

The Child Behavior Checklist Dysregulation Profile in Preschool Children: A Broad Dysregulation Syndrome

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Objective: Children with concurrent impairments in regulating affect, behavior, and cognition can be identified with the Anxious/Depressed, Aggressive Behavior, and Attention Problems scales (or AAA scales) of the Child Behavior Checklist (CBCL). Jointly, these scales form the Dysregulation Profile (DP). Despite persuasive evidence that DP is a marker for severe developmental problems, no consensus exists on the preferred conceptualization and operationalization of DP in preschool years. We addressed this concern by testing and validating the factor structure of DP in a group of predominantly clinically referred preschool children.

Method: Participants were 247 children (195 boys and 52 girls), aged 3.5 to 5.5 years. Children were assessed at baseline and 18 months later, using parent and teacher reports, a clinical interview with parents, behavioral observations, and neuropsychological tasks.

Results: Confirmatory factor analysis showed that a bifactor model, with a general DP factor and 3 specific

factors representing the AAA scales, fitted the data better than a second-order model and a one-factor model for both parent-reported and teacher-reported child problem behavior. Criterion validity analyses showed that the DP factor was concurrently and longitudinally associated with markers of dysregulation and clinically relevant criteria, whereas the specific factors representing the AAA scales were more differentially related to those criteria.

Conclusion: DP is best conceptualized as a broad syndrome of dysregulation that exists in addition to the specific syndromes as represented by the AAA scales. Implications for researchers and clinicians are discussed.

Key Words: Child Behavior Checklist, dysregulation profile, preschool, factor analyses, clinical sample

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A relatively large group of children who are referred for problem behavior experience mood instabilities, hyperarousal, and irritability.¹ Serious concerns have been expressed about these children, who show deficits across all domains of self-regulation. Their concurrent impairments in regulating affect, behavior, and cognition pose challenges to diagnostic classification systems, which do not accurately capture this behavioral phenotype.²

Problems of dysregulation might be identified by elevated scores on the so-called AAA scales: the Anxious/Depressed (affect), Aggressive Behavior (behavior), and Attention Problems (cognition) scales of the Child Behavior Checklist (CBCL).^{3,4} This well-established parental report of child problems allows researchers to communicate about a similar manifestation of dysregulation, which is referred to as the Dysregulation Profile (DP).²

DP was recently signified as a potential developmental profile for major psychopathology.⁵ In middle childhood and adolescence, DP is related to various adjustment problems later in life, including a range of psychological

disorders, suicidality, and substance abuse.^{6,7} Therefore, understanding the early-life manifestations of DP is warranted, as this might help to explain the etiology and development of dysregulation, resulting in valuable venues for prevention and treatment. The preschool years especially provide a window of opportunity for treatment because of the significant development in executive functioning and accompanied plasticity that marks this period.⁸

Although most research has been conducted on DP in middle childhood and adolescence, DP is also valuable for identifying younger children with concurrent psychosocial impairments. A community study with preschoolers (mean age, 3.5 years) showed that preschoolers with DP had more concurrent depressive and oppositional defiant disorder (ODD) symptoms, a temperamental profile characterized by high negativity and low effortful control, more authoritarian mothers and permissive fathers, and more functional impairment in age-appropriate activities, school functioning, and social relationships.⁹ Moreover, in a community sample of relatively young children (mean age, 6 years), a group of children scoring high on all CBCL scales and a group of children scoring high on externalizing problem behavior and emotional reactivity were identified using latent profile analysis.¹⁰ Especially the highly problematic class was associated with more maternal and paternal psychological problems¹⁰ and child lower nonverbal intelligence,¹¹ and was therefore proposed to resemble DP.



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There are also some salient gaps in our knowledge considering DP. Foremost, no consensus exists on how to theoretically and methodologically conceptualize DP. Although factor analysis could enhance consensus, the factor structure of DP in preschool years has not yet been examined. Second, no longitudinal research has been conducted on DP in preschool years, although this can clarify whether DP in preschoolers forms a valid developmental risk marker. Third, no research has been conducted on DP in clinically referred preschool children, although the CBCL was developed for purposes of screening within clinical practice.

Factorial Structure of DP

DP was originally proposed as a proxy for juvenile bipolar disorder¹²; however, subsequent research has indicated that the profile does not serve well as an indicator for this disorder.¹³ Currently, there is an ongoing debate on how DP is best conceptualized. Some argue that DP represents a single syndrome of dysregulation that is not included in dominant nosologies of child problem behavior.^{2,4} Others postulate that phenotypic manifestations of dysregulation represent comorbid disorders.¹⁴

Researchers have also operationalized DP in varying ways. These operationalizations suggest different underlying assumptions concerning the conceptualization of DP. Conceptualizing DP as a syndrome fits well with using the sum of the AAA scales,⁹ or latent classes/profiles.¹⁰ Assuming DP to represent comorbidity is best accompanied by cut-off approaches for each separate AAA scale.¹

Factor analysis could indicate the best conceptualization and operationalization of DP, which enhances integration of research on this topic. If a single factor (Figure S1a, available online) adequately represents the items of AAA scales, this indicates that DP represents a unidimensional syndrome. In this case, it would not be necessary to make distinctions between the AAA scales, as all symptoms are manifestations of DP only. Researchers could just use the sum-score of all 3 scales. Ayer *et al.*⁴ concluded that 1 factor adequately represented the items of the AAA scales, although it was not the main goal of this study, and comparisons with competing plausible factorial models were not conducted.

In contrast, if a second-order factor model (Figure S1b, available online) fits best, this indicates that DP is better conceptualized as comorbidity between the distinct problems of the AAA scales. Here, specific first-order factors represent distinct problems of Anxious/Depressed, Aggressive Behavior, and Attention Problems scales. A higher-order DP factor accounts for the communalities, or comorbidity, among the 3 specific syndromes.

Behavioral-genetic studies and studies with latent class analyses have indicated that DP is distinct from its specific components, that is the Anxious/Depressed, Aggressive Behavior, and Attention Problems scales.^{15,16} Therefore, conceptualizing DP as a separate syndrome is much more probable, although this syndrome would exist in addition to 3 specific syndromes as represented by the AAA scales. A bifactor model (Figure S1c, available online) accounts for this structure. Similar to a one-factor model, a general factor

acknowledges the existence of a single syndrome, but additional specific factors explain the unique coherence among symptoms within the same scale.

Present Study

In this study, we examined the factor structure of DP in a sample of predominantly clinically referred preschool children with externalizing problem behavior, both for parent- and teacher-reported problem behavior. In a study on DP in a community sample of school-aged children and adolescents, we demonstrated that this bifactor model was preferred above a second-order and one-factor model (Deutz, Geeraerts, Van Baar, Deković, and Prinzie, unpublished manuscript). We hypothesized that a bifactor model would show the best fit, indicating that DP is best conceptualized as a broad syndrome that exists in addition to specific syndromes.

Moreover, as reporter bias in particular can be a viable alternative explanation for correlations between the AAA scales, the structure should be thoroughly validated.¹⁷ We evaluated the concurrent and longitudinal criterion validity of the best-fitting factor structure using a multi-method and multi-informant approach. We examined associations between the best-fitting factor structure of the AAA scales on 1 hand, and external criteria that indicate dysregulation and maladjustment, both concurrently and 18 months later, on the other hand. Given the broad impairments that characterize DP, together with the wide range of concurrent and longitudinal associations that have been previously reported, we expected DP to be widely associated with the external criteria, both concurrently and longitudinally. This would further validate DP as a real phenotypic manifestation.

As we hypothesized the bifactor model to fit best, we also examined whether the 3 specific syndromes would predict external criteria over and above DP. We expected specific syndromes to be more differentially and selectively associated with these criteria (e.g., attention problems would be especially associated with impairments in attention and hyperactivity). This pattern of associations would support the conceptualization of DP as a broad syndrome of dysregulation that exists in addition to 3 specific syndromes as specified through the hypothesized bifactor model.

METHOD

Participants

General practitioners, pediatricians, and well-baby clinics in the province of Utrecht, the Netherlands, were invited to refer children 3.5 to 5.5 years of age with externalizing behavior problems for clinical assessment at the Outpatient Clinic for Preschool Children with Behavioral Problems, Department of Child and Adolescent Psychiatry, University Medical Centre Utrecht. Clinically referred children ($n = 189$) were included when they scored at or above the 90th percentile on the Attention Problems or Aggressive Behavior scales of the CBCL1.5-5 or Caregiver-Teacher Report Form (C-TRF). Typically developing children ($n = 58$) were recruited from elementary schools and daycare centers and were excluded if they scored at or above the 90th percentile of either the Attention Problems scale or the Aggressive Behavior scale of the CBCL1.5-5 or

C-TRF1.5-5. The total sample included 247 children (195 boys and 52 girls). In both groups, children were excluded if their IQ, as assessed by the average score of the Raven Color Progressive Matrices¹⁸ and Peabody Picture Vocabulary Test–III–NL,¹⁹ was below 70 and/or if they had a pervasive developmental disorder.

Children were assessed at baseline and at 18-month follow-up. At baseline, children's age was between 42 and 66 months (mean = 54.5, SD = 7.6). Children's IQ ranged between 77 and 135 (mean = 103.9, SD = 12.2). Parental educational level, for fathers and mothers respectively, was as follows: 6.9% and 0.8% unknown, 4.0% and 5.2% no high school diploma, 30.4% and 33.7% high school diploma, 24.7% and 24.7% vocational school diploma, and 34.0% and 35.6% college degree.

Retention was high: 235 children (95%) were seen both at baseline and at follow-up. No significant differences were found between participants who did or did not attend the 18-month follow-up on age, sex, and measures at baseline.

None of the children received medication for their behavioral problems at baseline. After baseline, 74 of the clinically referred children (39.2%) received psychopharmacotherapy, mainly methylphenidate ($n = 70$) but also atomoxetine ($n = 3$) and risperidone ($n = 1$). If children received methylphenidate, parents were asked to withhold medication for 48 hours before the follow-up assessment.

In addition, 108 families of clinically referred children (57.1%) received psychological interventions after the baseline measurement, that is, individual parent counseling at home ($n = 32$, 16.9%), at the outpatient clinic ($n = 87$, 46.0%), and/or participation in the Incredible Years Parent Program²⁰ ($n = 8$, 4.2%).

Procedure

At baseline and at 18-month follow-up, children were assessed during a single morning session, consisting of an intellectual and executive functioning assessment,²¹ observations during the Disruptive Behavior Diagnostic Observation Schedule (DB-DOS),^{22,23} and administration of the Kiddie–Disruptive Behavior Disorder Schedule (K-DBDS).^{24,25} The intellectual assessment was administered only during the baseline session. Questionnaires were answered by parents and teachers and sent to the medical center. Parents were asked to complete questionnaires together.

Parents provided written informed consent before participation and received a small amount of financial compensation. Children received 2 small gifts. The project was approved by the Medical Centre's ethical review committee.

Measures

Child Problem Behavior. Using the CBCL1.5-5 (parents) and C-TRF³ (teachers/caregivers), children's problem behaviors were rated on a 3-point scale (0 = not true, 1 = somewhat/sometimes true, 2 = very/often true).³ Items on the Anxious/Depressed ($n^{\text{CBCL}} = 8$, $n^{\text{TRF}} = 8$), Aggressive Behavior ($n^{\text{CBCL}} = 19$, $n^{\text{TRF}} = 25$), and Attention Problems ($n^{\text{CBCL}} = 5$, $n^{\text{TRF}} = 9$) scales were used. T scores of the Emotionally Reactive ($n^{\text{CBCL}} = 9$, $n^{\text{TRF}} = 7$) and CBCL Sleep Problems ($n = 7$) scales at baseline and 18-month follow-up were used for the purpose of validation. Cronbach's α values across waves and informants ranged between 0.71 and 0.96 (mean = 0.82). CBCL data were available for all children, and C-TRF data were available for 236 children (95.5%). No significant differences between participants with and without C-TRF data were found on age, sex, and measures at baseline.

DSM Behavioral Disorder Symptoms. The K-DBDS, a semi-structured clinical interview with parents, assessing DSM-IV-TR attention-deficit/hyperactivity disorder (ADHD), ODD, and conduct disorder (CD) symptoms was administered.^{24,25} Sum scores for each symptom cluster were used. The ODD cluster contained 11

questions assessing 8 symptoms (e.g., often loses temper), with answer categories ranging from "never" (0) to "many times a day" (5). The cluster was divided into irritable and headstrong clusters. Confirmatory factor analysis (CFA) showed that this distinction fit the data well ($\chi^2 [43] = 71.254$, $p = .004$, RMSEA = .052 [90% CI = 0.029–0.072], CFI = 0.978, TLI = 0.971), and better than a model without distinction ($\Delta\chi^2 [1] = 9.946$, $p = .002$). The CD cluster contained 13 questions, assessing 12 symptoms (e.g., physically cruel to people), with answer categories ranging from "never" (0) to "more than once a day" (5). The ADHD cluster contained 19 questions assessing 18 ADHD symptoms (e.g., always "on the go"), with answer categories ranging from "never" (0) to "often" (3).

Observed Externalizing Behavior. Observed behaviors were coded with the DB-DOS and divided into 5 categories.^{22,23} Behavior regulation problems ($n = 15$) encompassed behaviors resulting from difficulties in the ability to keep with social rules and norms. Anger modulation problems ($n = 6$) incorporated behaviors reflecting irritable, sullen mood, and deregulated expressions of anger (e.g., often loses temper). Competence ($n = 6$) covered positive affect, social engagement, and assertiveness. Inattentiveness ($n = 4$) covered symptoms of ADHD inattentive subtype, such as being easily distracted. Hyperactivity/impulsivity ($n = 6$) covered symptoms of ADHD hyperactivity subtype, such as talking excessively. Behaviors were rated on a scale ranging from typical (0) to atypical (3) and were summed, with higher scores indicating more atypical behavior. For the competence cluster, higher scores indicated more competence. The mean score across the different conditions of the DB-DOS was used. Coded behaviors were available only for the baseline session.

General Level of Functioning. Parents and teachers answered the nonclinical version of the Child Global Assessment Schedule, which ranges from 0 to 100. Lower scores indicate greater impairment in general level of functioning.²⁶

To measure inhibition, 3 tasks were used (detailed in Schoemaker *et al.*²¹). The Go–No–Go Task is a computerized task in which children receive the instruction to press a button when an ordinary fish appears ("Go" stimuli, 75%) but to withhold pressing when a shark appears ("No–Go" stimuli, 25%). Correct Go trials minus incorrect No–Go trials were calculated. During the Modified Snack Delay, children needed to stand still and place their hands on a mat without talking. A bell and a glass with a treat underneath were placed in front of each of the children. Children were told that they could move and eat the treat when an examiner rang the bell. The examiner progressively tried to distract the children, with activities such as dropping a pencil or leaving the room. Hand movement was coded every 5 seconds, and a total score of hand movement was calculated. The Shape School Task is a computerized task with cartoon figures in varying colors, shapes, and expressions. The naming rule varied in the different conditions. In the inhibition condition, children needed to name the color of the figures with happy faces and to suppress this response when the cartoon showed a sad or frustrated face. The number of correct responses was calculated and divided by the total number of trials. The mean of the 3 standardized scores was used, with higher scores indicating better inhibition.

Data Analyses

CFA was conducted in Mplus 7.11²⁷ using weighted least-squares means and variances adjusted (WLSMV) estimator with delta-parameterization because of categorical indicators. Three competing models were examined for both parent- and teacher-reported problem behavior: a bifactor, second-order, and one-factor model. Another possible model is a correlated 3-factor model; however, this model is statistically indistinguishable from a second-order model, as the models are the same in degrees of freedom and fit. First, it was examined

whether the bifactor model, which is the least constrained model, appropriately fitted the data. In this model, items load on orthogonal specific factors, representing the AAA scales, and on a general factor. Subsequently, it was examined whether the second-order model and, consequently, the one-factor model, significantly degraded this fit. In the second-order model, all items loaded on a factor representing their original AAA scale, which loaded on a second-order factor. In the one-factor model, all items loaded on 1 factor.

Model fit was evaluated through the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). CFI and TLI values above 0.95 and RMSEA values below 0.05 indicate a good fit.²⁸ χ^2 Difference tests for WLSMV estimator were conducted for model comparisons, with significant χ^2 values indicating a degrade in fit.

To examine the validity of the best-fitting factor structure, we successively entered external criteria into the model and computed regression paths. For longitudinal validity analyses, we controlled for received medication (yes/no) and psychosocial treatment (yes/no). For all analyses, an α level of 0.01 was adopted to correct for multiple testing.

RESULTS

Correlations and Factorial Structure of DP

Correlations between the AAA scales were 0.619 and 0.679 (Aggressive Behavior and Attention Problems), 0.501 and 0.388 (Aggressive Behavior and Anxious/Depressed), and 0.371 and 0.324 (Anxious/Depressed and Attention Problems) for parent- and teacher-reported problem behavior, respectively.

The results of the factor analyses are shown in Table 1. The results were similar for parent- and teacher-reported problem behavior. The model showed a very good fit to the data, and the fit significantly degraded when the model was restricted into a second-order model. It was therefore concluded that the bifactor model best fits the data.

Standardized factor-loadings in the bifactor model of parent data are reported in Table S1 (available online). Generally, factor loadings on DP were stronger than scale-specific loadings, although most scale-specific factor loadings were above 0.30. Scale-specific factor loadings were relatively low for the Aggressive Behavior scale, and 10 of 19 were not significant. Scale-specific factor loadings on the Attention Problems and Anxious/Depressed scales were, with 1 exception, all significant. Standardized factor loadings for teacher-reported problem behavior showed a fairly similar pattern (these can be obtained from the first author).

Criterion Validation

Concurrent and longitudinal associations of DP and 3 specific factors (Anxious/Depressed, Aggressive Behavior, and Attention Problems) with external criteria are reported in Table 2. With regard to parent-reported data, the DP factor was concurrently related to all criteria except observed competence. Notably, these associations were observed regardless of the source of information (i.e., parent or teacher reports, clinical interview, behavioral observations, and neuropsychological tasks).

The specific factors, representing the 3 problem areas, showed more differentiated concurrent associations with external criteria. The Anxious/Depressed factor was positively associated with parent-reported emotional reactivity and ODD irritable symptoms and negatively with observed anger modulation problems, behavior regulation problems, hyperactivity/impulsivity, and inattentiveness. Aggressive behavior was positively associated with more ODD headstrong and CD symptom clusters. Finally, attention problems were associated with a reduced general level of functioning and more ADHD symptoms, both observed and reported, and with fewer observed anger modulation problems and reported ODD irritable symptoms.

To a certain extent, factors of the teacher-reported data showed similar concurrent associations when compared to parent-reported factors. DP was concurrently related to external criteria, with 3 exceptions (i.e., parent-reported emotional reactivity, sleep problems, and observed competence). The associations with parent-reported criteria were generally weaker than for parent-reported DP, whereas associations with teacher-reported and observed criteria were larger. The Anxious/Depressed factor was concurrently related to emotional reactivity and sleep problems, less observed hyperactivity/impulsivity, and less observed competence. Aggressive behavior was poorly related to concurrent criteria, with only 1 negative association with teacher-reported emotional reactivity. Finally, attention problems were associated with lower level of general functioning, poor inhibition, more ADHD symptoms, and observed inattentiveness, hyperactivity/impulsivity, and behavior regulation problems.

Parent-reported DP was also widely associated with criteria 18 months later when controlling for medication use

TABLE 1 Fit Indices for the Bifactor, Second-Order, and One-Factor Models for Parent and Teacher Data

| | Model | χ^2 | df | RMSEA | RMSEA 90% CI | CFI | TLI | $\Delta\chi^2$ |
|---------|------------------------------|--------------|-----|-------|--------------|-------|-------|------------------------------------|
| Parent | 1. Bifactor | 658.559*** | 432 | 0.046 | 0.039–0.053 | 0.984 | 0.982 | |
| | 2. Second-order ^a | 886.530*** | 461 | 0.061 | 0.055–0.067 | 0.970 | 0.967 | 2 vs. 1 (29) = 190.192, $p < .001$ |
| | 3. One-Factor | 1,184.037*** | 464 | 0.079 | 0.074–0.085 | 0.949 | 0.945 | 3 vs. 2 (3) = 100.932, $p < .001$ |
| Teacher | 1. Bifactor | 1,242.580*** | 777 | 0.050 | 0.045–0.056 | 0.971 | 0.968 | |
| | 2. Second-order ^a | 1,519.277*** | 816 | 0.060 | 0.056–0.065 | 0.956 | 0.953 | 2 vs. 1 (39) = 232.434, $p < .001$ |
| | 3. One-Factor | 1,916.101*** | 819 | 0.075 | 0.071–0.080 | 0.931 | 0.927 | 3 vs. 2 (3) = 137.577, $p < .001$ |

Note: CFI = Comparative Fit Index; RMSEA = root mean square error of approximation; TLI = Tucker–Lewis Index.

^aLatent variable covariance matrix was not positive definite.

*** $p < .001$.

TABLE 2 Fully Standardized Regression Coefficients for Concurrent and Longitudinal Associations With External Criteria

| | | Parent Reports | | | | Teacher Reports | | | |
|------------------------------|-----------|----------------|-----------------------|------------------------|-----------------------|-----------------|-----------------------|------------------------|-----------------------|
| | | DP | Anxious/ Depressed | Aggressive Behavior | Attention Problems | DP | Anxious/ Depressed | Aggressive Behavior | Attention Problems |
| Parent-reported criteria | | | | | | | | | |
| Emotional reactivity | Baseline | 0.812*** | 0.290*** | −0.067 | −0.069 | 0.165 | 0.275*** | −0.106 | 0.106 |
| | Follow-up | 0.477*** | 0.190** | −0.011 | −0.010 | −0.037 | 0.308*** | −0.014 | −0.005 |
| Sleep problems | Baseline | 0.528*** | 0.123 | −0.147 | −0.058 | 0.012 | 0.222** | −0.054 | 0.015 |
| | Follow-up | 0.275*** | 0.078 | −0.125 | −0.128 | 0.075 | 0.290*** | −0.135 | −0.001 |
| General level of functioning | Baseline | −0.715*** | −0.091 | −0.144 | −0.307*** | −0.570*** | −0.128 | 0.060 | −0.218*** |
| | Follow-up | −0.398*** | −0.078 | −0.008 | −0.176 | −0.166** | −0.270*** | 0.140 | −0.080 |
| Teacher-reported criteria | | | | | | | | | |
| Emotional reactivity | Baseline | 0.328*** | 0.045 | −0.014 | 0.066 | 0.698*** | 0.407*** | −0.285*** | 0.016 |
| | Follow-up | 0.131 | 0.029 | 0.015 | 0.050 | 0.365*** | 0.183** | −0.261*** | 0.044 |
| General level of functioning | Baseline | −0.374*** | 0.185 | −0.144 | −0.361*** | −0.685*** | −0.030 | −0.067 | −0.293*** |
| | Follow-up | −0.221** | 0.131 | −0.164 | −0.251** | −0.425*** | −0.072 | 0.069 | −0.206** |
| Symptom clusters | | | | | | | | | |
| ODD headstrong | Baseline | 0.673*** | 0.010 | 0.181** | 0.000 | 0.277*** | 0.038 | 0.074 | −0.034 |
| | Follow-up | 0.396*** | 0.025 | 0.212** | −0.041 | 0.020 | 0.081 | −0.080 | −0.142 |
| ODD irritable | Baseline | 0.648*** | 0.179** | 0.039 | −0.235*** | 0.200** | 0.191 | −0.070 | 0.005 |
| | Follow-up | 0.414*** | 0.195** | −0.075 | −0.103 | −0.085 | 0.292*** | −0.190** | −0.047 |
| CD | Baseline | 0.491*** | −0.088 | 0.305*** | 0.000 | 0.248*** | −0.085 | 0.137 | −0.018 |
| | Follow-up | 0.364*** | 0.014 | 0.234** | −0.068 | 0.053 | 0.133 | −0.003 | −0.135 |
| ADHD | Baseline | 0.600*** | −0.006 | 0.013 | 0.531*** | 0.354*** | −0.093 | 0.016 | 0.426*** |
| | Follow-up | 0.295*** | 0.052 | −0.035 | 0.320*** | 0.044 | 0.023 | −0.012 | 0.263*** |
| Inhibition | Baseline | −0.352*** | 0.163 | 0.024 | −0.152 | −0.248*** | 0.102 | −0.006 | −0.263** |
| | Follow-up | −0.194*** | 0.092 | −0.192** | −0.336*** | −0.220*** | 0.110 | −0.067 | −0.241** |
| Observed behavior | | | | | | | | | |
| Anger modulation problems | Baseline | 0.323*** | −0.239** | −0.037 | −0.267** | 0.358*** | 0.107 | −0.114 | 0.012 |
| Behavior regulation problems | Baseline | 0.374*** | −0.342*** | 0.084 | 0.147 | 0.436*** | −0.149 | 0.081 | 0.198** |
| Inattentive | Baseline | 0.363*** | −0.358*** | 0.002 | 0.310*** | 0.308*** | −0.175 | 0.036 | 0.305*** |
| Hyperactivity/impulsivity | Baseline | 0.315*** | −0.304** | 0.005 | 0.381*** | 0.420*** | −0.209** | 0.009 | 0.200** |
| Competence | Baseline | −0.041 | −0.005 | −0.004 | 0.139 | 0.044 | −0.251*** | 0.103 | −0.069 |

Note: ADHD = attention-deficit/hyperactivity disorder; CD = conduct disorder; DP = dysregulation profile; ODD = oppositional defiant disorder.

p < .01; *p < .001.

and psychosocial treatment. These longitudinal associations were found across types of informants and methods and were still relatively strong.

Again, the specific factors were more selectively associated with external criteria 18 months later. Over time, anxious/depressed behavior was associated with parent-reported emotional reactivity and ODD irritable symptoms. Aggressive behavior was associated with poor inhibition and more ODD headstrong and CD symptoms, whereas attention problems were associated with impaired teacher-reported general level of functioning, more ADHD symptoms, and poor inhibition at follow-up.

For teacher reports, the DP factor was associated with a lower level of general functioning, more teacher-reported emotional reactivity, and less inhibition 18 months later, but was not related to the *DSM* symptom clusters and parent-reported emotional reactivity and sleep problems. Anxious/depressed behavior was associated with more emotional reactivity, sleep problems, and ODD irritable symptoms 18 months later. Aggressive behavior was longitudinally associated with less teacher-reported emotional reactivity and fewer ODD irritable symptoms. Attention problems were associated with lower teacher-reported general level of functioning, more ADHD symptoms, and poorer inhibition at follow-up.

Overall, DP was both concurrently and longitudinally related to a wide range of external criteria, whereas specific factors showed selective associations. These associations indicate the usefulness of the specific factors in addition to the general factor. Although fewer longitudinal associations for teacher-reported DP were found, this pattern of associations was generally found for both parent- and teacher-reported problem behavior.

DISCUSSION

Previous research has provided compelling evidence indicating that DP is valuable in identifying children who are seriously at risk in their development.^{6,7} Yet, to date, there is no consensus on the conceptual meaning and preferred operationalization of DP, although this could substantially increase its clinical and scientific usefulness. We addressed this concern by testing and validating the factor structure of parent- and teacher-reported DP in a sample of predominantly clinically referred preschool children with externalizing problem behavior.

The first question was whether DP represents comorbidity among anxiety/depression, aggressive behavior, and attention problems (i.e., second-order model) or a syndrome of dysregulation, either entirely (i.e., one-factor model) or in addition to the specific syndromes of anxiety/depression, aggressive behavior, and attention problems (i.e., bifactor model). Our findings convincingly support the hypothesized conceptualization of DP as a syndrome, which exists in addition to specific syndromes of anxiety/depression, aggressive behavior, and attention problems. This preferred conceptualization, accounted for by a bifactor model, was consistently found for both parent- and teacher-reported problem behavior and is in line with our results from

research with older children, in which a bifactor model also fits best (Deutz *et al.*, unpublished manuscript).

Examination of factor loadings further demonstrated the appropriateness of differentiating between DP and specific syndromes, as most items contributed to both DP and the specific syndromes. However, a limited number of items loaded appropriately on the Aggressive Behavior factor. It has been noted before that the Aggressive Behavior scale covers a range of behaviors that cause discomfort to others, instead of merely aggression.²⁹ Although a large cross-national study did find support for the existence of the Aggressive Behavior scale,³⁰ it did not account for an underlying dysregulation syndrome. Replication studies should further examine the structure of this scale when accounting for DP.

The second aim was to examine the concurrent and longitudinal criterion validity of DP and specific syndromes. As expected, DP was related to poor inhibition, poor general level of functioning, and more emotional reactivity, sleep problems, observed externalizing behavior, and *DSM* externalizing behavior symptoms, both concurrently and 18 months later. These broad associations were especially convincing for parent-reported problem behavior. An important strength of the current study is our reliance on several methods and informants, including behavioral observations and neuropsychological tasks, which minimizes the chance that DP merely represents reporter bias. Moreover, the 3 specific syndromes, namely, anxiety/depression, aggressive behavior, and attention problems, were more differentially associated with external criteria. For example, attention problems were associated mainly with concurrent and longitudinal ADHD symptoms and poor general level of functioning. This underlines the usefulness of differentiating between specific syndromes and DP, as these syndromes have their unique associations over and above the associations of DP.

Our results are in line with research showing that DP is related to concurrent impairments in young children.⁹⁻¹¹ Furthermore, the widespread associations between DP and impairments 18 months later are in line with findings in longitudinal studies with older children,^{6,7} and add to existing knowledge by indicating that DP in preschool years forms a valid marker for developmental risks.

Our findings provide compelling support for conceptualizing DP as a broad dysregulation syndrome.^{2,4} Given the associations with a range of clinical criteria, this syndrome is probably closely related to the general psychopathology factor, which was recently identified in (young) adults and preschoolers.^{31,32} This psychopathology factor summarizes an individual's propensity toward developing many forms of psychopathology. Notably, dysregulation is suggested to form the core of this psychopathology factor.^{31,32} The findings are also in line with recent efforts to capture underlying mechanisms that cut across existing disorders (e.g., the Research Domain Criteria [RDoC] framework).³³

Our results imply that preschool children differ in their liability for developing DP and for developing specific syndromes. Whereas some preschoolers have a liability for 1 form of problem behavior, others show a more generic deficit in self-regulation that can set the stage for broad

maladjustment. Children who score high on DP seem severely impaired and developmentally at risk. These children may possibly require different forms of prevention and treatment than children with more specific problem behaviors. Bifactor models may support researchers in examining such hypotheses, as they are well suited for disentangling DP from specific problems.

Because of the small number of girls in our sample, we could not examine measurement invariance across sexes. Results of the current study should also be replicated with larger samples, as this study might be underpowered according to some guidelines,³⁴ although it has sufficient participants according to others.³⁵

In addition, Berkson bias³⁶ is a relevant concern when examining the associations between syndromes within clinically referred samples. Berkson bias could occur because of a higher probability for children with more than 1 type of problem behavior to be referred than for children with only 1 type of problem behavior, which can lead to spurious associations among syndromes. However, the current sample contains typically developing children, which lowers the risk of Berkson bias. Moreover, differences between the correlations between AAA scales within our sample and within a nonreferred sample³ were small. Hence, there are no indications for spuriously high associations between scales. Nonetheless, future research could examine whether our conclusions still hold in a general population sample.

Moreover, clinically referred children in our sample were referred for externalizing behavior problems, and the instruments used for validation were especially suited for these problems. As externalizing problem behavior is the most common reason for referring young children,³⁷ our results are applicable to a large share of clinically referred preschoolers. Still, future research should be conducted in a sample with a greater variation in problems and with a broader variety of instruments to further establish the validity of the Anxious/Depressed factor, although our study more likely underestimated instead of overestimated the validity of this factor.

Finally, future research should incorporate even longer-term follow-up measures to further establish whether DP in preschool years can be considered a developmental risk marker.

To conclude, DP is best conceptualized as a broad syndrome of dysregulation that exists in addition to specific anxious/depressed, aggressive behavior, and attention problem syndromes. Preschoolers with these regulation problems deserve researchers' and clinicians' attention, as their problems are accompanied with impairments, and as they may be developmentally at risk.

In clinical practice, the CBCL and C-TRF are often filled in before clinicians meet their patients and can inform clinicians whether children have elevated scores on all AAA scales. The profile is therefore a low-effort method of attending clinicians, in the early stage of the diagnostic procedure, to identify possible regulation problems. More research is needed to further deepen our knowledge of DP in preschool children. &



Clinical Guidance

- The Dysregulation Profile (DP) consists of the Aggressive Behavior, Anxious/Depressed, and Attention Problems scales (or AAA scales) of the CBCL1.5-5 (parents) and C-TRF (teachers).
- In preschool years, DP is best conceptualized as a broad dysregulation syndrome that exists in addition to specific syndromes of aggressive behavior, anxiety/depression, and attention problems.
- DP can be seen as a marker of developmental risks, as it is associated with a wide range of clinically relevant criteria, both concurrently and 18 months later.
- As the CBCL1.5-5 and C-TRF are often completed before clinicians meet their patients, these measures provide a low-effort method to signal clinicians on possible regulation problems in the early stage of the clinical assessment of preschool children.

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FIGURE S1 Factor models: (a) one-factor model; (b) second-order factor model; (c) bifactor model. Note: CBCL-DP = Child Behavior Checklist–Dysregulation Profile.

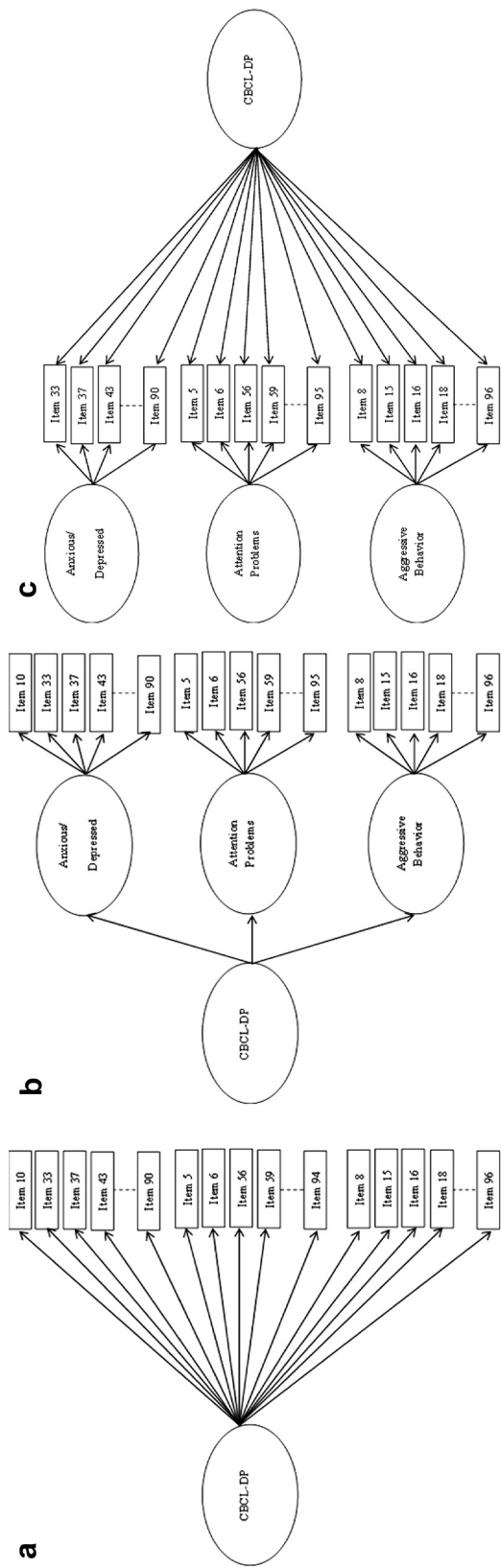


TABLE S1 Standardized Factor Loadings for Parent-Reported Problem Behavior

| Item | Description | Scale-Specific Loading | DP Loading |
|-----------------------------------|---------------------------|------------------------|------------|
| Anxious/Depressed | | | |
| I10 | Clings | 0.370*** | 0.557*** |
| I33 | Feelings hurt | 0.235** | 0.667*** |
| I37 | Upset by separation | 0.393*** | 0.403*** |
| I43 | Looks unhappy | 0.628*** | 0.625*** |
| I47 | Nervous | 0.318*** | 0.619*** |
| I68 | Self-conscious | 0.611*** | 0.407*** |
| I87 | Fearful | 0.596*** | 0.435*** |
| I90 | Sad | 0.759*** | 0.554*** |
| Aggressive Behavior | | | |
| I8 | Can't stand waiting | 0.058 | 0.912*** |
| I15 | Defiant | 0.313*** | 0.801*** |
| I16 | Demands met | 0.082 | 0.932*** |
| I18 | Destroys others | 0.282*** | 0.690*** |
| I20 | Disobedient | 0.279*** | 0.846*** |
| I27 | Lacks guilt | 0.284*** | 0.778*** |
| I29 | Easily frustrated | −0.200 | 0.801*** |
| I35 | Fights | 0.559*** | 0.559*** |
| I40 | Hits others | 0.703*** | 0.631*** |
| I42 | Hurts accidentally | 0.551*** | 0.574*** |
| I44 | Angry moods | 0.072 | 0.886*** |
| I53 | Attacks people | 0.548*** | 0.585*** |
| I58 | Punishment doesn't change | 0.228** | 0.825*** |
| I66 | Screams | 0.170 | 0.863*** |
| I69 | Selfish | 0.078 | 0.596*** |
| I81 | Stubborn/sullen/irritable | −0.089 | 0.791*** |
| I85 | Temper | 0.083 | 0.897*** |
| I88 | Uncooperative | 0.144 | 0.779*** |
| I96 | Wants attention | 0.027 | 0.876*** |
| Attention Problems | | | |
| I5 | Can't concentrate | 0.660*** | 0.703*** |
| I6 | Can't sit still | 0.455*** | 0.829*** |
| I56 | Clumsy | 0.353*** | 0.469*** |
| I59 | Quickly shifts | 0.534*** | 0.764*** |
| I95 | Wanders away | 0.018 | 0.590*** |
| Note: DP = dysregulation profile. | | | |
| **p < .01; ***p < .001. | | | |