



Family Functioning in Children With ADHD and Subthreshold ADHD: A 3-Year Longitudinal Study

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Journal of Attention Disorders
1–13

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DOI: 10.1177/10870547231217089

journals.sagepub.com/home/jad



Abstract

Objective: To compare family functioning over time for elementary school children with Attention-Deficit/Hyperactivity Disorder (ADHD; $N = 179$) and subthreshold ADHD (ST-ADHD; $N = 86$), to children without ADHD (Control; $N = 212$). **Method:** ADHD was assessed using the Conners 3 ADHD Index and Diagnostic Interview Schedule for Children IV. At baseline, 18-month follow-up and 36-month follow-up, parents completed measures assessing a range of family functioning domains. **Results:** At baseline, the ADHD group reported higher psychological distress, less parenting self-efficacy, less parenting consistency, and more stressful life events; and both groups reported poorer family quality of life (QoL) and greater parenting anger. Trajectories were largely similar to controls (i.e., stable over time), but unlike controls, ADHD and ST-ADHD groups showed lessening parent-partner support and parenting warmth, respectively; and both groups showed worsening aspects of family QoL. **Conclusion:** Families of children with ADHD and ST-ADHD report persistently poor or worsening family functioning; highlighting a need for tailored psycho-social supports. (*J. of Att. Dis.* XXXX; XX(X) XX-XX).

Keywords

ADHD, family functioning, longitudinal, subthreshold ADHD

Attention-Deficit/Hyperactivity disorder (ADHD) is characterized by a pervasive pattern of inattention, hyperactivity and impulsivity symptoms and affects between 5 and 7% of children worldwide (Polanczyk et al., 2014). Parents report that raising a child with ADHD poses challenges for their own overall physical and mental health and life satisfaction (Peasgood et al., 2021). Over time, the economic burden related to raising a child with ADHD is 5 times that for a child without ADHD (Zhao et al., 2019), underscoring the need to better understand and support the well-being of these families. Yet, family well-being and functioning for children with ADHD has rarely been comprehensively examined, with little research tracking family functioning in this population over time.

Family psychology models emphasize family functioning as a key aspect of the socio-ecological climate that shapes child development (Fiese et al., 2019). Parent-related family functioning domains (i.e., primary caregiver characteristics, well-being, transactional processes, and contexts) are important to consider as these are central to forming a child's environment, and the difficulties children experience can impact on parent well-being and functioning (Johnston & Mash,

2001; Lange et al., 2005; Sollie et al., 2016). A number of cross-sectional studies have shown that compared to typically developing children, parents of children with ADHD report difficulties in a range of domains: greater family stress and lower quality of life (QoL) (Cussen et al., 2012; Lange et al., 2005), lower self-efficacy regarding their parenting

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role (Gohari et al., 2012; Primack et al., 2012; Rogers et al., 2009), higher psychological distress (Gau, 2007; Insa et al., 2018), less optimal parenting styles (Alizadeh et al., 2007; Bhide et al., 2019; Chang et al., 2013; Ellis & Nigg, 2009; Gau & Chang, 2013), and strained inter-parental relationships (Weyers, Zemp, & Alpers, 2019). There is also evidence that greater family adversity and stressful life events are associated with symptoms and risk of ADHD (Counts et al., 2005; Pheula et al., 2011; Rydell, 2010). However, much research to date has been cross-sectional, preventing examination of changes in family functioning over time, associated with developmental demands of the child and other life transitions.

Little research has tracked family functioning for children with ADHD over time. One study found some improvements in family satisfaction and family behavior controls (e.g., supervision to child, family organization) over an 18-month period for families of children with ADHD (aged 4–18 years old with an existing ADHD diagnosis) who had received a case management intervention, relative to non-intervention families (Churchill et al., 2018). However the wide age range of the sample used in this study, limits age-specific considerations in family functioning. Another study found evidence for a dynamic and bidirectional relationship involving negative mutual influences between ADHD symptoms and family functioning domains (including parent psychopathology, life stress and parenting style) for children with behavior problems followed annually from ages 3 to 6 years old (Breux & Harvey, 2019). The study highlights the importance of applying a developmental perspective when examining family functioning, however the absence of an ADHD-specific sample in this study, limits inferences about how family functioning relates to children with ADHD relative to children with behavior problems more broadly. Such information can be valuable in identifying areas of unmet need unique to families of children with ADHD.

In addition to full threshold ADHD, there is emerging interest in less severe forms of ADHD. Subthreshold disorders are conceptualized as conditions that have relevant symptoms which fall below the criteria for formal diagnosis (Balázs & Keresztény, 2014). A systematic review (Balázs & Keresztény, 2014) and our subsequent research (Efron et al., 2020) has shown that children with ST-ADHD have meaningful interpersonal, educational, emotional-behavioral and functional difficulties compared to children without ADHD. To our knowledge, the only study to examine family functioning for children with ST-ADHD was a cross-sectional study comparing 449 children aged 6 to 12 years with ADHD, ST-ADHD and non-ADHD controls. While children with ADHD had greater difficulties than non-ADHD controls on the Family Assessment Device, a composite measure of family dysfunction, children with ST-ADHD did not differ from controls on this measure

(Scahill et al., 1999). The wide age range of children included in this study, similar to previously described research above (Churchill et al., 2018), limits consideration of any developmentally sensitive impacts on family functioning. To our knowledge, no published study has examined family functioning as it relates to ST-ADHD using a longitudinal design and a same-age sample. We address these limitations in the current study.

ADHD is most commonly diagnosed after elementary school entry, when increasing demands impact children and families. Examining the relationship and role of ADHD and ST-ADHD with family functioning at this stage of the child's development offers an opportunity to understand ADHD-specific associations with family functioning and guide assessment, early intervention, and prevention. Further, examining ST-ADHD as a separate group, might shed light on family functioning for this group of children who may miss out on an ADHD diagnosis. This in turn may be important in determining whether families of children with ST-ADHD may benefit from the same types of interventions as full diagnosis children.

Aims

The current community-based study aimed to compare family functioning over a 3-year period among elementary school-aged children with ADHD and ST-ADHD, to non-ADHD controls. Parent-reported measures were used to assess family functioning in multiple domains including: family QoL, parent distress, parenting self-efficacy, parenting style, stressful life events, and parent-partner relationship. We aimed to: 1) compare family functioning at age seven (baseline) for the ADHD and ST-ADHD groups to non-ADHD controls; and 2) compare trajectories of family functioning from baseline to 18-month follow-up, and from baseline to 36-month follow-up, for the ADHD and ST-ADHD groups to non-ADHD controls. We hypothesized that parents of children with ADHD would experience more strained family functioning compared to non-ADHD controls across all domains. No hypotheses were made regarding parents of children with ST-ADHD, or trajectories of family functioning over time, due to the paucity of research.

Methods

Study Design, Setting, and Recruitment

This study is a sub-study of the Children's Attention Project (CAP), a community-based longitudinal cohort study (Sciberras et al., 2013). The study was approved by the Human Research Ethics Committee of the Royal Children's Hospital (#31056) and the Department of Education and Early Childhood Development (#2011_001095), Victorian Government.

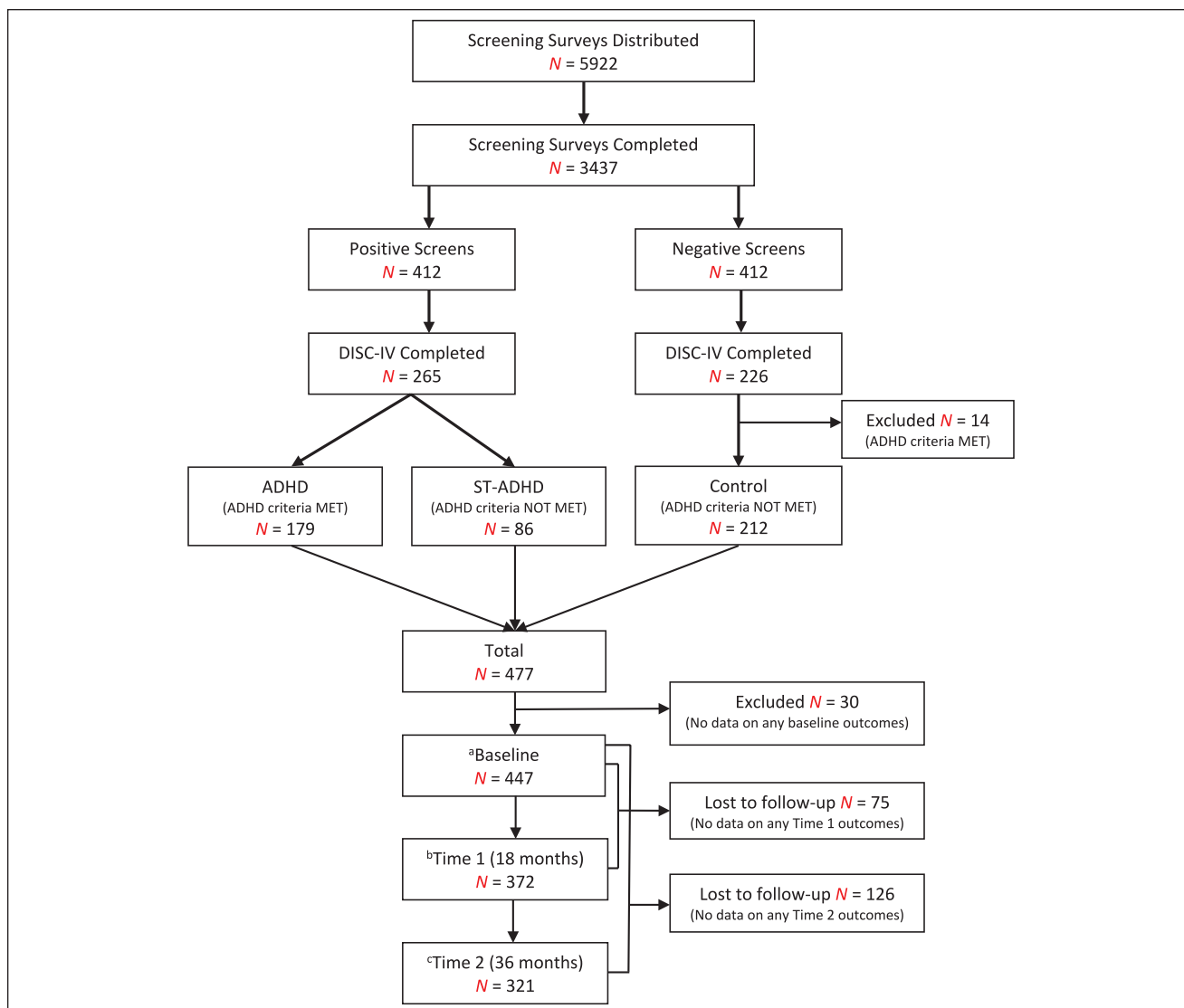


Figure 1. Flow of participants through the longitudinal study.

Note. Participants lost to follow-up were defined as those with no data on any outcome variable at the respective time points: ^aAt baseline, ADHD N = 167; ST-ADHD N = 78; Control N = 202.

^bAt 18 months, ADHD N = 136; ST-ADHD N = 68; Control N = 168.

^cAt 36 months, ADHD = N 122; ST-ADHD N = 59; Control N = 140.

We screened and recruited two cohorts of Grade 1 children (aged 6–8 years old in their second year of formal education), their parents and teachers from consecutive years (2011 and 2012) of enrolments across 43 schools across metropolitan Melbourne, Australia. Accordingly, all data collection (i.e., baseline assessment, 18-month follow-up and 36-month follow-up) for this study was completed by late 2015, and was not impacted by the 2020 global pandemic. Children were excluded if they had an intellectual disability, severe medical condition, genetic disorder, moderate-severe sensory impairment, or neurological disorder. Non-English speaking families were also excluded.

Procedure

Participant flow is shown in Figure 1 with further details described in previous papers (Sciberras et al., 2013). Screening surveys, which included the Conners 3 ADHD Index (Conners, 2008), were distributed to 5,922 children at schools to take home. Where the parent returned their survey and provided consent for teacher participation, teachers also completed the Conners 3 ADHD Index. Children screened as positive or negative for ADHD based on parent and teacher scores, were invited to participate in the study. The study involved baseline assessment, 18-month follow-up, and 36-month follow-up, with the

parent completing the US National Institute of Mental Health (NIMH) Diagnostic Interview Schedule for Children IV (DISC-IV) (Shaffer et al., 2000) at baseline to confirm the child's diagnostic status.

Screening. Parent and teacher screening surveys were received for 3,734 children. Children who were reported by parents as having previously been diagnosed with ADHD, or those scoring equal to or above selected cut-off point (girls: 75th percentile, boys: 80th percentile) on *both* parent and teacher Conners 3 indices were screened as positive for ADHD. Children with no previous ADHD diagnosis and scoring below the selected Conners cut-off points by *both* parent and teacher report, were classified as negative screens. All positively screened children ($n=412$), and a matched (by sex and school) negatively screened child ($n=412$) were invited to participate in the longitudinal study. Of these, 265 positive screens and 226 negative screens consented to participate ($n=491$).

Diagnostic Case Confirmation. The DISC-IV (Shaffer et al., 2000) was used to confirm ADHD status at baseline. There is considerable variation in the definitions and instruments used to classify subthreshold ADHD in the literature, however much research has used an approach of assessing elevated ADHD symptoms that fall short of meeting full DSM-IV ADHD criteria on the DISC-IV (Balázs & Keresztény, 2014; Cho et al., 2009; Efron et al., 2020). The current study utilized a similar approach such that positively screened children who met full criteria for ADHD on the DISC-IV were classified as ADHD ($n=179$), and positively screened children who did not meet full ADHD criteria were classified as ST-ADHD ($n=86$). Negatively screened children not meeting criteria for ADHD were classified as non-ADHD controls ($n=212$), and negatively screened children meeting ADHD criteria were excluded ($n=14$), resulting in a final sample of 477 children.

Measures

Measures used in this study were all parent-reported (unless otherwise noted), and with the exception of the DISC-IV, all were collected at baseline, 18-month follow-up, and 36-month follow-up.

ADHD Symptoms and Criteria. The Conners 3 ADHD index (Conners, 2008) is a 10-item scale assessing ADHD symptoms rated on a 4-point Likert scale from 0 (*never/seldom*) to 3 (*very often/very frequent*) that was completed by parents and teachers in this study. Greater scores indicate greater levels of ADHD symptoms severity, with good validity and reliability (Conners et al., 1998; Westerlund et al., 2009).

The DISC-IV uses an algorithm-based approach to assess DSM-IV based criteria for ADHD and externalizing

disorders including Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD). Acceptable reliability and moderate-to-good criterion validity have been demonstrated for the DISC-IV (Shaffer et al., 2000).

Family QoL. The parent-reported Child Health Questionnaire (CHQ) (Landgraf et al., 1996) was used to assess family QoL. Three subscales were analysed examining the impact of child well-being and behavior on parent's emotional worry (parent impact-emotional; 2 items; Cronbach's alpha (α)=.80), on parents' time (parent impact-time; 2 items; α =.88); and on family activities (6 items; α =.90). Items were rated on a 5-point Likert scale from 0 (*none/never*) to 4 (*a lot/very often*), with mean subscale scores transformed to a scale from 0 (*worst health*) to 100 (*best health*). The CHQ has been shown to demonstrate good psychometric properties (Waters et al., 2000).

Parent Psychological Distress. The Kessler-6 (K-6; 6 items; α =.86) is a reliable and valid (Furukawa et al., 2003) self-reported measure of psychological distress, with items rated on a 5-point Likert scale from 0 (*none of the time*) to 4 (*all of the time*). Total scores range from 0 to 24 with higher values indicating greater psychological distress.

Parenting Style. Three scales from the Longitudinal Study of Australian Children (LSAC) (Zubrick et al., 2014) were used to assess parenting warmth, consistency and anger with moderate-to-strong reliability over time and acceptable-to-good validity. Warmth scale (6 items; α =.89) was rated from 1 (*never/almost never*) to 5 (*always/almost always*). Consistency scale (6 items; α =.73) and Anger scale (5 items; α =.73) were rated from 1 (*never/almost never*) to 5 (*all the time*). As determined in LSAC analyses, weights were applied to items to adjust for the degree of measurement error associated with each item. Higher scores indicate greater levels of each parenting dimension.

Parenting Self-efficacy. The LSAC single-item global parenting efficacy scale (Zubrick et al., 2014) assessed overall parent-perceived ability on a 5-point Likert scale ranging from 1 (*not very good at being a parent*), 2 (*a person who has some trouble being a parent*), 3 (*an average parent*), 4 (*a better than average parent*) to 5 (*a very good parent*). Higher scores indicate greater parenting self-efficacy.

Parent-Partner Relationship. Two LSAC scales (Zubrick et al., 2014) were completed if parents reported having a partner; conflict scale (3-items; α =.84) and support scale (4 items; α =.77) were rated on a 5-point Likert scale from 1 (*never*) to 5 (*always*). Higher summed item scores on each scale reflect greater levels of conflict and support respectively.

Stressful Life Events. The List of Threatening Experiences (LTE-Q; 12 items; $\alpha = .53$) assessed the experience of common stressful life events (i.e., Parent illness/injury/assault, Close family member illness/injury/assault, Death of partner or child's grandparent, Death of close friend/family member, Parent separation/relationship end, Serious problem with a family member/close friend/neighbor, Parent/partner lost job, Major financial difficulties, Parent/close family member had trouble with police, Valuables lost/stolen, Moved house, Parent becoming pregnant/having a child) in the past 12 months using dichotomous ratings of yes (1) or no (0) (Brugha et al., 1985). Summed scores ranged from 0 to 12 with higher scores indicating greater adverse life events. The LTE-Q has good test-retest reliability and criterion validity (Brugha & Cragg, 1990).

Socio-Demographic and Other Information. Parents provided the following socio-demographic information: age, sex, single-parent status (yes/no) at each time point, highest level of education at baseline (not completed high school, completed high school, completed university), and whether their child was taking ADHD medication (yes/no) at baseline.

Statistical Analyses

Analytic Sample Selection. Preliminary examination of data following screening and diagnostic case confirmation revealed that of the 477 participants, 30 were missing baseline data for all study outcome variables. After exclusion of these participants the final analytic sample size was 447 (ADHD, $N=167$; ST-ADHD, $N=78$; non-ADHD control, $N=202$). Baseline sample characteristics were reported for the included sample by group, and based on whether participants provided data at follow-up.

Analyses of parent-partner relationship variables (conflict, support) were undertaken with a sub-sample of 280 parents (ADHD, $N=100$; ST-ADHD, $N=55$; Control, $N=125$) who completed the single-parent status (yes/no) measure at all three time points. This ensured that only those parents with known relationship status at all three time points were included, and, therefore, that the conflict and support scales were appropriately analysed for only those parents in a couple relationship at a given time point.

Longitudinal Analyses. First, we plotted means for the ADHD, ST-ADHD, and control groups at each time point for the family functioning variables collected from the full analytic sample (i.e., not including the parent-partner relationship variables). Next linear mixed regression models estimated using restricted maximum likelihood (REML) were fitted to examine group differences in family functioning (aim 1) and their trajectories (aim 2), analyzing the outcomes as repeated measures. For the 11 outcome variables, the mixed

model was fitted with group (ADHD, ST-ADHD, and control) as the between-subjects factor, time (baseline, 18-month follow-up, and 36-month follow-up) as the within-subjects factor and an interaction term between group and time. Models allowed for the correlation between observations from the same participant. In each model, the control group and baseline served as the reference group and reference time point, respectively. Comparisons between ADHD and ST-ADHD were not conducted as these were outside the scope for this study. Primary analyses were adjusted for child age, sex, parent's education, child externalizing disorder, and parent's single-status (this variable was not included as a covariate for the analysis of parent-partner relationship variables). Unadjusted models were also fitted.

Regression coefficients for the main effect of group indicate the mean difference for the ADHD and ST-ADHD groups compared to the control group at baseline. Regression coefficients for the main effect of time indicate the mean change in the outcome variables for the control group from baseline to each follow-up (18-months and 36-months). Coefficients of interaction terms indicate the extent to which the ADHD and ST-ADHD groups differ from the control group in their change from baseline to each follow-up. Where interactions were significant, change from baseline for the ADHD and ST-ADHD groups was calculated from the coefficients of the main effect of time and the coefficients of the interaction effects to determine the absolute magnitude and direction of trajectory for those groups, and these results are reported in-text. Analyses were undertaken in StataSE 16 (Stata Corp, College Station, TX).

Results

Sample Characteristics

Descriptive statistics on baseline characteristics of the included sample ($N=447$) by group are reported in Table 1. Average age of children was similar across all groups. For children in the ADHD and control groups, there was a higher proportion of males than females; and for children in the ST-ADHD group, the proportion of males and females was more even with a slightly higher proportion of females. Parents across all groups were largely females. Amongst the three groups, at baseline, parents in the ADHD group had the highest rate of not having completed high school, lowest rate of completing university, and were more frequently from single-parent households. Additionally, further examination revealed a pattern of a higher proportion of families in the ADHD group reporting stressful life events at baseline (e.g., parent illness/injury/assault, parent separation/relationship end, major financial difficulties, moving houses) relative to the ST-ADHD and the Control group, as shown in Supplemental Table S1.

Table 1. Descriptive Statistics of the Included Sample at Baseline by Group.

	Included sample (N = 447)		
	ADHD (N = 167)	ST-ADHD (N = 78)	Control (N = 202)
Child characteristics			
Age, mean (SD)	7.3 (0.4)	7.3 (0.4)	7.3 (0.4)
Male child, <i>n</i> (%)	117 (70.1)	35 (44.9)	129 (63.9)
ADHD symptom severity, mean (SD)	13.7 (4.1)	9.8 (3.6)	1.3 (1.8)
Externalizing disorder, <i>n</i> (%)	91 (54.5)	20 (24.6)	16 (7.9)
ADHD medication, <i>n</i> (%)	21 (12.6)	0 (0)	0 (0)
Parent and family characteristics			
Age, mean (SD)	37.2 (5.8)	39.5 (5.8)	38.9 (5.4)
Female, <i>n</i> (%)	159 (95.2)	72 (92.3)	186 (92.1)
Highest education level			
Parent did not complete high school, <i>n</i> (%)	62 (37.1)	19 (24.4)	37 (18.3)
Completed high school, <i>n</i> (%)	64 (38.3)	27 (34.6)	70 (34.7)
Completed university education, <i>n</i> (%)	41 (24.6)	32 (41.0)	95 (47.0)
Single-parent family, <i>n</i> (%)	42 (25.2)	12 (15.4)	23 (11.4)

Baseline characteristics of participants lost to follow-up were largely similar to those who provided data at follow-up time points, as shown in Supplemental Table S2, with a small number of exceptions. Participants lost to follow-up after 18-months ($n=75$, 16.8%) and 36-months ($n=126$, 28.2%) from baseline, had, at baseline, higher rates of parents not completing high school and lower rates of university completion. Participants lost to follow-up after 18-months from baseline also had, at baseline, a greater proportion of children taking ADHD medication and were more frequently from single-parent households. Given that only a small number of children in the sample were taking ADHD medication at baseline ($n=21$, 4.7% of included sample), and a sensitivity analyses additionally adjusting for ADHD medication status at baseline revealed no changes to the pattern of results, we have reported results only from our main analyses.

Group Differences at Baseline (Aim 1)

Results from adjusted analyses are reported in Table 2; and unadjusted analyses in Supplemental Table S3. The results below primarily refer to adjusted analyses and any reference to unadjusted analyses is indicated in-text.

Main effects for the ADHD group on 8 of the 11 baseline outcomes variables were found. Specifically, relative to controls, the ADHD group reported poorer family QoL (i.e., greater parent impact-emotional, parent impact-time and impact on family activities), greater parent distress, less parenting self-efficacy, greater parenting anger and less consistency, and more stressful life events. There were no main effects of the ADHD group on parenting warmth, parent-partner conflict and parent-partner support (all $p \geq .05$), but a main effect of the ADHD group on these outcomes was found in unadjusted analyses. Further examination

of covariates in adjusted models revealed co-occurring externalizing disorders was a predictor of parenting warmth, and parent-partner conflict ($p = .05$, $p = .008$, respectively).

At baseline, a main effect of the ST-ADHD group was found on 4 of the 11 baseline outcome variables. In particular, relative to controls, the ST-ADHD group reported poorer family QoL (parent-impact time, parent-impact emotional, family activities) and greater parenting anger. There were no main effects of the ST-ADHD group on the remaining baseline outcome variables. However, in unadjusted analyses, there was a main effect of the ST-ADHD group on parent distress and parenting self-efficacy, with further examination revealing co-occurring externalizing disorders as a predictor in adjusted models for these outcomes ($p = .001$, $p = .05$, respectively).

Trajectories Over Time (Aim 2)

An overall pattern of lower mean ratings for positive family functioning measures, and higher mean ratings on negative family functioning measures was evident for the ADHD and ST-ADHD groups compared to controls (see Figure 2). While not part of the planned analyses, an inspection of mean outcome ratings between the ST-ADHD and ADHD groups showed that the ST-ADHD group had a pattern of slightly better family functioning compared to the ADHD group over time (see Figure 2).

There were largely no main effects of time, indicating that for the control group, family functioning was stable over time (i.e., family functioning at follow-up time points did not differ from baseline), but there were a small number of exceptions. Specifically, at 18-month follow-up the control group reported less parent impact-emotional and less parenting self-efficacy compared to baseline, and at

Table 2. Adjusted Analyses Comparing Family Functioning for the ADHD and ST-ADHD Groups With the Control Group.

Group	Family quality of life ^a				Parenting style ^a				Parent-partner relationship ^b															
	Emotional impact		Time impact		Family impact		Parent distress ^a		Parenting self-efficacy ^a		Warmth		Consistency		Anger		Stressful life events ^a		Conflict		Support			
	β [95% CI]		β [95% CI]		β [95% CI]		β [95% CI]		β [95% CI]		β [95% CI]		β [95% CI]		β [95% CI]		β [95% CI]		β [95% CI]		β [95% CI]		β [95% CI]	
ADHD	-32.7*** [-37.9, -27.4]		-16.5*** [-21.7, -11.3]		-20.4*** [-24.6, -16.2]		1.72*** [0.86, 2.58]		-0.48*** [-0.68, -0.27]		-0.07 [-0.20, 0.07]		-0.25*** [-0.42, -0.08]		0.53*** [0.39, 0.67]		0.53*** [0.22, 0.83]		0.73 [-0.14, 1.60]				-0.62 [-1.25, 0.01]	
ST-ADHD	-15.6*** [-21.8, -9.49]		-8.72** [-14.8, -2.65]		-8.60** [-13.5, -3.70]		0.85 [-0.14, 1.84]		-0.18 [-0.41, 0.06]		0.09 [-0.07, 0.24]		-0.10 [-0.30, 0.10]		0.23** [0.07, 0.39]		-0.01 [-0.37, 0.36]		0.79 [-0.16, 1.75]				-0.35 [-1.04, 0.35]	
Time																								
T1	3.58* [0.06, 7.09]		1.65 [-1.99, 5.29]		2.09 [-0.49, 4.68]		-0.34 [-0.85, 0.17]		-0.16** [-0.27, -0.04]		-0.05 [-0.12, 0.02]		0.08 [-0.03, 0.18]		-0.08 [-0.17, 0.001]		-0.16 [-0.41, 0.08]		-0.17 [-0.58, 0.25]				0.13 [-0.18, 0.45]	
T2	1.38 [-2.30, 5.06]		3.54 [-0.28, 7.36]		1.50 [-1.21, 4.21]		-0.05 [-0.59, 0.50]		-0.06 [-0.18, 0.07]		-0.09* [-0.17, -0.02]		0.03 [-0.08, 0.13]		-0.12** [-0.20, -0.03]		-0.17 [-0.43, 0.09]		0.17 [-0.24, 0.58]				-0.13 [-0.44, 0.18]	
Group × time																								
ADHD × T1	-3.72 [-9.03, 1.60]		-5.83* [-11.3, -0.33]		-2.56 [-6.46, 1.34]		-0.18 [-0.95, 0.58]		-0.02 [-0.20, 0.16]		-0.07 [-0.18, 0.03]		0.06 [-0.10, 0.21]		0.03 [-0.09, 0.16]		-0.24 [-0.61, 0.12]		0.33 [-0.31, 0.97]				-0.55* [-1.04, -0.06]	
ADHD × T2	5.17 [-0.24, 10.6]		-2.44 [-8.06, 3.17]		-0.39 [-4.37, 3.59]		0.05 [-0.76, 0.85]		-0.04 [-0.22, 0.14]		-0.07 [-0.18, 0.04]		-0.01 [-0.17, 0.15]		0.01 [-0.12, 0.13]		-0.36 [-0.74, 0.02]		0.18 [-0.46, 0.83]				-0.03 [-0.52, 0.46]	
ST-ADHD × T1	-9.63** [-16.2, -3.07]		-5.13 [-11.9, 1.65]		-2.74 [-7.56, 2.08]		0.62 [-0.34, 1.57]		0.04 [-0.17, 0.26]		0.01 [-0.12, 0.14]		-0.12 [-0.31, 0.07]		0.03 [-0.13, 0.18]		0.24 [-0.22, 0.69]		0.51 [-0.26, 1.27]				-0.56 [-1.15, 0.02]	
ST-ADHD × T2	-5.94 [-12.8, 0.87]		-8.02* [-15.1, -0.97]		-1.74 [-6.75, 3.26]		0.47 [-0.54, 1.48]		-0.05 [-0.27, 0.18]		-0.23** [-0.37, -0.09]		-0.09 [-0.29, 0.10]		0.07 [-0.09, 0.23]		0.02 [-0.47, 0.50]		0.15 [-0.63, 0.93]				-0.41 [-1.00, 0.18]	

Note. β = regression coefficient; CI = confidence interval; T1 = time 1 (18 months); T2 = time 2 (36 months); ADHD = Attention Deficit/Hyperactivity Disorder group; ST-ADHD = Subthreshold Attention Deficit/Hyperactivity Disorder group. Bold face denotes statistical significance. *p < .05. **p < .01. ***p < .001.

^aN = 447; Adjusted for child age, gender, externalizing disorder, parent education, and single-parent status.

^bN = 280; Adjusted for child age, gender, externalizing disorder, and parent education.

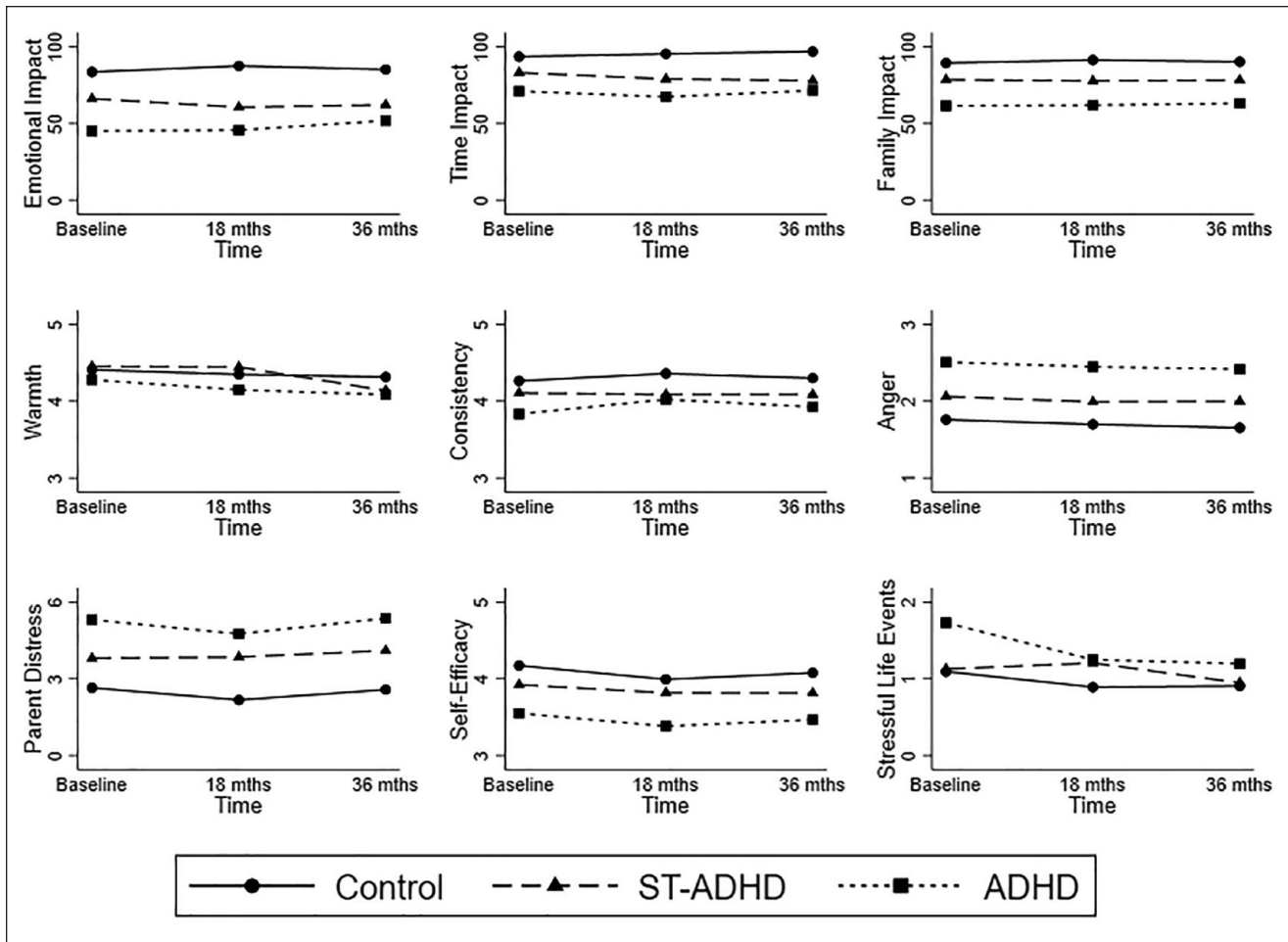


Figure 2. Outcome means for the Control, ST-ADHD and ADHD groups at each time point.

Note. Score range for family QoL scales = 0 to 100; range for parenting style scales and parenting self-efficacy = 1 to 5; range for parent distress = 0 to 24; and range for stressful life events = 0 to 12.

36-month follow-up, the control group reported less parenting warmth and less parenting anger compared to baseline.

Most interaction terms were non-significant ($p \geq .05$) indicating that trajectories of family functioning for the ADHD and ST-ADHD groups were generally similar to controls (i.e., stable over time), with a few exceptions. Where interaction terms were significant ($p < .05$), further scrutiny revealed that between baseline and 18-month follow-up, the ADHD group had more negative trajectories of parent impact-time and parent-partner relationship support (regression coefficient (β) = -4.18, β = -0.42, respectively) compared to controls (β = 1.65, β = 0.13, respectively); and the ST-ADHD group had a more negative trajectory of parent impact-emotional (coefficient (β) = -6.05) compared to controls (β = 3.58). Between baseline and 36-month follow-up, the ST-ADHD group had more negative trajectories of parent impact-time and parenting warmth (β = -4.48, β = -0.32, respectively) as compared to controls (β = 3.54, β = -0.09, respectively).

Discussion

We aimed to compare family functioning over time for children with ADHD and ST-ADHD to non-ADHD controls. Relative to controls at baseline, parents reported more strained family functioning in the ADHD group in several domains (i.e., all family QoL subdomains, parent distress, parenting self-efficacy, parenting consistency, parenting anger, stressful life events), and in the ST-ADHD group in some domains (i.e., all family QoL subdomains, parenting anger). Over time, trajectories of family functioning were largely similar to controls (i.e., stable over time), except some for the ADHD group (parent-impact time, parent-partner support) and for the ST-ADHD group (parent-impact emotional, parent-impact time, parenting warmth) were more negative than controls (i.e., worsening over time). Findings of this study are broadly consistent with the limited past longitudinal research showing a negative mutual relationship between ADHD symptoms and

family functioning over time, and research suggesting a role for supportive interventions in improving aspects of family function over time (Breux & Harvey, 2019; Churchill et al., 2018).

Adding to previous research in ADHD (Cussen et al., 2012; Lange et al., 2005; Peasgood et al., 2021), our results showed that not only ADHD, but also ST-ADHD was associated with poorer family QoL (i.e., greater parent-impact emotional, parent-impact time, and limitations to family activity) relative to controls. Specifically, parents in both groups identified their child's emotional, behavioral, and learning difficulties as a source of emotional worry, and reported a negative impact of these difficulties on time available for their own personal needs, as well as on limiting and interrupting every-day family activities. Furthermore, unlike controls, both groups showed a trajectory of worsening family QoL, in terms of impact on parent's time (i.e., an increasing pattern over 18 months for ADHD group, and over 36 months for the ST-ADHD group), and the ST-ADHD group also showed increasing emotional impact on parents over 18 months. These worsening trajectories may be associated with increasing challenges in managing ADHD-related difficulties, and co-occurring disorders, as children progress through elementary school.

We found higher parenting anger for children with ADHD and ST-ADHD relative to controls. This is consistent with previous research in ADHD (Alizadeh et al., 2007; Bhide et al., 2019; Chang et al., 2013; Cussen et al., 2012), and extends this to include ST-ADHD and consider trajectories over time. Over 36 months, there was less parenting anger reported by the control group, which might be associated with age-related changes in autonomy granting and limit setting. Results suggest the ADHD and ST-ADHD groups may share a similar absolute trajectory of lessening parenting anger, but there remains a relative or rank order stability with higher levels of parenting anger in these groups over time relative to controls (Loeber et al., 2000). Past literature refers to reciprocal cycles of influence between child and parent factors that reinforce and maintain both child difficulties and parenting challenges (Burke et al., 2008). Our results suggest that such transactional processes may also take place in less severe presentations of ADHD including ST-ADHD, and potentially indicate areas for early detection and intervention.

Parents in the ADHD group also reported greater parent psychological distress, less parenting self-efficacy, and less parenting consistency relative to controls at baseline. This is in line with previous cross-sectional research (Ellis & Nigg, 2009; Gau, 2007; Gohari et al., 2012; Insa et al., 2018; Primack et al., 2012; Rogers et al., 2009; Sollie et al., 2016), and our data show that these differences are maintained over time such that parents of children with ADHD continue to experience challenges in these domains relative

to parents of non-ADHD children. ADHD-related challenging symptoms and behaviors may contribute to negative parent perceptions of their parenting skills, and interfere with consistent parenting. There was also some evidence of higher parent distress and lower parenting self-efficacy in the ST-ADHD group prior to adjustment of externalizing disorders. Co-occurring externalizing disorders may to some extent overshadow less severe ADHD presentations to impact on parent mental well-being and parenting self-efficacy. Over 18-months from baseline, there was a decline in parenting self-efficacy reported by the control group, which appeared to be shared by the ADHD and ST-ADHD group and may correspond at a broader level with changing parenting duties related to increments in child age and education level (Gohari et al., 2012).

Consistent with previous research (Alizadeh et al., 2007; Bhide et al., 2019; Gau & Chang, 2013; Weyers et al., 2019) there was some evidence of lower parenting warmth, higher parent-partner conflict and less parent-partner support in the ADHD group compared to controls in unadjusted analyses. In the current study, the attenuation of effects of ADHD on parenting warmth and parent-partner conflict appeared to be driven by adjustment of co-occurring externalizing disorders. Managing ODD or CD in addition to ADHD may have stronger detrimental impacts on parenting warmth and interparental relationships than ADHD alone (Williamson & Johnston, 2016). Over time, relative to controls, the ADHD group showed a lessening pattern of parent-partner support over 18-months from baseline, and the ST-ADHD group showed a steeper decline in parenting warmth over 36-months from baseline. More longitudinal research examining parent-partner relationship quality and parenting warmth is required to better understand and clarify ADHD-specific associations with these constructs over time.

Parents of children with ADHD recorded a greater total number of stressful life events (e.g., parent illness/injury/assault, major financial crisis) than controls at baseline, and there was no evidence of group differences in trajectories over time. These findings support past research showing associations between family adversity and ADHD (Counts et al., 2005; Pheula et al., 2011; Rydell, 2010), and suggest that over time, families of children with ADHD continue to experience more stressful life events relative to controls. Our measure of stressful life events elicited events occurring in the past 12 months, and, therefore, scores at follow-up time points reflect new events since baseline. Our findings highlight the importance of assessing the lifetime history of stressful life events for families of children with ADHD in order to understand both acute and chronic impacts of recent and past stressors, and inform selection of appropriate psychosocial interventions.

This study had a number of limitations. Our study did not have a measure of parent's ADHD symptoms, and therefore could not take into account the influence of these symptoms

on family functioning, with past research showing higher vulnerability for poorer family functioning for these groups (Moen et al., 2015, 2016). Furthermore, the study did not include the perspectives of other family members (i.e., child themselves or siblings); future research may consider including perspectives from the full family. We utilized abbreviated scales (e.g., single-item parenting self-efficacy scale, 2-item parent impact-emotional subscale) in the interest of minimizing participant burden, but future research may consider using more comprehensive measures. Our findings also suggested a potential role of co-occurring externalizing disorders in driving associations with certain family functioning domains in ADHD, and while outside the scope of this paper, future research may explore associations between symptom severity (including co-occurring externalizing disorders) and family functioning trajectories. Our study relied on ADHD group definitions at baseline and did not examine the role of potential changes in ADHD grouping over time, and there was a high attrition rate (28.2%) at 36-month follow-up. We did not run power analyses prior to this study, therefore it is unclear if the study had adequate power to detect small to moderate effects. Finally, we did not assess any interventions that families may have accessed during the study.

Potential differences in family functioning between ADHD subtypes were not examined in this study and may be an important direction for future research to better understand the relationship between ADHD presentations and family functioning over time. Notably, there were slightly more females (~55%) than males (~45%) in the ST-ADHD group. This together with previous research showing that children with ADHD predominantly inattentive presentation are more likely to be female (Weiss et al., 2003), could indicate possible underreporting of difficulties for these children where some symptoms may not be easily observable. This in turn may suggest a need for further efforts toward recognizing and facilitating access to clinical supports for families of children with ST-ADHD.

The National Institute for Health and Care Excellence (NICE, 2018) guidelines for ADHD encourage family members or carers “to seek an assessment of their personal, social and mental health needs, and to join self-help and support groups if appropriate” (NICE, 2018, p. 15). Similarly, the American Academy of Child and Adolescent Psychiatry (AACAP) recommends assessment of family functioning, history and psychosocial stressors in ADHD (Pliszka & AACAP Work Group on Quality Issues, 2007). However, comprehensive assessment of areas of family functioning (e.g., family QoL, parent well-being) and psychosocial support may not be routinely delivered in clinical practice. In the updated 2019 American Academy of Pediatrics guidelines, a need for further research into psychosocial interventions for ADHD and ways to improve adherence to these was identified (Wolraich et al., 2019). For this purpose, co-design approaches to interventions may be important to ensure that

the experiences and needs of families with ADHD are being adequately considered. We recently completed a co-design process for a mindful parenting program for parents of children with ADHD (Ruuskanen et al., 2019) which might have flow on benefits for helping parents with their own emotions in the context of challenging ADHD-related symptoms while also supporting their general psychological well-being and family QoL. Furthermore, clinicians may choose to prioritize specific parenting intervention techniques that have been identified in a recent meta-analysis as relating to better parenting sense of competence, parent mental health, and a decrease in negative parenting (Dekkers et al., 2021).

To our knowledge, this study is amongst the first longitudinal studies to examine a range of family functioning domains in an elementary school-aged sample of children with ADHD and ST-ADHD. Our results indicate that overall family functioning is worse for children with ADHD compared to controls in multiple domains; with this pattern largely persisting over time. Moreover, in some domains, challenges reported by parents appear to worsen in the short-term relative to controls, particularly relating to the impact on parent’s time and parent-partner support. The study also adds to the small body of literature investigating family functioning in ST-ADHD. Importantly, parents for this group of children reported poorer family QoL and parenting anger compared to controls, and a worsening pattern of emotional impact on parents in the short-term, and on their time and parenting warmth in the long-term. This suggests that similar to children with ADHD, there might be a role for psychosocial intervention and support for children with ST-ADHD. More longitudinal research and continued effort towards understanding ways to best support and improve family functioning for children with ADHD and ST-ADHD is warranted. Screening for ST-ADHD, comprehensive family assessment and co-design approaches to psychosocial interventions in ADHD might help improve the well-being of these families.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study is part of the Children’s Attention Project funded by the Australian National Health & Medical Research Council (NHMRC; Project Grant No. 1008522) and the Victorian Government Operational Infrastructure Scheme. A/Prof. Efron was supported by a Clinician Scientist Fellowship from the Murdoch Children’s Research Institute. Prof. Ukoumunne was supported by the National Institute for Health and Care Research Applied Research Collaboration South West Peninsula. The views expressed in this publication are those of the author(s) and not necessarily those of the National Institute for Health and Care

Research or the Department of Health and Social Care. Prof. Anderson was funded by an NHMRC Senior Practitioner Fellowship (No. 607333; 2015–2019). Prof. Nicholson was funded by the Roberta Holmes Chair for Contemporary Parenthood at La Trobe University. A/Prof. Sciberras is funded by an NHMRC Early Career Fellowship in Population Health (No. 1037159; 2012–2015) and an NHMRC Career Development Award (No. 1110688; 2016–2019). Funders had no role in study design, data collection, data analysis, and interpretation, nor in the preparation of the manuscript or decision to submit for publication.

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Data Availability

To access research materials related to this study, please email corresponding author.

Supplemental material

Supplemental material for this article is available online.

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