Are There Resilient Children with ADHD?

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Abstract

Objective: The adverse outcomes associated with ADHD are well known, but less is known about the minority of children with ADHD who may be flourishing despite this neurodevelopmental risk. The present multi-informant study is an initial step in this direction with the basic but unanswered question: *Are there resilient children with ADHD?*

Method: Reliable change analysis of the BASC-3 Resiliency subscale for a clinically evaluated sample of 206 children with and without ADHD (ages 8-3; 85 girls; 66.5% White/Non-Hispanic).

Results: Most children with ADHD are perceived by their parents and teachers as resilient (52.8%-59.2%), with rates that did not differ from the comorbidity-matched Non-ADHD sample.

Conclusion: Exploratory analyses highlighted the importance of identifying factors that promote resilience for children with ADHD specifically, such that some child characteristics were promotive (associated with resilience for both groups), some were protective (associated with resilience only for children with ADHD), and some were beneficial only for children without ADHD.

Keywords

ADHD; resilience; positive youth development; protective factors

Attention-deficit/hyperactivity disorder (ADHD) is a chronic neurodevelopmental disorder (APA, 2013), and one of the most common childhood disorders affecting approximately 5% of school-aged children (Polanczyk et al., 2014). ADHD is highly heterogenous in both presentation and long-term outcomes (Halperin et al., 2008; Erskine et al., 2016; Nigg et al.,

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Conflict of Interest:
The authors have no conflicts of interest to report.

Ethical Approval:
All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent:
Informed consent was obtained from all individual participants included in the study.

2005), with the majority of children with ADHD experiencing clinically significant impairments in peer, family, and academic functioning (Pelham et al., 2005) at an annual cost of illness of over $100 billion in the US alone (Zhao et al., 2019). Decades of knowledge have been accumulated on the risk factors associated with ADHD (e.g., Becker et al., 2012). However, considerably less is known about the minority of children with ADHD who may be flourishing in one or more functional domains (Biederman et al., 1998). Given the highly heterogenous pattern of development in ADHD, identifying factors that contribute to positive outcomes could elucidate processes that can be targeted from a strength-based perspective to both reduce risk and facilitate thriving for this high-risk population. From this framework, Lee, Sibley, and Epstein (2015) called for an increased study of resilience in ADHD. The present study reflects an initial step in this line of research with the basic, but essential and unanswered, question: *Are there resilient children with ADHD?*

Resilience in Children

The positive youth development framework moves away from deficit-focused views of at-risk youth that have dominated the fields of psychology, education, and public health, towards approaches that identify, enable, and emphasize a youth's positive assets to promote optimal functioning or *thriving* (Lerner et al., 2009, 2013; Masten, 2014b). Resilience from a positive youth development perspective is conceptualized as a dynamic interaction between the individual and context (Lerner et al., 2013; Masten, 2014a). Importantly, resilience requires both an experience of *risk* or vulnerability to negative outcomes (e.g., presence of ADHD), and a pattern of positive adaptation in the context of that adversity (Lerner, 2009; Masten & Obradovic, 2006). Resilient children are broadly characterized as exhibiting a diverse set of behaviors, skills, and attributes (Alvord & Grados, 2005) that include engaging in prosocial behaviors or seeking resources (Sanders et al., 2015), using problem solving skills (Coşkun, Garipağaoğlu, & Tosun, 2014) and harnessing family and/or social community assets to cope with challenges and recover from setbacks (Masten, 2014a). While the field has yet to reach full consensus regarding the terminology surrounding resilience, researchers have recently adopted the term *promotive* to describe factors that promote adaptive outcomes for children at both low and high levels of risk, whereas the term *protective* is reserved for factors that mediate risk or confer particularly salient benefits for individuals at high risk levels (Masten 2014b). Thus, the key distinction between the two terms is whether a factor has an adaptive effect only (or primarily) when high levels of risk are present (Dvorsky & Langberg, 2016).

To date, the study of resilience is most robust within the developmental literature. However, despite strong linkages between resilience and positive functional outcomes in the developmental literature (e.g., Masten, 2014a), and extensive work aimed at improving these functional outcomes in children with clinical disorders (Evans et al, 2018), there is a surprising paucity of research examining resilience in clinical child disorders such as ADHD (Dvorsky & Langberg, 2016). This gap in the literature is important to address, as it cannot be assumed that (a) there *is* a subgroup of children with ADHD who exhibit observable, broad-based positive adaptation (i.e., resilience) despite the disorder's well-documented neurodevelopmental risk (Dvorsky & Langberg, 2016), or that (b) the same individual,

family, and social-community factors that promote resilience in non-clinical populations exert protective effects for children with ADHD (e.g., Mikami & Hinshaw, 2003).

Resilience and ADHD

While the resilience literature in ADHD is still in its nascent stages, significant strides have already been made in the quest to promote resilience in children with ADHD (e.g., Mikami & Hinshaw 2003, 2006). In Dvorsky and Langberg's (2016) review, they highlight that – with a few notable exceptions (e.g., Biederman et al., 1998; Chronis et al., 2007) – the predominance of information on resilience in ADHD is based on reinterpretation of risk factors identified via variable-focused study designs and continuous measures of risk and resilience. Variable-focused approaches provide critical insights into how individual developmental competencies relate to specific domains of positive functioning in ADHD (Mikami & Hinshaw, 2006); however, they do not permit identification and examination of groups of children who share risk factors (e.g., ADHD) but differ on adaptive outcomes (Dvorsky & Langberg, 2016). To address this limitation, Dvorsky and Langberg (2016) called for an increased application of person-focused approaches to the study of ADHD and resilience. Person-focused approaches such as the reliable change analyses used in the current study classify high-risk individuals according to their level of adaptive functioning. However, despite its widespread use in the social sciences (e.g., Magnusson, 2003; Masten, 2014a), to our knowledge only three prior studies (Biederman et al., 1998; Kofler et al., 2016; Chronis et al., 2007) have applied person-focused research designs to the study of ADHD and resilience.

For example, Biederman and colleagues (1998) classified adolescent boys with ADHD based on the presence/absence of impairments in specific functional domains, and found that the majority of youth with ADHD were functioning as well as their non-ADHD peers in at least one domain, despite functional impairments being required to meet criteria for a diagnosis of ADHD (APA, 2013). Similarly, Kofler et al. (2016) found that 30% of school-aged children with ADHD were not impaired academically, 38% were not impaired within the domain of family functioning, and 45% were not impaired socially. However, despite these promising findings regarding positive functioning in specific domains, to our knowledge no study to date has examined resilience more broadly, examined profiles of resilient children with ADHD, or examined whether similar individual, family, and social-community assets are associated with resilience in children with and without ADHD. As argued by Dvorsky & Langberg (2016), increased application of person-focused approaches could provide a more complete understanding of how multiple versus individual developmental factors contribute to the heterogeneity of adaptive outcomes in ADHD. The current study reflects an initial, person-focused investigation of resilience in pediatric ADHD, towards a program of research aimed at identifying novel intervention targets to not only reduce deficits, but also identify and harness strengths to promote optimal functioning among youth with ADHD.

Current Study

Taken together, a large body of evidence has been accumulated on the risk factors and adverse outcomes associated with ADHD (e.g., Becker et al., 2012), but little is known about the subset of children with ADHD who may be flourishing in one or more functional domains (Biederman et al., 1998), or whether there is a subset of children with ADHD who respond positively and adaptively to adversity despite their neurodevelopmental risk (i.e., whether there are resilient children with ADHD). To address this gap in the literature, the present study took a person-focused approach (Dvorsky & Langberg, 2016) to evaluate whether there are subgroups of children with ADHD who are perceived by parents or teachers as exhibiting this pattern of resilience and, if so, whether the proportion of children with ADHD who are perceived as resilient is similar to the rates observed in a non-ADHD group matched for most common comorbidities. In other words, the primary aim of the current study was to empirically examine whether there are resilient children with ADHD, and if so whether resilience occurs at similar rates in children with ADHD as it does in children without ADHD.

Given that the limited available evidence has consistently identified a sub-group of ADHD children with strengths in specific functional domains (for review, see Dvorsky & Langberg, 2016), we hypothesized that we would identify a subgroup of children with ADHD who are perceived by their parents and/or teachers as resilient or highly resilient. Finally, we added exploratory analyses to provide a preliminary demographic profile of resilient children with ADHD, and test whether these characteristics are *protective* (i.e., exert greater benefits for children with ADHD), *promotive* (i.e., associated with resilience similarly for children with and without ADHD; Dvorsky & Langberg, 2016), or *risk* factors (i.e., are associated with low resilience for children with and/or without ADHD). These additional analyses were exploratory, and were added after inspecting the data given the encouraging answer to our primary question as detailed below. No specific hypotheses regarding the profiles of resilient children with ADHD were offered due to paucity of research and the exploratory ('hypothesis generating') nature of these post hoc analyses.

Method

Participants

The sample comprised 206 children aged 8 to 13 years (M = 10.31, SD = 1.41; 121 boys, 85 girls; Table 1) from the Southeastern United States, recruited through community resources from 2013 to 2019 for participation in a clinical research study of the neurocognitive mechanisms underlying pediatric attention and behavior problems. All parents and children gave informed consent/assent, and Florida State University IRB approval was obtained/maintained. Sample race/ethnicity was mixed with 137 White/Non-Hispanic (66.5%), 20 Hispanic (9.7%), 27 Black (13.1%), 7 Asian (3.4%), and 15 multiracial children (7.3%). All participants spoke English.

Group Assignment

All children and caregivers completed a detailed, semi-structured clinical interview using the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Aged Children (K-SADS; Kaufman et al., 1997). The K-SADS (2013 Update) allows differential diagnosis according to symptom onset, course, duration, quantity, severity, and impairment in children and adolescents based on DSM-5 criteria. Its psychometric properties are well established, including inter-rater agreement of .93 to 1.00, test-retest reliability of .63 to 1.00, and concurrent (criterion) validity between the K-SADS and psychometrically established parent rating scales (Kaufman et al., 1997). K-SADS interviews were supplemented with parent and teacher rating scales from the Behavior Assessment System for Children (BASC-2/3 Reynolds & Kamphaus, 2004, 2015) and ADHD Rating Scale 4/5 (ADHD-4/5; DuPaul et al., 2016). A psychoeducational report was provided to parents. Children that met all of the following criteria were included in the ADHD group (n=108; 31.5% girls): (1) DSM-5 diagnosis of ADHD Combined (n=80), Inattentive (n=26), or Hyperactive/Impulsive presentation (n=2) by the directing clinical psychologist based on the K-SADS; (2) borderline/clinical elevations on at least one parent and one teacher ADHD subscale (i.e., > 90th percentile); and (3) current impairment based on parent report. Children with any ADHD subtype/presentation were eligible given the instability of ADHD subtypes (Valo & Tannock, 2010).

To improve generalizability (Wilens et al., 2002), children with comorbidities were included in the ADHD group. Comorbidities reflect clinical consensus best estimates and included oppositional defiant disorder (29.6%), anxiety disorders (21.3%), autism spectrum disorder (10.2%), and depressive disorders (4.6%). A subset of children with ADHD screened positive for specific learning disorders (SLD) in reading (12.0%) and/or math (17.6%) defined by score(s) >1.5 SD below age-norms on one or more subtest(s) of the KTEA-3 (Kaufman & Kaufman, 2014) Academic Skills Battery reading or math subtests. Thirty-three of the 108 children with ADHD were currently prescribed psychostimulants (30.6%).

The Non-ADHD group comprised 98 consecutive case control referrals (51 girls) who did not meet ADHD criteria, and included both neurotypical children and children with psychiatric disorders other than ADHD. Neurotypical children (66.3%) had normal developmental histories and nonclinical parent/teacher ratings and were recruited through community resources. Clinically referred and evaluated children who did not meet ADHD criteria were also included in the Non-ADHD group. These Non-ADHD disorders were included to control for comorbidities in the ADHD group, and included clinical consensus best estimate diagnoses of anxiety (19.4%), autism spectrum (8.2%), depressive (4.1%), SLD-reading (3.1%), SLD-math (3.1%) and oppositional defiant (1.0%) disorders. The ADHD and Non-ADHD groups did not differ significantly in the proportion of children with clinical disorders other than ADHD (anxiety, depression, ASD; p>.16); the ADHD group had a higher proportion of children with ODD as expected (p<.001).

The first 57 Non-ADHD participants underwent an identical evaluation as the ADHD group. Due to funding constraints, the final 41 Non-ADHD participants completed an abbreviated screening evaluation that included parent BASC-3 and ADHD-RS-5, a 1-subtest IQ screener, and detailed developmental, medical, educational, and psychiatric histories. Teacher BASCs

were also obtained for a subset of the abbreviated cases recruited during the school year (n=12); thus, the sample size differs slightly based on parent (N=206) and teacher (N=177) report.[1] Neurotypical children that received the abbreviated evaluation had slightly lower SES (M=46.44 vs. 53.15; p=.02) and parent-reported ADHD inattentive symptoms (M= 50.29 vs 56.25; p=.01), but did not differ from the full evaluation subgroup in terms of age, IQ, parent-reported hyperactivity-impulsivity symptoms, or sex (all p>.11). Children were excluded from the study if they presented with (a) gross neurological, sensory, or motor impairment, (b) history of a seizure disorder, psychosis, or intellectual disability, or (c) non-stimulant medications that could not be withheld for testing.

Intellectual Functioning (FSIQ) and Socioeconomic Status (SES)

All children were administered the WISC-V Short Form (Sattler et al., 2016) or WISC-V Matrix Reasoning subtest (Wechsler, 2014) to obtain an estimate of intellectual functioning. Hollingshead (1975) SES was estimated based on caregiver(s)' education and occupation.

ADHD Symptoms

The *ADHD Rating Scale* (ADHD-RS-4/5; DuPaul et al., 2016) parent and teacher forms assess the quantity and frequency of ADHD symptoms based on DSM criteria in children and adolescents aged 5 to 17 (18 items; 4-point Likert scale). The ADHD-RS-4/5 comprises two symptom subscales: Inattention (9 items) and Hyperactivity-Impulsivity (9 items). Psychometric support for the ADHD-RS-4/5 includes high internal consistency (α=0.94) and test-retest reliability (r= 0.79 to 0.85; DuPaul et al., 2016). Higher raw scores indicate higher frequency/severity of inattention or hyperactivity-impulsivity symptoms.

Psychometrically-Defined Resilience

The *Behavioral Assessment System for Children* (BASC-2/3; Reynolds & Kamphaus, 2004, 2015) parent and teacher forms consist of 139-175 items that assess both internalizing and externalizing behaviors as well as adaptive functioning in children and adolescents ages 2-21. Psychometric support for the BASC includes high internal consistency (α=.85-.96) and 1-10 week test-retest reliability (r = .84-.90). Age- and sex-specific T-scores are obtained via conversion of raw scores based on the national standardization sample (N=1,419 per form). The parent and teacher Resiliency subscales were used in the current study to assess resilience (12-13 items; 4-Point Likert scale; e.g., "is resilient," "recovers quickly after a setback"). Higher scores indicate higher levels of parent- or teacher-perceived resilience. The concurrent validity of these scales has been supported via associations with global as well as specific indices of adaptation to stress or risk (Bradstreet et al., 2017; Dean et al., 2018; Happer et al., 2017; Hass et al., 2012; Volker et al., 2010; Zaharakis et al., 2018) as well as via their sensitivity to detecting treatment-related improvements from interventions specifically designed to increase resilience (Habayeb et al., 2017).

Following Kofler et al. (2016, 2019), each child's age/sex normed BASC Resilience T-scores were used to objectively define resilience by applying the Jacobson and Truax (1991) model

[1]Exploratory analyses indicated that the pattern and interpretation of results was unchanged in exploratory analyses limited to the n=177 who had both parent and teacher Resilience data, with one minor exception noted below.

of reliable change. Each child was classified into one of three mutually exclusive categories (Low Resilience, Resilient, or High Resilience) based on whether their norm-referenced T-score was reliably above or below the BASC standardization sample mean (i.e., difference exceeded chance at $p < .05$). This classification was based on computation of the Reliable Change Index (RCI), or the ratio of the difference between the child's score and the BASC standardization sample mean divided by standard error (computed using each measure's reported test-retest reliability and the SD of the BASC normative sample; Rule B; Jacobson & Truax 1991) individually for each child. This method was selected over static cut points (e.g., 10th percentile of Non-ADHD group) because it improves precision by explicitly accounting for measurement unreliability (Jacobson & Truax 1991). The RCI is tested against the z distribution; resilience is defined as a score that does not differ significantly from the Resilience score of the average same age/sex neurotypical child; high and low resilience are defined as scores significantly better and worse than normative expectations given the scale's reported reliability, respectively.

Separate classifications were made based on parent and teacher perceived resilience given expectations that different individual characteristics may promote resilience in different settings (Sorensen et al., 2003). Inspection of the RCI data indicated that the high and low resilience cut-offs fell at 1.0-1.1 SD above/below the normative sample mean across informants; statistical significance was obtained at slightly different cut points across the parent and teacher measures due to slight differences in test-retest reliability (i.e., because the teacher subscale had slightly lower test-retest reliability, scores approximately 1 T-score unit further from the mean were required to conclude with $p<.05$ certainty that the child's score was more likely to come from the low/high resilience populations than the average resilience population).

Data Analysis Overview

The current study's primary analyses addressed two interrelated questions: (a) Are there resilient children with ADHD?; and (b) if so, whether the prevalence of resilience in ADHD was similar to rates seen in the Non-ADHD group. This involved classifying each child as Low Resilience, Resilient, or High Resilience using the Jacobson & Truax (1991) method, separately based on parent and teacher-perceived resilience as described above, and then using χ^2 tests to compare the proportions of ADHD and Non-ADHD children who fell into each of these descriptive categories.

Given the encouraging answer to our primary research questions, we then added a series of exploratory (hypothesis generating) analyses to construct a preliminary demographic profile of resilient children with ADHD, as an initial, proof of concept step toward a line of basic and applied research aimed at identifying factors that promote thriving for children with ADHD. This involved conducting a series of ADHD (Yes/No) x Resilience (Low vs. Average/High) χ^2 tests and ANOVAs on each of the demographic characteristics shown in Table 1 (as noted below, the Resilient and High Resilience categories identified in the primary analyses were combined in the exploratory analyses to address unbalanced cell sizes). Teacher-reported ADHD symptom severity was used when examining profiles of

children perceived by their parents to be resilient, and vice versa, to prevent spurious associations attributable to mono-informant bias.

Power Analyses

For the study's primary analyses, we conducted an *a priori* power analysis using GPower v3.1 (Faul, Erdfelder, Lang, & Buchner, 2007) to determine our sensitivity for detecting effects with $\alpha = .05$, power $(1-\beta) = .80$, and 2 sets (ADHD Yes/No) by 3 groups (Low Resilience, Resilient, Highly Resilient). Results indicated that our sample size is powered to detect small to medium χ^2 effect sizes of $w \geq 0.22$ (parent models) or $w \geq .24$ (teacher models). For the exploratory analyses, with $\alpha = .05$, power $(1-\beta) = .80$, and 2 sets of 2 groups (ADHD Yes/No x Low Resilience vs. Resilient/Highly Resilient), our sample size is powered to detect small to medium χ^2 effect sizes of $w \geq 0.20$ (parent) to $w \geq 0.21$ (teacher) and small to medium ANOVA main and interaction effect sizes of $d \geq 0.40$ (parent) to $d \geq 0.44$ (teacher). Thus, the study is sufficiently powered to detect clinically relevant effects.

Results

Preliminary Analyses

All independent and dependent variables were screened for univariate outliers, defined as values greater than 3 SD above or below the within-group mean. Two datapoints (both from ADHD cases) were identified as outliers and corrected to the most extreme value 3 SD above or below the within-group mean. Several of the child/demographic characteristics analyzed in Tier 2 have been reported in previous, conceptually unrelated studies for the purposes of characterizing the sample (e.g., Irwin et al., 2021; Soto et al., 2020). Data for the study's primary outcomes, parent and teacher reported Resilience, have not been previously reported. Parent and teacher ADHD ratings were higher for the ADHD relative to Non-ADHD group as expected (Table 1). In addition, the ADHD group was slightly older (M=10.53 vs 10.13; p=.03) and had slightly lower IQ scores (M=102.47 vs 107.32; p=.01), but did not differ from the non-ADHD group in terms of SES (p=.72). Age and sex were controlled via the use of age/sex normed Resilience T-scores; IQ was not included as a covariate given our exploratory goal of examining it as a potential promotive/protective factor for resilience in ADHD.

Primary Analyses: Are There Resilient Children with ADHD?

Results from the reliable change analyses (Jacobson & Truax, 1991) indicated that approximately half of children with ADHD are perceived as resilient by their parents (50.0%) and teachers (54.6%), with a small subset perceived as more resilient than most of their same age/sex neurotypical peers (2.8% and 4.6%, respectively). Comparison of the ADHD and Non-ADHD groups indicated that resilience classification rates differed as a function of ADHD status based on both parent (p=.001) and teacher report (p=.04). Post-hocs using the adjusted residuals method (Macdonald & Gardner, 2000) indicated that children with ADHD were just as likely as their Non-ADHD peers to be perceived as resilient (50.0% vs 61.9%; p=.09, *ns*) by their parents despite being underrepresented in the High Resilience (2.8% vs 12.4%; p=.009) and overrepresented in the Low Resilience groups (47.2% vs 25.8%; p=.001). Similarly, children with ADHD were just as likely as their Non-

ADHD peers to be perceived as Resilient (54.6% vs. 56.5%; p=.84, *ns*) and Low Resilience (40.7% vs. 29.0%; p=.11, *ns*) by their teachers, despite being underrepresented in the High Resilience group (4.6% vs. 14.5%, p=.02). Taken together, results of the study's primary analyses indicate that resilience may be the norm rather than the exception among children with ADHD, with slightly more than half (52.8%-59.2%) of these children perceived by parents and/or teachers as resilient/highly resilient.

Exploratory Analyses: Demographic Characteristics of Resilient Children With and Without ADHD

Given the encouraging findings from the study's primary analyses, we conducted a series of exploratory analyses using the sample characteristics reported in Table 1 as a 'proof of concept' toward a line of research aimed at identifying child, family, and social-community assets (Masten, 2014) that promote resilience in children with ADHD. Separate models were run for each informant (parent, teacher) and child characteristic. Reporting is truncated for readability; full reporting can be found in Supplementary (online only) Tables S1 and S2. As noted above, the Resilient and High Resilience categories identified in the primary analyses were combined to address unbalanced cell sizes.

Characteristics differentiating resilience in children with ADHD.—Characteristics associated with resilience in ADHD differed as a function of informant/setting. Children with ADHD who were perceived as resilient by their parents were *less* likely to take psychostimulant medications than low-resilient children with ADHD (15.8% vs. 47.1%; Φ= −.34, p<.001), whereas medication status did not covary with teacher-perceived resilience (p=.51). In contrast, children with ADHD who were perceived by their teachers as resilient had higher IQs (d=0.47, p=.01), were *more* likely to have co-occurring anxiety (29.7% vs. 9.1%; Φ=.25, p=.01), and were *less* likely to have co-occurring ODD (21.9% vs. 40.9%; Φ= −.21, p=.03) and SLD-math (27.3% vs. 10.9%; Φ=.047, p=.03). No additional child characteristics shown in Table 1 were associated with parent- or teacher-perceived resilience in children with ADHD (Tables S1–S2).

Characteristics differentiating resilience in children with versus without ADHD.—Next, we examined whether demographic characteristics associated with resilience in ADHD function similarly in children without ADHD. For IQ, the significant main effect of Resilience (p=.007) and the nonsignificant ADHD Status x Resilience interaction (p=.56) indicated that higher IQ is a promotive factor for children in the school setting (i.e., higher IQ children are more likely to be perceived as resilient regardless of ADHD diagnostic status). In contrast, the finding above linking an anxiety diagnosis with teacher-perceived resilience in ADHD likely reflects a protective factor. This conclusion is based on the significant ADHD Status x Resilience interaction (p=.047) and post-hocs indicating that anxiety diagnoses were present at significantly *higher* rates among teacher-perceived resilient children with ADHD (29.7% vs 9.1%; Φ=.24, p=.01), but present at significantly *lower* rates for resilient Non-ADHD children based on both parent (16.7% vs 50.0%; Φ=−.34, p=.003) and teacher perceptions (18.4% vs 45.0%; Φ=−.28, p=.02). ODD and SLD were not examined as predictors of resilience in the Non-ADHD group due to low cell counts.

Characteristics associated with resilience only for children without ADHD.— Finally, we examined whether characteristics that were *not* associated with resilience in ADHD were associated with resilience in children without ADHD, based on significant Resilience x ADHD interactions (all $p<.045$) in the absence of main effects of Resilience (all $p>.25$). First, children without ADHD who were perceived by their parents as resilient tended to come from higher SES backgrounds ($d=0.58$, $p=.048$; resilient and low-resilient children with ADHD did not differ on SES, $p=.22$), suggesting that children with ADHD may not benefit from the promotive effects of higher SES to the same degree as their peers. Next, children without ADHD who were perceived by teachers as resilient had significantly lower hyperactive symptoms ($d=.79$, $p=.004$) than low resilient Non-ADHD children. Similarly, both parents and teachers perceived Non-ADHD children with lower inattentive symptoms as more resilient ($d=1.01$, $p=.03$ and $d=1.30$, $p<.001$, respectively; resilient and low-resilient children with ADHD showed similarly elevated inattention and hyperactive-impulsivity symptoms, $p>.06$). Finally, among the Non-ADHD group, children perceived as resilient by teachers were less likely to be diagnosed with a depressive disorder than the low-resilient children ($\Phi=.39$, p=.001; resilient and low-resilient children with ADHD did not differ significantly in rates of co-occurring depressive disorders, $p=.97$). No additional child characteristics shown in Table 1 were associated with parent- or teacher-perceived resilience for children with or without ADHD (all $p>.06$).

Discussion

The current study was the first to specifically and systematically assess resilience in pediatric ADHD using a person-focused approach (Dvorsky & Langberg, 2018) with a carefully phenotyped sample of children with and without ADHD and psychometrically-defined resilience (Jacobson & Truax, 1991). Previous studies adopting a strength-based approach to studying ADHD have focused on identifying subsets of children with ADHD who exhibit intact or above average performance in one or more specific functional domains that may in turn promote resilience (e.g., academic achievement, social skills, family relational functioning; e.g., Biederman et al., 1998; Kofler et al., 2016), but to our knowledge the current study is the first to identify a subgroup of children with ADHD who demonstrate observable, broad-based positive adaptation (i.e., resilience) despite the disorder's well-documented neurodevelopmental risk (Becker et al., 2012). Of primary interest in the current study was the basic, but essential and unanswered question: *Are there resilient children with ADHD?* The results indicate that the answer to this question is a resounding 'yes.' Specifically, we found that parents and teachers perceive a majority of children with ADHD to be resilient (50%-53%), with rates that did not differ from a Non-ADHD sample matched for the number of non-ADHD clinical disorders. In addition, a small subset of children with ADHD was perceived to be *more* resilient than most of their same age/sex neurotypical peers (3%-6%). Nonetheless, a sizable minority of children with ADHD exhibit low levels of resilience, with rates that exceeded expectations based on the local normative comparison group based on parent but not teacher report. These findings (a) are consistent with previous work documenting heterogeneity in cognitive, behavioral, and functional outcomes associated with ADHD (e.g., Kofler, Irwin, et al., 2019); (b) extend previous findings by documenting heterogeneity in how children with ADHD harness these

assets to promote positive adaptation despite the risk conferred by their neurodevelopmental vulnerabilities (e.g., Becker et al., 2012); and (c) highlight the importance of future work that extends this line of inquiry to identify child, family, and social-community assets that promote resilience and maximize positive outcomes for this at-risk group (Masten, 2014a).

Given this highly heterogenous pattern of adaptation, detecting and characterizing resilient children with ADHD has the potential to help us identify novel intervention targets to expand our armamentarium of evidence-based treatments and promote optimal functioning/thriving despite – or in some cases potentially because of – the neurocognitive, behavioral, and affective risks conveyed by ADHD (e.g., Becker et al., 2012; Lee, Sibley, & Epstein, 2016). To that end, we were encouraged by the results of the study's primary analyses and decided to add a 'proof of concept' series of exploratory analyses based on the child demographic characteristics reported in Table 1 as a first step toward characterizing and promoting resilience and thriving in children with ADHD. These exploratory profile analyses provided strong evidence for the importance of identifying factors that promote resilience specifically for children with ADHD. That is, despite examining a rather small number of basic, mostly child-level demographics characteristics, a pattern emerged in which some characteristics were promotive (associated with resilience for both groups), some were protective (associated with resilience only, or more strongly, for children with ADHD), and some were not associated with resilience in ADHD despite being beneficial for children without ADHD.

Of the child characteristics associated with resilience in ADHD, only higher IQ was also associated with resilience in non-ADHD children. This pattern of findings positions higher IQ as a promotive factor for resilience in the classroom, which is consistent with developmental evidence linking higher IQ with better functioning for individuals in both low- and high-stress conditions (Masten & Coatsworth, 1998; Masten, Burt, & Coatsworth, 2006), and as a protective factor against long-term negative outcomes (Losel & Farrington, 2012; Werner & Smith, 1992, 2001). However, unlike prior studies that have found IQ to be more protective for at-risk individuals (Masten & Obradovic, 2006), the current study did not find that global IQ confers significantly greater benefits for the ADHD group. Further research evaluating links between specific cognitive functions that influence IQ test performance will be important given evidence that certain cognitive functions (e.g., working memory, inhibitory control) may be improved with training in children with ADHD (e.g., Kofler, Wells, et al., 2020) despite overall IQ being fairly stable by middle childhood (Sattler, 2018) and resistant to training (Melby-Lervag et al., 2016).

In contrast, the presence of a co-occurring anxiety disorder appears to have protective effects for children with ADHD despite being a risk factor for children without ADHD. These findings are aligned with extant research indicating that anxiety symptoms may attenuate the cognitive deficits commonly associated with ADHD, such that co-occurring anxiety has been associated with *better* inhibitory control/executive functioning in children with ADHD (e.g., Bloemsma et al., 2013; Klymkiw et al., 2013), despite being associated with *worse* cognitive control and executive functioning in children without ADHD (e.g., Yurtbasi et al., 2018). Future research examining the interrelations among resilience, anxiety, and ADHD is needed to identify the specific mechanisms and processes through which anxiety operates to

produce differently valanced outcomes in children with versus without ADHD (Maric et al., 2018).

Interestingly, the use of psychostimulant medication was associated with lower resilience in children with ADHD based on parent (but not teacher) perceptions. At first glance, this finding appears surprising given that psychostimulants increase cortical dopamine availability (Volkow, 2001), which in turn is associated with resilient adaptation to stress (Southwick et al., 2005). Although previous work has documented emergent effects of psychostimulants in some children with ADHD, particularly at higher dosages, these tend to primarily reflect transient physical complaints that in many cases can be mitigated by careful dosage titration and/or switching to a different formulation (Rapport et al., 2008). In this context, our current view is that the lower likelihood of psychostimulant medication treatment in resilient children with ADHD likely reflects an effect rather than a cause. That is, we hypothesize that parents who perceive their child to be resilient may be less likely to pursue medical treatment options (rather than the medication producing changes in their child's behavior that makes them appear less resilient). This hypothesis is of course speculative, but is generally consistent with evidence that a parent's decision to medicate their child for ADHD is related to their level of concern regarding the child's ADHD-related academic and social impairments (Coletti et al., 2010). To our knowledge, however, no studies have directly examined whether child resilience impacts, or is impacted by, parental decisions to pursue medical treatment for ADHD.

Unexpectedly, Non-ADHD children who were perceived by their parents as resilient tended to come from higher SES backgrounds, but this association was not found for children with ADHD. This finding was surprising given the extensive literature demonstrating the positive effects and competencies conferred by higher socioeconomic status among groups of differing risk levels (Masten, 2014a). However, our findings corroborate recent research that similarly found resilience was not significantly associated with SES for children with ADHD (Regalla et al., 2019), and thus it appears that children with ADHD may not benefit from the promotive effects of higher SES to the same degree as most children. Similarly, several risk factors for low resilience in Non-ADHD children were not found to confer risk for children with ADHD (e.g., ADHD symptom severity). Collectively, this pattern of findings suggests that some assets and risks that are considered protective or vulnerability factors for children in general (Masten, 2014a) may operate differently or not confer the same benefits for children with ADHD. This pattern highlights the importance of identifying factors that promote resilience in ADHD, toward supplementing as well as modifying extant evidence-based treatments for ADHD (Dvorsky & Langberg, 2016). Looking ahead, a strength-based approach that adapts each child's treatment plan based on their existing and potentially malleable individual, family, and social-community assets may facilitate more positive outcomes via a precision medicine approach that moves beyond deficit-reduction to promote thriving for children with ADHD (Cox, 2006).

Limitations

The current study was the first to specifically assess resilience in pediatric ADHD using a person-focused approach, multiple informants, a carefully phenotyped sample of children

with and without ADHD, and psychometrically-defined resilience. Despite these methodological refinements, the following limitations must be considered when interpreting results. A strength of our study was that our ADHD and Non-ADHD groups were matched for most common comorbidities (e.g., anxiety, ASD), which enabled us to differentiate between promotive and protective factors (see Dvorsky & Langberg, 2016) while maximizing external validity and generalizability given that comorbidity appears to be the rule rather than the exception in ADHD (Wilens et al., 2002). However, due to insufficient representation of SLD and ODD in the Non-ADHD sample, the potential risk and promotive effects of these disorders could not be examined in this study. Further, equating the groups based on the number of other clinical disorders may not perfectly match the groups, and as such future work is needed to examine resilience in children with 'pure' ADHD.

Our primary research question was "are there resilient children with ADHD?", and thus the exploratory profile analyses were limited to categorical analyses (resilient vs. low resilience subgroups) of basic child-level characteristics typically reported in "Table 1" of most manuscripts. Despite the exploratory focus on this 'low hanging fruit,' a pattern of results emerged indicating a high likelihood that many if not most promotive factors identified in the broader developmental literature may operate differently or not confer the same benefits for children with ADHD as they do for children in general. Replications with larger and broader samplings of children and diagnoses, a primary focus on a broader range of individual, family, and social-community assets (Wright & Masten, 2015), and examination of whether specific behavioral characteristics of resilient children account for the results reported herein are needed to evaluate the extent to which the resiliency profiles identified herein meaningfully predict ecologically-valid adaptive domains for children with ADHD.

Moreover, the use of psychometrically defined resilience based on norm-referenced, multiple informant perceptions across the home and school domains was a strength of our study, given that findings reflect comparisons with a large, nationwide standardization sample and are more likely to reflect a child's ability to adapt to adversity in their daily lives across settings (Dvorsky & Langberg, 2016). At the same time, informant report measures introduce confounds such as social desirability, halo effects, and retrospective recall bias. In addition, while the BASC Resiliency subscale has been corroborated by global as well as specific indices of adaptation to stress or risk (e.g., Bradstreet et al., 2017; Dean et al., 2018; Happer et al., 2017), more construct validity work on this measure is needed. It would have been ideal to include additional measures or objective observations of resilient behavior in the present study. Further research using specific validated measures of resilience adapted from the developmental/positive youth development literature are needed to replicate the present findings and to identify the specific behavioral characteristics associated with resilience among children with ADHD. Finally, the cross-sectional design precludes us from drawing conclusions about cause and effect, and it is likely that the child characteristics associated with resilience reflect a combination of factors that contribute to and/or are outcomes of resilience. Longitudinal and experimental designs will be important as this line of work expands.

Clinical and Research Implications

Taken together, the current findings suggest that there is a subset of resilient and even highly resilient children with ADHD, and that resilience may be the norm rather than the exception for these children. That is, despite neurodevelopmental risk and documented impairment across peer, family, and/or academic domains (e.g., Becker et al., 2012), the majority of children with ADHD demonstrate a pattern of positive adaptation to adversity in both the home and school setting, with rates that were in most cases comparable to those seen in their Non-ADHD peers. Nonetheless, there remains a sizeable minority of low-resilient children with ADHD that may be particularly at risk for adverse outcomes. The current results are therefore consistent with a growing body of evidence for heterogeneity across cognitive, behavioral, and affective domains among children with ADHD (e.g., Kofler et al., 2019), while providing initial evidence that ADHD is also characterized by heterogeneity in resilience. If replicated, these findings provide a strong empirical basis for a line of basic and applied research that applies the positive youth development framework (e.g., Masten, 2014a) to identify individual, family, and social-community assets that promote adaptive outcomes and improve treatment outcomes for children with ADHD.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Sample and Demographic Variables

Variable	ADHD (N=108)		Non-ADHD (N=98)		Cohen's *d*	*p*
	M	*SD*	*M*	*SD*		
Sex (Boys/Girls)	73/34		51/47		--	.003
Ethnicity (B/A/W/H/M)	17/0/77/8/5		10/7/59/12/10		--	.01
Oppositional Defiant Disorder (Y/N)	32/76		1/97		--	<.001
Anxiety (Y/N)	23/85		19/79		--	.73
Depression (Y/N)	5/103		4/94		--	.85
Autism (Y/N)	11/97		8/90		--	.62
Specific Learning Disability-Reading (Y/N)	13/95		3/95		--	.005
Specific Learning Disability-Math (Y/N)	19/89		3/95		--	.04
Age	10.13	1.44	10.53	1.36	0.29	.03
SES	47.91	11.45	48.57	11.87	0.06	.72
FSIQ (Standard Scores)	102.4	15.38	107.32	11.73	0.35	.01
Resilience						
BASC-3 Resiliency subscale						
Parent (T-score)	42.19	8.68	47.56	9.25	0.60	<.001
Teacher (T-score)[1]	41.94	9.15	46.72	10.76	0.48	.002
ADHD Symptoms						
ADHD-RS-4/5 Inattention						
Parent (Raw Score)	19.44	5.65	11.07	8.11	1.20	<.001
Teacher (Raw Score)[1]	17.18	5.75	10.43	7.53	1.01	<.001
ADHD-RS-4/5 Hyperactivity/Impulsivity						
Parent (Raw Score)	14.82	7.21	6.51	6.33	1.22	<.001
Teacher (Raw Score)[1]	12.35	8.47	6.26	7.05	0.78	<.001
BASC-3 Attention Problems						
Parent (T-score)	67.62	7.18	56.05	11.24	1.23	<.001
Teacher (T-score)[1]	65.29	7.55	56.01	11.02	0.98	<.001
BASC-3 Hyperactivity						
Parent (T-score)	68.53	12.93	55.37	11.34	1.08	<.001
Teacher (T-score)[1]	63.89	14.89	53.29	11.21	0.80	<.001

[1]*Note* Teacher BASC data was missing for 29 of the neurotypical children who completed the abbreviated assessment (*n*=65 Non-ADHD cases for these comparisons). BASC = Behavior Assessment System for Children. Ethnicity: B = Black, A = Asian, C = White Non-Hispanic, H = Hispanic, M = Multiracial. FSIQ Full Scale Intelligence (WISC-V Short Form), SES = Hollingshead socioeconomic status.