high in hyperactivity, but the reverse was not true—most girls high in hyperactivity were not high in physical aggression. Moreover, we found that girls who were not hyperactive were likely not to be physically aggressive, but that girls who were not physically aggressive could display moderate levels of hyperactivity.

Previous to the present study, little was known about the relation of female childhood hyperactivity and physical aggression with adjustment problems during young adulthood. With this large population sample observed prospectively, we found that the females on high trajectories of hyperactivity and physical aggression (HH-HPA group) between the ages of 6 and 12 years, compared with females on lower trajectories, were more likely to show adjustment problems in early adulthood, includ-

ing nicotine use problems, physical and psychological aggression in intimate relationships, low educational attainment, and welfare assistance. They also accumulated more adjustment problems by early adulthood. Furthermore, the results showed that the females in the HH-only group, compared with females who did not follow high trajectories of hyperactivity or physical aggression, were also more likely to accumulate adjustment problems in adulthood. Specifically, they were more likely to have nicotine use problems, to have a mutual psychologically aggressive intimate relationship, and to have low educational attainment. In sum, elementary schoolgirls with the highest levels of hyperactivity were at high risk of serious adjustment problems in early adulthood. The risk of physical and psychological aggression in intimate relationships, early pregnancy, and being on welfare increased when these hyperactive girls were also on a high trajectory of physical aggression. However, because of the small HPA-only group, we could not verify if HPA during elementary school was an independent adverse outcome risk for girls, as has been found in boys.<sup>49</sup> Because we oversampled for girls with disruptive problems during their kindergarten year, it must be assumed that a large population sample would be needed to study the long-term outcomes of elementary schoolgirls high only on physical aggression.

Although the HH-HPA group seemed to be at highest risk for multiple negative outcomes, the contrasts between the 2 high-risk groups (HH-HPA vs HH only) did not reveal any significant differences. This could be because of the lack of statistical power. It does make sense that the HH-HPA group would be more at risk of physical aggression problems in intimate partner relationships and would have more problems generally than those who were only hyperactive. However, it is clear that elementary schoolgirls with chronic hyperactivity are at high risk of psychosocial adjustment problems during early adulthood. This study extends prior research<sup>14</sup> based on females included in our sample, showing that the girls who followed high trajectories of disruptive behaviors in childhood were likely to meet the criteria for conduct disorder in adolescence. Herein, we show that females who followed high childhood trajectories of hyperactivity or HH-HPA were more likely to manifest negative outcomes in early adulthood.

While this study is innovative and extends previous research in this area, some limitations should be noted. First, the developmental trajectories of childhood hyperactivity and physical aggression were limited to the period between the ages of 6 and 12 years. Studies on girls' development at an early stage (ie, before kindergarten) are needed, given evidence that these behaviors start early in the life course.<sup>10,50</sup> Second, our measures of substance use problems did not assess current diagnosis of substance abuse or dependence. This should be considered in future research. Third, we controlled for family risks (ie, a composite index, including family structure, parents' levels of education, parents' occupational status, and parents' age at the birth of the first child). However, other factors, such as family conflicts, parental mental health problems, and interpartner violence, might also play a role in placing young people at risk of adjustment prob-

lems in early adulthood.<sup>6</sup> Such factors should be controlled for in future studies. Fourth, risk factors more specific to girls, such as social and relational aggression,<sup>51,52</sup> also need to be considered in future investigations. Fifth, because not all hyperactive and physically aggressive girls grow up to have serious adjustment problems, we also need to understand what protective factors might interplay for this particular group. Sixth, the sample was composed of white and French-speaking females. Replications are needed with groups from diverse backgrounds to verify the generalizability of the results. Seventh, because 32% of the girls in our sample were selected based on their high disruptiveness scores in kindergarten, caution is needed in generalizing the current results to the general population.<sup>53</sup> However, we examined the extent to which the disruptive girls may have biased the results by conducting the analyses on the representative females only. The broad patterns of results for the trajectories and their associations to adjustment problems were maintained, suggesting minimal bias in the results presented herein. Eighth, despite the fact that we used a large sample of females, with an oversampling of at-risk girls, we were unable to include measures of violent behaviors and drug use problems because the frequencies were too low across all trajectory groups. Similarly, the overall frequencies of nonviolent criminality were low and there were no significant differences across the groups. Studies with larger samples, or more at-risk females, may be better able to examine these particular adjustment problems.

These results suggest that girls with chronic hyperactivity and physical aggression in childhood should be a primary target for intensive prevention programs because they are more likely to exhibit serious adjustment problems later in life. Although chronic physical aggression tended to increase the predictive value of chronic hyperactivity, our results confirmed that early identification solely based on overt aggression can result in a significant underidentification of at-risk girls.<sup>54-57</sup> In fact, our results indicate that by targeting hyperactive elementary schoolgirls there is a high likelihood that most high aggressive girls would be included. However, hyperactive girls who are also physically aggressive might need specific interventions to help them learn alternatives to physical aggression. Experimental studies will be needed to test the effects of such interventions, but future longitudinal studies should monitor types of treatments received by the participants to assess their effect on the developmental trajectories of hyperactivity and aggression, and on the long-term social and mental health outcomes.

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