

Treatment Trajectories of Methylphenidate versus Risperidone in Preschool ADHD: A 12-Week Retrospective Study



Cihan ASLAN

ABSTRACT

Objective: The objective of this study was to evaluate and compare the 12-week trajectories of symptom change and functional outcomes associated with methylphenidate and risperidone monotherapies in preschool-aged children with ADHD across four sequential evaluation points.

Method: This naturalistic, non-randomized retrospective chart review, in which treatment allocation was based on routine clinical practice, analyzed clinical data from 38 drug-naïve male preschool children (aged 52–72 months) who completed a 12-week monotherapy regimen (methylphenidate, n=20; risperidone, n=18). Treatment outcomes were assessed at baseline (T0), week 3 (T1), week 6 (T2), and week 12 (T3) using the Conners' Parent Rating Scale-Revised Short Form (CPRS-R:S) and the Strengths and Difficulties Questionnaire (SDQ).

Results: Two-way repeated measures ANOVAs indicated no statistically significant Time × Group interactions for any CPRS-R:S subscales ($p > 0.05$), with both monotherapies showing a parallel, significant reduction in core ADHD symptoms that stabilized after week 6 ($T0 > T1 > T2 = T3$). In contrast, significant Time × Group interactions were observed across multiple SDQ dimensions ($p < 0.05$). In the methylphenidate group, significant reductions in global behavioral difficulties were observed by week 3, whereas the risperidone group showed a more gradual trajectory, with improvement in conduct problems becoming evident after week 6 and improvement in emotional symptoms becoming evident at week 12.

Conclusion: Both methylphenidate and risperidone monotherapies were associated with substantial reductions in core diagnostic ADHD symptoms over 12 weeks in preschool children. However, they demonstrated distinct trajectories across broader functional domains: functional improvement emerged earlier in children receiving methylphenidate, whereas children receiving risperidone showed a more gradual and time-dependent pattern of behavioral improvement.

Keywords: Attention deficit-hyperactivity disorder, methylphenidate, preschool children, risperidone

INTRODUCTION

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder that emerges in childhood and is characterized by symptoms of inattention, hyperactivity, and impulsivity. The diagnostic process is conducted according to the criteria in the DSM-5 or ICD-11 diagnostic classification systems. Although current diagnostic systems do not provide a separate classification for preschool children, the diagnostic criteria emphasize that symptoms must be present to a degree inconsistent with the developmental level (World Health Organization 2020, American Psychiatric Association 2022).

According to a recent meta-analysis, the prevalence of ADHD in preschool children is estimated to be 3.3%, although screening rates based solely on teacher reports may range from 11.0% to 25.8% (Popit et al. 2024). First-line treatment in this age group consists of parent training and school-based interventions. However, pharmacological treatment may be used when symptoms continue to cause moderate-to-severe functional impairment despite these interventions (Wolraich et al. 2019). Psychosocial interventions for ADHD have been reported to provide additional benefits for symptoms and functioning, particularly when administered in addition to pharmacotherapy (Kahveci Öncü and İnözü 2025).

How to cite: Aslan C. Treatment Trajectories of Methylphenidate versus Risperidone in Preschool ADHD: A 12-Week Retrospective Study. *Türk Psikiyatri Derg* 37:248–257. <https://doi.org/10.5080/u27993>

Received: 24.06.2026, **Accepted:** 02.08.2026, **Publication Date:** 01.10.2026

Assist. Prof., Hacettepe University Faculty of Medicine, Department of Child and Adolescent Psychiatry, Ankara, Türkiye

Cihan Aslan, e-mail: cihanaslan@yahoo.com

The Preschool ADHD Treatment Study (PATS), a comprehensive investigation of this topic, showed that methylphenidate was effective in this age group but had lower efficacy and higher rates of adverse effects than in school-aged children (Greenhill et al. 2006). Immediate-release methylphenidate has been studied extensively in children with ADHD in this age group and remains a widely used pharmacological agent (Greenhill et al. 2006, Ghuman et al. 2009, Wigal et al. 2020). Other non-stimulant agents, including atomoxetine, guanfacine, and clonidine, have also been investigated for core ADHD symptoms; however, their efficacy for core symptoms in preschool children is generally lower than that of stimulants, which points to the prioritization of behavioral interventions during the preschool period (Kratochvil et al. 2007, Scahill et al. 2015, Safavi et al. 2016).

On the other hand, atypical antipsychotics such as risperidone are used primarily to manage accompanying severe disruptive behaviors, low frustration tolerance, and externalizing aggression in preschool children rather than to treat the core symptoms of ADHD (Arabgol et al. 2015, Vaidyanathan et al. 2020). Studies comparing methylphenidate and risperidone in preschool children are very limited. In one such study, Arabgol et al. (2015) examined the effects of methylphenidate and risperidone in children aged 3–6 years with ADHD over a 6-week follow-up period and reported that both medications significantly reduced symptom severity. Safavi et al. (2016) compared the efficacy of methylphenidate monotherapy with the combination of methylphenidate and risperidone in the same age group; after 6 weeks of follow-up, both approaches were found to significantly reduce symptoms, and methylphenidate could be used at lower doses in the combination group. In a more recent study, Vaidyanathan et al. (2020) reported that pharmacological treatments initiated together with behavioral interventions in children aged 2.5–6 years produced significant improvement over a 12-week follow-up period. The fact that existing studies are generally limited to follow-up periods shorter than 12 weeks is an important limitation.

There is consensus that parent training and school-based interventions are required as first-line treatment for ADHD in preschool children. However, pharmacotherapy may be needed in children who do not respond adequately to these interventions, who are at risk of harming themselves or others, who have a high risk of accidents, who have frequent temper tantrums, or who display disruptive behavioral problems. Although pharmacotherapy is frequently used in clinical practice for children who do not respond adequately to behavioral interventions or who display severe behavioral disturbance, the short follow-up periods in existing study designs limit understanding of the sustainability and temporal course of treatment response (Wigal et al. 2020).

In clinical practice, when pharmacological intervention is required for ADHD during the preschool period, clinicians generally choose among different medication classes according to the predominant symptom. Methylphenidate, a stimulant medication, acts primarily as an inhibitor of dopamine and norepinephrine transporters and directly targets impairment in prefrontal functioning (Riddle et al. 2013). In contrast, risperidone, an atypical antipsychotic with potent serotonin-dopamine (5-HT_{2A/D2}) receptor antagonism, is frequently used as an alternative or adjunctive treatment option. Although it is not a primary treatment for the core cognitive problems observed in ADHD, risperidone is effective in alleviating the severe behavioral problems, emotional lability, and disruptive aggression that frequently accompany ADHD in preschool children (Ercan et al. 2011, Harrison et al. 2012). Despite the widespread use of both medications, direct comparative studies of their longitudinal clinical effects in the preschool age group remain very limited.

The present study aimed to retrospectively compare the efficacy of methylphenidate and risperidone in preschool children diagnosed with ADHD over a 12-week follow-up period to address this gap in the literature. This way, the limitations of previous studies in terms of short follow-up periods and direct comparative designs may be overcome, providing a clearer understanding of the effects of the two pharmacological agents on ADHD symptoms and the temporal course of treatment response.

The hypotheses of the study were as follows:

- Compared with the risperidone group, the methylphenidate group would show a faster and more pronounced reduction in core ADHD symptoms (inattention and hyperactivity) throughout the follow-up periods.
- The risperidone group was expected to exhibit a pattern of improvement in behavioral difficulties that differed from that of the methylphenidate group.

METHOD

Participants and Procedure

The study had a naturalistic, retrospective, comparative follow-up design. The clinical records of boys aged 52–72 months who presented to the Hacettepe University Child and Adolescent Psychiatry outpatient clinic between January 1, 2019, and November 30, 2019, were retrospectively reviewed. The records of a total of 212 children who underwent psychometric assessment for behavioral problems and developmental skills and were diagnosed with ADHD according to DSM-5 criteria were screened. The children's cognitive and behavioral status was assessed using the Conners' Parent Rating Scale-Revised Short Form (CPRS-R:S) and the Strengths and Difficulties Questionnaire (SDQ).

Pharmacotherapy was not indicated in 60% (n=128) of the diagnosed children, and 8% (n=18) were excluded because their parents declined medication despite the treatment recommendation. During follow-up, 3% (n=7) discontinued medication because of adverse effects (decreased appetite, sleep disturbances, irritability), and 9% (n=21) were excluded because of incomplete scale data. The final study sample consisted of 38 boys who completed the 12-week follow-up (risperidone, n=18; methylphenidate, n=20). The choice of medication was determined by the treating physician on the basis of the clinical assessment and patient characteristics. None of the participants included in the analysis required dose adjustment or treatment discontinuation because of adverse effects.

The inclusion criteria were as follows: being male, being between 52 and 72 months of age, having no previous pharmacological treatment for ADHD, having received psychoeducation and behavioral recommendations for at least 6 weeks before starting medication, and having complete and regular scale data throughout the 12-week follow-up period. This approach intended to yield a more homogeneous clinical sample. Patients with autism spectrum disorder, intellectual disability, chronic physical illness, or comorbid neurological

disorders were excluded. All participants underwent clinical assessment by an experienced child psychiatrist (Fig. 1).

Treatment options and doses were determined by the relevant physician according to the patients' clinical needs. Methylphenidate treatment was initiated at 2.5 mg/day and titrated up to a maximum of 10 mg/day according to efficacy and tolerability; risperidone treatment was initiated at 0.25 mg/day and was observed to be titrated up to a maximum of 1.25 mg/day using similar criteria.

The study protocol was approved by the Hacettepe University Non-Interventional Clinical Research Ethics Committee (Date: December 17, 2019; Decision No.: GO 19/1174). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data Collection Instruments

Conners' Parent Rating Scale-Revised Short Form (CPRS-R:S)

This 27-item scale developed by Conners (1997) consists of four subscales: Oppositional, Cognitive Problems/Inattention, Hyperactivity, and ADHD Index. Each item is rated on a 4-point Likert scale: 0 (not true at all/never,

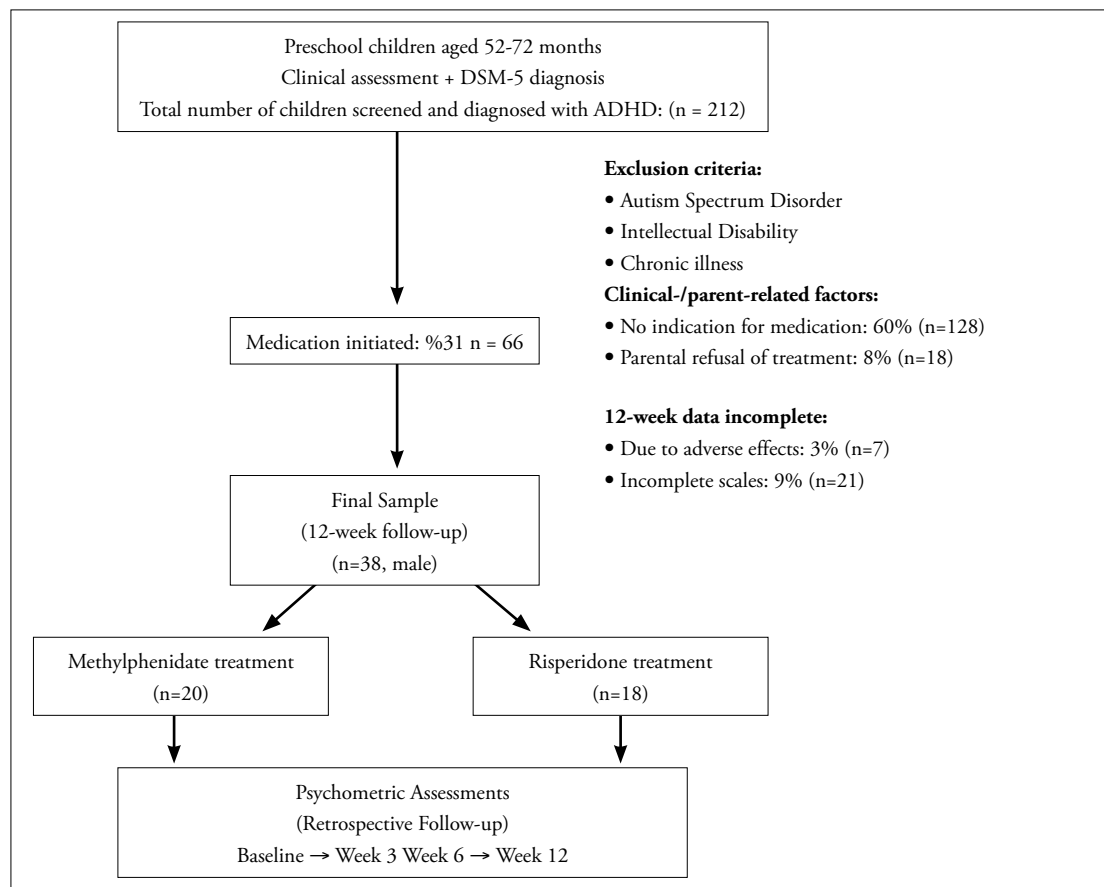


Figure 1. Flowchart of the sample selection process.

seldom), 1 (just a little true/occasionally), 2 (pretty much true/often, quite often), and 3 (very much true/very often, very frequently). Higher scores indicate greater severity of the symptoms defined by the scale (Conners 1997).

Cronbach's alpha and split-half reliability coefficients for the subscales range from 0.73 to 0.86 and from 0.72 to 0.85, respectively. Test-retest reliability values for the subscales range from 0.56 to 0.72. The Turkish validity and reliability study of the scale was conducted by Kaner et al. (2013). In the present study, it was used to measure symptom severity at baseline and during follow-up visits.

Strengths and Difficulties Questionnaire (SDQ)

The 25-item scale developed by Goodman (1997) is used to screen behavioral problems and strengths in children aged 4–16 years. In addition to the total difficulties score, five subscale scores are calculated: emotional problems, conduct problems, hyperactivity, peer problems, and prosocial behavior. Each item is scored on a 3-point Likert scale (0=not true, 1=somewhat true, 2=certainly true). The Turkish validity and reliability study was conducted by Güvenir et al. (2008). In the present study, it was used to evaluate the behavioral difficulties and strengths of preschool children diagnosed with ADHD at baseline and throughout the medication follow-up period.

Statistical Analysis

Data analyses were performed using IBM Statistical Package for Social Sciences (SPSS) program version 23.0 (IBM Corp., Armonk, NY, USA). Normality of the variables was examined using the Shapiro-Wilk test. Baseline (T0) clinical scores were compared between the treatment groups using the independent-samples *t* test. Hedges' *g* was used as the measure of effect size.

A Two-Way Mixed-Design Repeated-Measures Analysis of Variance (RM-ANOVA) was performed to evaluate longitudinal changes in symptom severity and clinical outcomes across multiple time points (baseline, week 3, week 6, and week 12). In these models, 'time (visit)' (T0, T1, T2, T3) was defined as the within-subject factor and 'medication group' (methylphenidate/risperidone) as the between-subject factor.

When interpreting the RM-ANOVA results, the assumption of sphericity was formally evaluated using Mauchly's test. For all clinical scales and subscales in which the assumption of sphericity was significantly violated ($p < 0.05$), degrees of freedom were determined using the Greenhouse-Geisser correction. Effect sizes for the RM-ANOVA models were examined using partial eta squared (η^2), with values interpreted as small (0.01), medium (0.06), or large (0.14). Following the overall RM-ANOVA models, post-hoc pairwise comparisons based on

estimated marginal means were performed to identify specific periods of clinical change over time within and between the groups. The Bonferroni correction was applied to control error rates arising from multiple continuous comparisons. Statistical significance for all overall and post-hoc tests was maintained at a two-tailed $p < 0.05$ level.

RESULTS

Baseline Characteristics and Group Comparisons

The study sample consisted of 38 preschool boys who had not previously received pharmacological treatment for ADHD and who met the criterion of completing the 12-week treatment period. There were 20 children in the methylphenidate group and 18 children in the risperidone group.

When baseline comparisons between the two retrospectively examined groups were evaluated, no statistically significant differences were found in chronological age or baseline CPRS-R:S subscale scores (all $p > 0.05$). However, compared with the risperidone group, the methylphenidate group had significantly higher baseline scores for the SDQ total difficulties score ($p=0.042$) and the emotional problems ($p=0.020$) and hyperactivity ($p=0.032$) subscales (Table 1).

Conners' Parent Rating Scale-Revised Short Form (CPRS-R:S) Results

A series of two-way repeated-measures ANOVAs was conducted to evaluate changes in ADHD symptoms measured by the CPRS-R:S subscales across four assessment times (T0, T1, T2, T3) and two treatment groups (MPH and RIS). None of the subscales showed a statistically significant Time $\times$ Group interaction effect ($p > 0.05$). This finding indicates that the reduction in symptoms over time did not differ significantly between children treated with methylphenidate and those treated with risperidone. Because no difference was found between the two treatments, the main effects of time were analyzed for the pooled patient sample ($n=38$) (Table 2).

Cognitive Problems/Inattention: The main effect of time was significant ($F(1.62, 58.16)=61.17, p < 0.001, \eta^2=0.630$), whereas the main effect of group was not significant ($F(1,36)=1.37, p=0.249, \eta^2=0.037$). The Time $\times$ Group interaction was also not significant ($F(1.62, 58.16)=2.79, p=0.080, \eta^2=0.072$). Post-hoc pairwise comparisons using Bonferroni correction for the pooled sample showed a significant reduction in inattention scores from baseline (T0) to week 3 (T1), and this clinical improvement was maintained at weeks 6 and 12 with no further significant change (T0 $>$ T1=T2=T3) (Table 2).

Hyperactivity: The main effect of time was significant ($F(1.46, 52.44)=91.47, p < 0.001, \eta^2=0.718$). The main

Table 1. Baseline clinical characteristics of the treatment groups (baseline scale scores)

Scale/ Subscale	Methylphenidate (n=20) (Mean ± SD)	Risperidone (n=18) (Mean ± SD)	Test statistics	p value	Hedges' g (95% CI)
CPRS-R:S					
Cognitive problems/inattention	11.25±4.25	11.72±4.07	0.349	0.729	0.11 [-0.51,0.73]
Hyperactivity	14.70±3.11	14.38±2.27	-0.348	0.730	-0.11 [-0.73,0.51]
Oppositional	13.05±4.22	14.44±2.17	1.298	0.217	0.40 [-0.23,1.03]
ADHD index	24.75±8.06	24.05±6.61	-0.288	0.775	-0.09 [-0.72,0.53]
SDQ					
SDQ total difficulties	25.05±5.93	21.17±6.18	-2.104	0.042	-0.67 [-1.31,-0.02]
Hyperactivity	8.40±1.09	6.89±2.61	-2.282	0.032	-0.75 [-1.40,-0.10]
Conduct problems	4.30±1.03	4.39±0.85	0.288	0.775	0.09 [-0.53, 0.72]
Emotional problems	6.80±2.12	5.00±2.42	-2.443	0.020	-0.78 [-1.42,-0.12]
Prosocial behavior	8.95±1.32	5.33±3.38	-4.260	0.001	-1.41 [-2.11,-0.70]
Peer problems	4.45±1.93	3.83±1.89	-0.993	0.327	-0.32 [-0.94,0.31]

CPRS-R:S: Conners' parent rating scale-revised short form; SDQ: strengths and difficulties questionnaire; Mean ± SD: mean ± standard deviation. Independent-samples t test was applied. p <0.05.

Table 2. Two-way repeated-measures ANOVA and post-hoc results for core ADHD Symptoms (CPRS-R:S)

Scale/ subscale	Effect	df	F	p	η^2	Group	Baseline (T0)	Week 3 (T1)	Week 6 (T2)	Week 12 (T3)	Post-hoc Bonferroni
Cognitive problems/inattention	Time	1.62, 58.16	61.17	<0.001***	0.630	MPH	11.25±4.25	6.30±4.04	2.35±1.46	1.60±1.35	T0>T1>T2=T3 (all participants)
	Group	1, 36	1.37	0.249	0.037	RIS	11.72±4.07	4.72±4.29	4.16±2.79	3.83±3.07	
	Time × Group	1.62, 58.16	2.79	0.080	0.072						
Hyperactivity	Time	1.46, 52.44	91.47	<0.001***	0.718	MPH	14.70±3.11	7.60±5.35	5.05±2.28	4.85±2.39	T0>T1>T2=T3 (all participants)
	Group	1, 36	0.00	0.963	0.000	RIS	14.38±2.27	8.22±3.55	5.11±3.19	4.61±3.50	
	Time × Group	1.46, 52.44	0.20	0.749	0.006						
Oppositional	Time	1.66, 59.90	119.93	<0.001***	0.769	MPH	13.05±4.22	7.70±3.24	4.45±1.14	4.00±1.58	T0>T1>T2=T3 (all participants)
	Group	1, 36	0.45	0.507	0.012	RIS	14.44±2.17	7.72±3.13	4.38±2.45	4.05±2.48	
	Time × Group	1.66, 59.90	0.72	0.467	0.020						
ADHD Index	Time	1.53, 55.03	81.72	<0.001***	0.694	MPH	24.75±8.06	13.95±6.77	7.50±2.37	7.35±2.51	T0>T1>T2=T3 (all participants)
	Group	1, 36	0.38	0.543	0.010	RIS	24.05±6.61	14.66±7.68	9.05±5.89	9.00±5.94	
	Time × Group	1.53, 55.03	0.41	0.609	0.011						

CPRS-R:S: Conners' parent rating scale-revised short form; MPH: participants receiving methylphenidate treatment (n=20); RIS: participants receiving risperidone treatment (n=18). Mean ± SD: mean ± standard deviation. df: degrees of freedom; η^2 : partial eta squared. Because the Time × Group interaction effects were not statistically significant (p >0.05), Bonferroni-corrected post-hoc pairwise comparisons were performed on the basis of the pooled patient sample (N=38) (p <0.05). Statistical significance levels: *p < 0.05; **p < 0.01; ***p < 0.001.

effect of group (F (1,36)=0.00, p=0.963, η^2 =0.000) and the Time × Group interaction (F (1.46, 52.44)=0.20, p=0.749, η^2 =0.006) did not reach statistical significance. Bonferroni post-hoc comparisons across the entire cohort showed a continuous, statistically significant decline in hyperactivity symptoms from T0 to T1 and from T1 to T2, followed by a plateau at T3 (T0 > T1 > T2=T3) (Table 2).

Oppositional: The main effect of time was significant (F (1.66, 59.90)=119.93, p <0.001, η^2 =0.769). The main effect of group (F (1,36)=0.45, p=0.507, η^2 =0.012) and the Time × Group interaction (F (1.66, 59.90)=0.72, p=0.467, η^2 =0.020) were not significant. Pairwise comparisons showed progressively significant improvement in oppositional behavior over the first three assessment points for the pooled group, with no significant change between week 6 and week 12 (T0 > T1 > T2=T3) (Table 2).

ADHD Index: The main effect of time was significant (F (1.53, 55.03)=81.72, p <0.001, η^2 =0.694). No significant differences were found for the main effect of group (F (1,36)=0.38, p=0.543, η^2 =0.010) or the Time × Group interaction (F (1.53, 55.03)=0.41, p=0.609, η^2 =0.011). According to Bonferroni post-hoc results for the pooled sample, ADHD Index scores decreased significantly from baseline to week 3 and decreased further at week 6. They remained statistically unchanged at week 12 (T0 > T1 > T2=T3) (Table 2).

Strengths and Difficulties Questionnaire (SDQ) Results

A two-way repeated-measures ANOVA was performed to examine the effects of treatment type (MPH/RIS) and

Table 3. Two-way repeated-measures ANOVA and post-hoc results for SDQ scores

Scale/ subscale	Effect	df	F	p	η^2	Group	B ^s eline (T0)	Week 3 (T1)	Week 6 (T2)	Week 12 (T3)	Post-hoc Bonferroni
SDQ total difficulties	Time	2.43, 87.59	28.62	<0.001***	0.443	MPH	25.05±5.93 ^a	15.95±4.13 ^b	16.65±8.29 ^b	13.45±7.26 ^c	T0>T1=T2>T3
	Group	1, 36	0.90	0.350	0.024	RIS	21.17±6.18 ^a	20.61±2.20 ^a	13.33±7.34 ^b	11.00±4.39 ^b	T0=T1>T2=T3
	Time × Group	2.43, 87.59	5.18	0.005**	0.126						
Hyperactivity	Time	1.99, 71.77	44.95	<0.001***	0.555	MPH	8.40±1.09 ^a	5.85±2.60 ^b	5.10±2.15 ^b	3.15±2.13 ^c	T0>T1=T2>T3
	Group	1, 36	0.14	0.710	0.004	RIS	6.89±2.61 ^a	8.17±2.15 ^a	3.94±1.35 ^b	2.94±1.83 ^b	T0=T1>T2=T3
	Time × Group	1.99, 71.77	7.27	0.001**	0.168						
Conduct problems	Time	2.45, 88.01	24.02	<0.001***	0.400	MPH	4.30±1.03 ^a	2.85±1.63 ^b	3.30±1.56 ^b	1.95±1.64 ^c	T0>T1=T2>T3
	Group	1, 36	0.68	0.416	0.018	RIS	4.39±0.85 ^a	3.78±1.77 ^a	1.17±2.09 ^b	2.05±1.05 ^b	T0=T1>T2=T3
	Time × Group	2.45, 88.01	8.92	<0.001***	0.199						
Emotional problems	Time	2.05, 73.78	12.91	<0.001***	0.264	MPH	6.80±2.12 ^a	3.55±1.82 ^b	3.85±1.87 ^b	4.30±2.54 ^b	T0>T1=T2=T3
	Group	1, 36	6.25	0.017*	0.148	RIS	5.00±2.42 ^a	4.61±3.26 ^a	2.72±2.08 ^{ab}	1.89±2.14 ^b	T0=T1>T2=T3
	Time × Group	2.05, 73.78	4.52	0.013*	0.112						
Prosocial behavior	Time	2.09, 75.05	9.65	<0.001***	0.211	MPH	8.95±1.32 ^a	7.45±1.39 ^a	8.75±1.07 ^{ab}	9.50±1.54 ^{ab}	T0=T1<T2=T3
	Group	1, 36	34.47	<0.001***	0.489	RIS	5.33±3.38 ^a	6.72±1.36 ^a	6.17±1.92 ^a	8.44±1.98 ^b	T0=T1=T2<T3
	Time × Group	2.09, 75.05	5.59	0.005**	0.134						
Peer problems	Time	2.22, 79.72	3.43	0.033*	0.087	MPH	4.45±1.93	3.60±1.35	3.30±0.86	4.05±2.04	T0=T1=T2=T3
	Group	1, 36	0.05	0.833	0.001	RIS	3.83±1.89	3.89±0.68	3.22±2.29	4.11±1.94	(all participants)
	Time × Group	2.22, 79.72	0.78	0.475	0.021						

SDQ: strengths and difficulties questionnaire; MPH: participants receiving methylphenidate treatment (n=20); RIS: participants receiving risperidone treatment (n=18). Mean ± SD; mean ± standard deviation. df: degrees of freedom; η^2 : partial eta squared. Different superscript letters (a, b, c) within the same row indicate statistically significant differences between sequential assessment points based on post-hoc Bonferroni adjustments (p < 0.05). Statistical significance levels: *p < 0.05; **p < 0.01; ***p < 0.001.

assessment time (T0, T1, T2, and T3) on SDQ scores in preschool children diagnosed with ADHD (Table 3).

SDQ Total Difficulties Score: The main effect of time was significant (F (2.43, 87.59)=28.62, p < 0.001, η^2 =0.443). This finding indicates a significant reduction in total difficulties over the 12-week period. The main effect of group was not statistically significant (F (1,36)=0.90, p=0.350, η^2 =0.024). This finding also indicates that there was no overall difference between the two medication groups. However, a significant Time × Group interaction was observed (F (2.43, 87.59)=5.18, p=0.005, η^2 =0.126). Post-hoc pairwise comparisons with Bonferroni correction showed that the MPH group demonstrated significant improvement at weeks 3 and 12 (T0 > T1=T2 > T3), whereas the RIS group showed a significant reduction only after week 6 (T0=T1 > T2=T3) (Table 3).

Hyperactivity: The main effect of time was highly significant (F (1.99, 71.77)=44.95, p < 0.001, η^2 =0.555). The main effect of group was not significant (F (1,36)=0.14, p=0.710, η^2 =0.004). The Time × Group interaction was significant (F (1.99, 71.77)=7.27, p=0.001, η^2 =0.168). Bonferroni post-hoc analyses showed that hyperactivity symptoms decreased earlier in the MPH group (T0 > T1=T2 > T3) than in the RIS group (T0=T1 > T2=T3) (Table 3).

Conduct Problems: The main effect of time was statistically significant (F (2.45, 88.01)=24.02, p < 0.001, η^2 =0.400). No significant main effect was detected for group (F (1,36)=0.68, p=0.416, η^2 =0.018). The Time × Group interaction was significant (F (2.45, 88.01)=8.92, p < 0.001, η^2 =0.199). Post-hoc comparisons showed that behavioral improvement

followed a T0 > T1=T2 > T3 pattern in the MPH group, whereas the RIS group showed a significant decline from week 6 onward (T0=T1 > T2=T3) (Table 3).

Emotional Problems: Significant main effects were observed for both time (F (2.05, 73.78)=12.91, p < 0.001, η^2 =0.264) and group (F (1,36)=6.25, p=0.017, η^2 =0.148). The Time × Group interaction was also statistically significant (F (2.05, 73.78)=4.52, p=0.013, η^2 =0.112). Bonferroni post-hoc analyses showed that emotional symptoms decreased significantly at week 3 in the MPH group (T0 > T1=T2=T3), whereas the RIS group showed a significant decrease at week 6 that continued through week 12 (T0=T1 > T2=T3) (Table 3).

Prosocial Behavior: The main effect of time (F (2.09, 75.05)=9.65, p < 0.001, η^2 =0.211) and the main effect of group (F (1,36)=34.47, p < 0.001, η^2 =0.489) were significant. In addition, the Time × Group interaction was significant (F (2.09, 75.05)=5.59, p=0.005, η^2 =0.134). Post-hoc comparisons showed that prosocial behavior improved significantly at weeks 6 and 12 in the MPH group (T0=T1 < T2=T3), whereas the RIS group showed a significant increase only at the final, week-12 assessment (T0=T1=T2 < T3) (Table 3).

Peer Problems: The main effect of time was statistically significant (F (2.22, 79.72)=3.43, p=0.033, η^2 =0.087). However, the main effect of group (F (1,36)=0.05, p=0.833, η^2 =0.001) and the Time × Group interaction (F (2.22, 79.72)=0.78, p=0.475, η^2 =0.021) were not significant. Bonferroni-corrected pairwise comparisons detected no statistically significant differences among the visit times

(T0=T1=T2=T3). This finding indicates that peer difficulties remained stable throughout the study period in the pooled sample (Table 3).

DISCUSSION

This retrospective study compared not only the treatment outcomes of methylphenidate and risperidone monotherapies in preschool children diagnosed with ADHD, but also the trajectories of change in symptoms and functioning across four consecutive assessment points over 12 weeks. Although the naturalistic design of the study precluded controlled evaluation of baseline clinical characteristics, it may be important because it reflects decision-making processes in daily clinical practice. Although no significant baseline differences were found between the groups in CPRS-R:S scores, the methylphenidate group had higher SDQ total difficulties, hyperactivity, and emotional problems scores. In contrast, prosocial behavior scores were also higher in the same group, indicating better social functioning. These findings suggest that children in the methylphenidate group had more pronounced emotional problems and hyperactivity-related difficulties at baseline, while their prosocial behavior was relatively better preserved.

In clinical practice, methylphenidate is generally preferred as the first option for treating core ADHD symptoms, whereas risperidone is used more often in cases accompanied by pronounced irritability, difficulties with behavioral control, or problems with emotional regulation. The higher total difficulties, hyperactivity, and emotional problems scores in the methylphenidate group in the present sample suggest that psychostimulants may have been preferentially selected in cases with a more pronounced symptom burden and functional difficulties. This finding is also consistent with treatment algorithms recommending that psychostimulant treatment be prioritized in preschool ADHD cases with more pronounced functional impairment (Wolraich et al. 2019, Wigal et al. 2020).

On the other hand, the emotional problems subscale of the SDQ predominantly assesses internalizing symptoms such as anxiety, fear, unhappiness, and somatic complaints. Therefore, the higher emotional problems scores observed in the methylphenidate group may indicate the presence of more pronounced internalizing symptoms at baseline rather than difficulty with behavioral regulation. This suggests that emotional difficulties accompanying ADHD symptoms during the preschool period may be one of the important clinical characteristics that can influence treatment selection.

With regard to the first hypothesis, which predicted that methylphenidate would produce a faster reduction in core ADHD symptoms, the study findings showed a parallel

decline in both cohorts on the CPRS-R:S rather than a different pattern. Both treatment groups showed gradual reductions in Cognitive Problems/Inattention, Hyperactivity, and the ADHD Index. Although the limited sample size restricts generalization, the absence of differentiation between the medications in the reduction of core symptom severity is consistent with the findings of Arabgol et al. (2015), who reported no significant clinical differences between methylphenidate and risperidone monotherapies on symptom scales in a similar age group. Post-hoc pairwise comparisons showed that core symptom scores decreased significantly at weeks 3 and 6 in both treatment groups and remained stable between weeks 6 and 12. This finding suggests that the primary therapeutic effect occurred during the first half of the intervention and that clinical gains were maintained through the 12-week endpoint. In addition, a study conducted by Safavi et al. (2016) found that combining risperidone with methylphenidate accelerated acute symptom control over a 6-week trial compared with methylphenidate monotherapy. The 12-week longitudinal observations in our study showed that both monotherapies could produce significant and comparable reductions in core ADHD scores over a longer period. This finding suggests that combined medication regimens may optimize rapid behavioral control in acute crises, but that monotherapies may also remain a long-term clinical option depending on the baseline assessment and length of follow-up. This suggests that, although the two medications reach similar endpoints for core ADHD symptoms, they may differ in the temporal pattern of clinical change.

Some differences between the findings observed with the CPRS-R:S and the SDQ may be understood in terms of the different constructs these instruments are intended to measure. The CPRS-R:S is an assessment instrument based on the core DSM symptoms (Conners 1997). The SDQ, however, provides a more comprehensive assessment of childhood development in terms of overall functional impairment, social adjustment, and peer relationships (Goodman 1997). In a recent Turkish sample, SDQ total difficulties and inattention/hyperactivity scores were also reported to be strongly associated with the lack of premeditation and lack of perseverance dimensions of impulsivity (Tekeoğlu et al. 2025). The consistent efficacy of methylphenidate in these dimensions in our study is consistent with findings from the PATS study conducted in preschool children diagnosed with ADHD (Riddle et al. 2013). Therefore, the differences observed on the SDQ may reflect changes in broader functional and behavioral domains rather than changes in core ADHD symptoms. Indeed, social-cognitive difficulties in ADHD have been reported to be associated more with comorbid oppositional and aggressive behaviors than with the ADHD diagnosis alone (Günay and Günay 2019). Psychostimulants can effectively regulate neurodevelopmental underarousal

through catecholamine regulation in the prefrontal cortex (Faraone and Buitelaar 2010, Wigal et al. 2020). In contrast, the parallel course shown by risperidone on the CPRS-R:S indicates that, at the end of 12 weeks, it produced a pattern of change in parent-reported CPRS-R:S scores similar to that of methylphenidate. However, it may be more appropriate to interpret this result as secondary behavioral stabilization rather than primary neurocognitive improvement (Loy et al. 2017). In preschool children, parent-reported hyperactivity is often closely related to gross motor restlessness and low frustration tolerance (van Stralen 2016, Cui et al. 2024). By downregulating subcortical dopaminergic pathways, risperidone reduces this externalizing motor output and may show an improvement slope on diagnostic scales similar to that produced by psychostimulants by regulating behavioral output rather than improving executive attention (Aman et al. 2004, Penubarthi et al. 2026).

The most notable finding of our study is that the two treatment groups differed in how they reached the final clinical outcomes rather than in the final outcomes themselves. Functional improvement emerged early in the methylphenidate group, whereas a more gradual and time-distributed trajectory of change was observed in the risperidone group. The SDQ results demonstrated this difference most clearly. Although the methylphenidate group had higher total difficulties, hyperactivity, and emotional problems scores at baseline, it progressed more rapidly in terms of behavioral improvement and showed an acute decline in the total difficulties level, SDQ hyperactivity scores, and conduct problems from week 3 onward, reaching the same level as the risperidone group at week 12. This early change observed in the methylphenidate group is consistent with the reported clinical effects of psychostimulants in preschool ADHD; however, because of the non-randomized design of the study, it should not be interpreted as evidence that methylphenidate is superior to risperidone (Riddle et al. 2013). In contrast, the risperidone group in our study showed a steady but delayed decline in conduct problem scores. Marked changes in conduct problem and hyperactivity scores in the risperidone group emerged after week 6, whereas improvement in emotional difficulties became evident at week 12. These findings indicate a more gradual longitudinal trajectory of change in the risperidone group. This 12-week longitudinal course of improvement with risperidone is consistent with the findings of the prospective study by Vaidyanathan et al. (2020), which showed that short-term pharmacological interventions in preschool ADHD provided sustained control over a similar follow-up period. Whereas psychostimulants are typically used to alleviate core symptoms of hyperactivity and inattention, the demonstration that risperidone produced delayed but significant improvements in behavioral and emotional domains suggests that it may be an option for preschool children diagnosed with ADHD who have pronounced irritability,

difficulty with behavioral control, or externalizing problems. During early developmental stages, when severe externalizing behaviors substantially impair daily functioning, risperidone may be considered an option particularly for managing disruptive symptoms that do not respond to the stimulant treatments recommended as the first priority (Gleason et al. 2007, Arabgol et al. 2015, Vaidyanathan et al. 2020).

The study has several limitations. The retrospective and naturalistic design of the study and the fact that treatment allocation was not randomized but was based on clinical judgment are important methodological limitations. This design limits control over confounding variables such as variations in medication doses, differences in titration, or concurrent behavioral interventions. In particular, because baseline differences in SDQ scores between the groups may have contributed to the observed longitudinal trajectories of change, these patterns cannot be attributed solely to treatment effects. The limited sample size is another important limitation of the study. In addition, family-related variables that may have influenced treatment selection and treatment response (such as parental attitudes, family functioning, and caregiver characteristics) were not assessed in the study. ADHD symptoms and accompanying behavioral difficulties have previously been shown to be associated with family context and parenting characteristics (Çöp et al. 2017).

The sample analyzed in the study represents only a subset of all patients who initiated treatment. The exclusion of cases who could not continue treatment or had incomplete data may have led to selection bias. In addition, ADHD subtypes could not be determined for all participants because the retrospective records were insufficient. Although most preschool children who require pharmacotherapy are thought to present with the combined or hyperactive-impulsive presentation in clinical practice, the inability to conduct subgroup analyses is an important limitation.

The sample consisted exclusively of boys. Although this reflects the higher rate of clinical presentation among boys in early childhood, it limits the generalizability of the findings to preschool girls diagnosed with ADHD. The scale data collected were based solely on parent reports. Including teacher reports could have provided an additional perspective across settings and reduced possible parent-report bias (Stone et al. 2010). Therefore, the absence of teacher reports should also be considered a limitation.

Although the children included in the study were participants who had not discontinued treatment because of adverse effects, sensitivity to adverse effects is known to be higher in this age group. The absence of standardized adverse-effect scales and the fact that the assessments did not include BMI or metabolic laboratory measurements may be considered

important limitations. The retrospective design of the study limited access to this information.

Finally, although the 12-week follow-up period is consistent with the existing comparative literature, it is insufficient to evaluate the long-term efficacy and safety profiles of the medications in this age group (Arabgol et al. 2015, Safavi et al. 2016, Vaidyanathan et al. 2020). Prospective randomized controlled studies in larger samples that include systematic safety monitoring are needed to confirm the findings and to develop evidence-based pharmacological algorithms for the treatment of ADHD in the preschool age group.

CONCLUSION

The main contribution of this study is not to demonstrate that one treatment is superior to the other, but to show that methylphenidate and risperidone exhibit different longitudinal trajectories of change despite producing similar improvements in core ADHD symptoms. This study showed that both methylphenidate and risperidone monotherapies led to significant reductions in parent-reported core ADHD symptoms in preschool children over 12 weeks. Although the two pharmacological agents could reach similar clinical outcomes, they followed different trajectories of change in reaching these outcomes. Functional improvement emerged earlier in children receiving methylphenidate, whereas improvement in children receiving risperidone followed a more gradual and time-distributed pattern. In clinical practice, these findings should not be interpreted as evidence that one medication is superior to the other, but as preliminary findings supporting the joint consideration of core ADHD symptoms, accompanying externalizing and behavioral-control difficulties, and the individual benefit-risk profile when pharmacotherapy is required.

Ethics Committee Approval: The study protocol was approved by the Hacettepe University Non-Interventional Clinical Research Ethics Committee on December 17, 2019, with decision number GO 19/1174

Conflict of Interest: The authors declare no conflicts of interest.

Funding: This research received no external funding.

REFERENCES

- Aman MG, Binder C, Turgay A (2004) Risperidone effects in the presence/absence of psychostimulant medicine in children with ADHD, other disruptive behavior disorders, and subaverage IQ. *J Child Adolesc Psychopharmacol* 14:243–54. <https://doi.org/10.1089/1044546041649020>
- American Psychiatric Association (2022) *Diagnostic and Statistical Manual of Mental Disorders, 5th Ed. (Text Revision)*. Washington DC, American Psychiatric Association. <https://doi.org/10.1176/appi.books.9780890425787>
- Arabgol F, Panaghi L, Nikzad V (2015) Risperidone versus methylphenidate in treatment of preschool children with attention-deficit hyperactivity disorder. *Iran J Pediatr* 25:e265. <https://doi.org/10.5812/ijp.265>
- Conners C (1997) *Conners' Rating Scales-Revised User's Manual*. North Tonawanda, Multi-Health Systems Inc. <https://doi.org/10.1037/t81067-000>
- Çöp E, Çengel Kültür SE, Şenses Dinç G (2017) Association between parenting styles and symptoms of attention deficit hyperactivity disorder. *Türk Psikiyatri Derg* 28:25–32.
- Cui Z, Li S, Liang A et al. (2024) Association between reported ADHD symptom and motor development delay in preschool children. *Front Pediatr* 12:1480488. <https://doi.org/10.3389/fped.2024.1480488>
- Ercan ES, Basay BK, Basay O et al. (2011) Risperidone in the treatment of conduct disorder in preschool children without intellectual disability. *Child Adolesc Psychiatry Ment Health* 5:10. <https://doi.org/10.1186/1753-2000-5-10>
- Faraone SV, Buitelaar J (2010) Comparing the efficacy of stimulants for ADHD in children and adolescents using meta-analysis. *Eur Child Adolesc Psychiatry* 19:353–64. <https://doi.org/10.1007/s00787-009-0054-3>
- Ghuman JK, Aman MG, Lecavalier L et al. (2009) Randomized, placebo-controlled, crossover study of methylphenidate for attention-deficit/hyperactivity disorder symptoms in preschoolers with developmental disorders. *J Child Adolesc Psychopharmacol* 19:329–39. <https://doi.org/10.1089/cap.2008.0137>
- Gleason MM, Egger HL, Emslie GJ et al. (2007) Psychopharmacological treatment for very young children: contexts and guidelines. *J Am Acad Child Adolesc Psychiatry* 46:1532–72. <https://doi.org/10.1097/chi.0b013e3181570d9e>
- Goodman R (1997) The strengths and difficulties questionnaire: a research note. *J Child Psychol Psychiatry* 38:581–6. <https://doi.org/10.1111/j.1469-7610.1997.tb01545.x>
- Greenhill L, Kollins S, Abikoff H et al. (2006) Efficacy and safety of immediate-release methylphenidate treatment for preschoolers with ADHD. *J Am Acad Child Adolesc Psychiatry* 45:1284–93. <https://doi.org/10.1097/01.chi.0000235077.32661.61>
- Günay AM, Günay KB (2019) Factors associated with empathy among adolescents with attention deficit hyperactivity disorder. *Türk Psikiyatri Derg* 30:260–7. <https://doi.org/10.5080/u23398>
- Güvenir T, Özbek A, Baykara B et al. (2008) Psychometric properties of the Turkish version of the strengths and difficulties questionnaire (SDQ). *Türk J Child Adolesc Ment Health* 15:65–74.
- Harrison JN, Cluxton-Keller F, Gross D (2012) Antipsychotic medication prescribing trends in children and adolescents. *J Pediatr Health Care* 26:139–45. <https://doi.org/10.1016/j.pedhc.2011.10.009>
- Kahveci ÖB, İnöz M (2025) Psychological and psychosocial interventions in attention deficit hyperactivity disorder: a systematic review. *Türk Psikiyatri Derg* 36:10. <https://doi.org/10.5080/u27201>
- Kaner S, Büyükoztürk Ş, İşeri E (2013) Conner's parent rating scale-revised short: Turkish standardization study. *Noro Psikiyatr Ars* 50:100–9. <https://doi.org/10.4274/npa.y6219>
- Kratochvil CJ, Vaughan BS, Mayfield-Jorgensen ML et al. (2007) A pilot study of atomoxetine in young children with attention-deficit/hyperactivity disorder. *J Child Adolesc Psychopharmacol* 17:175–85. <https://doi.org/10.1089/cap.2006.0143>
- Loy JH, Merry SN, Hetrick SE et al. (2017) Atypical antipsychotics for disruptive behaviour disorders in children and youths. *Cochrane Database Syst Rev* 8:CD008559. <https://doi.org/10.1002/14651858.CD008559.pub3>
- Penubarthi S, Rajamanickam K, Thappa HA et al. (2026) Efficacy and safety of risperidone for attention deficit hyperactivity disorder and disruptive behaviour disorders: a systematic review and meta-analysis. *East Asian Arch Psychiatry* 36:40–5. <https://doi.org/10.12809/eaap25137>
- Popit S, Serod K, Locatelli I et al. (2024) Prevalence of attention-deficit hyperactivity disorder (ADHD): systematic review and meta-analysis. *Eur Psychiatry* 67:e68. <https://doi.org/10.1192/j.eurpsy.2024.1786>
- Riddle MA, Yerushova K, Lazzaretto D et al. (2013) The preschool attention-deficit/hyperactivity disorder treatment study (PATS) 6-year follow-up. *J Am Acad Child Adolesc Psychiatry* 52:264–78. <https://doi.org/10.1016/j.jaac.2012.12.007>

- Safavi P, Dehkordi AH, Ghasemi N (2016) Comparison of the effects of methylphenidate and the combination of methylphenidate and risperidone in preschool children with attention-deficit hyperactivity disorder. *J Adv Pharm Technol Res* 7:144–8. <https://doi.org/10.4103/2231-4040.191425>
- Scahill L, McCracken JT, King BH et al. (2015) Extended-release guanfacine for hyperactivity in children with autism spectrum disorder. *Am J Psychiatry* 172:1197–206. <https://doi.org/10.1176/appi.ajp.2015.15010055>
- Stone LL, Otten R, Engels RC et al. (2010) Psychometric properties of the parent and teacher versions of the strengths and difficulties questionnaire for 4- to 12-year-olds: a review. *Clin Child Fam Psychol Rev* 13:254–74. <https://doi.org/10.1007/s10567-010-0071-2>
- Tekeoğlu U, Çöp E, Avcı H (2025) UPPS-P impulsive behavior scale for children: Turkish adaptation, reliability and validity study. *Türk Psikiyatri Derg* 36:297–308. <https://doi.org/10.5080/u27468>
- Vaidyanathan S, Rajan TM, Chandrasekaran V et al. (2020) Pre-school attention deficit hyperactivity disorder: 12 weeks prospective study. *Asian J Psychiatr* 48:101903. <https://doi.org/10.1016/j.ajp.2019.101903>
- van Stralen J (2016) Emotional dysregulation in children with attention-deficit/hyperactivity disorder. *Atten Defic Hyperact Disord* 8:175–87. <https://doi.org/10.1007/s12402-016-0199-0>
- Wigal S, Chappell P, Palumbo D et al. (2020) Diagnosis and treatment options for preschoolers with attention-deficit/hyperactivity disorder. *J Child Adolesc Psychopharmacol* 30:104–18. <https://doi.org/10.1089/cap.2019.0116>
- Wolraich ML, Hagan JF, Allan C et al. (2019) Clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents. *Pediatrics* 144: e20192528. <https://doi.org/10.1542/peds.2019-2528>
- World Health Organization (2020) *International Classification of Diseases (11th Revision)*. Geneva, World Health Organization.